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Agriculture Faculty, Widyagama University of Malang
Jl. Taman Borobudur Indah No. 3 Malang 65142 INDONESIA
Phone / Fax +62341 496919
Email: jsed@widyagama.ac.id
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The impact of electricity investment on inter-regional economic development in Indonesia: An Inter-Regional Input-Output (IRIO) approach

Albertus Girik Allo[1]*, Inayati Nuraini Dwiputri[2], and Marcus Maspaitella[1]

[1]Papua University, Indonesia
[2]Universitas Negeri Malang, Indonesia

*Correspondence email: ag.allo@unipa.ac.id

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ABSTRACT

Electricity is a development priority for low and middle income countries, including Indonesia, especially in the households living in suburban and rural areas. By 2020, Indonesia's electrification ratio has reached 96.71%. However, there were 433 villages that did not have electricity, most of which were located in eastern Indonesia (Papua, West Papua, East Nusa Tenggara, and Maluku). Investment in the electricity sector will drive regional economic growth. This research attempts to figure out the impact of investment in electricity on economy. This study used Indonesian inter-regional Input-Output data. The method used in this study was the Interregional Input-Output (IRIO) model. The analysis shows that electricity impacted not only the territory being built but also other regions in Indonesia. Electricity industry investment in Indonesia have been able to provide a multiplier effect on the economy as many as 3.11. Java region gets the greatest benefit from electricity development in Indonesia. This was rationally acceptable due to the fact that most of the industry was located in this region. This causes a development gap between Java and outside Java. It is necessary to accelerate reallocate several national strategic industries on various islands in Indonesia based on the advantages of each region and to strive for areas that are still "dark" to have electricity.

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INTRODUCTION

The trend of electricity consumption in Indonesia has progressively increased in recent years. According to the Central Bureau of Statistics, per capita consumption of electricity grew gradually from 0.91 MWH in 2015 to 1.08 MWH in 2019 (BPS, 2021). Nowadays, electricity is considered as one of the energy sources that is utilized in generating economic activities of the Indonesian people. Economic activities related to production of goods and services are mostly powered by electricity as their energy sources. Therefore, the utilization of electricity is still considered having significant contributions to the improvement of economic development (Chakravorty et al., 2016; Khandker et al., 2014; Van de Walle et al., 2017). Moreover, it is an undeniable fact that the increase of electricity consumption is also supported by the investment in the electricity sector. In addition, the increasing trend of electricity utilization has also encouraged various researches on the identification of

the impact of electricity utilization and investment on economic development. Electricity is able to provide a multiplier effect to other sectors, such as manufacturing (Rud, 2012), agriculture (Kline & Moretti, 2014), real estate (Lipscomb et al., 2013), and industry (Hadi et al., 2021). Additionally, electricity also has a positive effect to the increase of the Human Development Index (Maqin & Sidharta, 2017). However, the Government of Indonesia should also develop the renewable energy in reducing greenhouse gas emissions and the use of petroleum fuels (Erdiwansyah et al., 2021).

In terms of investment, many studies revealed that investment is expected to increase economies (Cavallo & Daude, 2011; Cullison, 1993; Levine & Renelt, 1992; Milbourne et al., 2003). The investment can be implemented in the forms of infrastructure developments and supporting facilities, from which it can generate economic activities. Therefore, investment can also be a main drive in recovering economy both in short term and in long term development. Moreover, other empirical researches also highlighted that investment on infrastructure has direct effects on community prosperity, especially income improvement (Lee et al., 2020; Prastiwi et al., 2017), labor supply increase (Grogan & Sadanand, 2013), better respiratory health (Barron & Torero, 2017), higher schooling attainment for children (Khandker et al., 2014).

In the context of investment on electricity, some previous empirical studies in various countries revealed the importance of electricity investment. For instance, electricity investment played a significant role in maintaining business cycle in Chile (Agurto et al., 2021). Other studies showed that, in the macroeconomic perspective, electrification is able to trigger economic development in regions (Bhattacharyya, 2012; Cook, 2011; Mulder & Tembe, 2008). In addition, studies conducted by Khandker et al. (2014) and Lee et al. (2020) confirmed that, in the microeconomic level, electrification advantages also has positive impacts on economic activities. Saidi et al. (2017), using dynamic panel data analysis for 67 sampled countries, found that information communication technology (ICT) and economic growth have a significant effect on electricity consumption in both high-income, middle-income, and low-income countries. Furthermore, using a different perspective regarding the different relationship between use, investment in the electricity sector and economic growth, one research attempted to identify whether there was an economic loss during the time of power outage due to flooding in the United Kingdom (Koks et al., 2019). This study found that the flood resulting in a blackout caused a decline in the UK economy. The results showed that up to a 300% increase in total economic losses due to power outages was included in the risk assessment, compared to analysis that just included the economic impacts of business interruption due to flooded business premises (Koks et al., 2019). Another similar study found that there was a significant economic loss when there was a power outage due to a disaster (Kajitani et al., 2013). These findings become a foundation in identifying further impacts of electricity investment on economy.

At present, electricity is one of the major projects in development in Indonesia. This can be seen from the electrification ratio target set by the government, which is 100% by 2024. In 2020, the electrification ratio in Indonesia reached 96.71%, where in Java it reached 98.91% and outside Java it reached 93.49% (PLN, 2020). To achieve the target of electrification ratio, the Indonesian government power sector developed an investment plan of USD48.74 billion for generators (fossil and new renewable energy), transmissions, and substations during 2020-2024 (Direktorat Jenderal Ketenagalistrikan KESDM, 2020).

Investment on electricity in Indonesia is also important to be further identified due to the fact that Indonesia is an archipelago country with various cultures. Various research on the impact of electricity on the economy have been carried out in Indonesia (Handayani et al., 2017; Munasinghe, 1988; Sambodo, 2015; Sambodo & Novandra, 2019). However, the impact of electricity investment in this country may vary among regions or provinces and there is still little research on this topic. Thus, this research attempts to figure out the impact of investment in electricity on economy, especially on interregional and intraregional outputs, in several regions in Indonesia.

RESEARCH METHOD

This study used data of the 2016 Indonesian interregional Input-Output table with the domestic transactions at producer's price by six island groups and 52 industries. The unit of measurement in Input-Output table was calculated in million rupiah. The six island groups included Sumatera, Java, Bali and Nusa

Tenggara, Kalimantan, Sulawesi, Maluku and Papua, while the 52 industries can be seen in Appendix.

Technical Analysis

This research utilized Interregional Input-Output (IRIO) Model. The model was first introduced by Walter Isard in 1951, and thus was also known as "Isard Model". This model was then developed by Miller and Blair (2009) with the basic structure as presented in Table 1.

Table 1. Basic Structure of IRIO Models

Selling Sector		Purchasing Sector				
		Regional r			Regional s	
		1	2	3	1	2
Regional r	1	z_{11}^{rr}	z_{12}^{rr}	z_{13}^{rr}	z_{11}^{rs}	z_{12}^{rs}
	2	z_{21}^{rr}	z_{22}^{rr}	z_{23}^{rr}	z_{21}^{rs}	z_{22}^{rs}
	3	z_{31}^{rr}	z_{32}^{rr}	z_{33}^{rr}	z_{31}^{rs}	z_{32}^{rs}
Regional s	1	z_{11}^{sr}	z_{12}^{sr}	z_{13}^{sr}	z_{11}^{ss}	z_{12}^{ss}
	2	z_{21}^{sr}	z_{22}^{sr}	z_{23}^{sr}	z_{21}^{ss}	z_{22}^{ss}

Note: There are two regions, r and s, let there be three purchasing sectors (1, 2, 3) in region r and two (1, 2) in region s. Notation z_{ij}^{rr} and z_{ij}^{ss} are intraregional flows, while z_{ij}^{sr} and z_{ij}^{rs} are interregional flows (Miller & Blair, 2009)

If the data in Table 1 is transformed into matrix model, it can be written as followed:

$$Z = \begin{bmatrix} Z^{rr} & Z^{rs} \\ Z^{sr} & Z^{ss} \end{bmatrix}$$

The notation of Z^{rr} and Z^{ss} are called as intraregional linkages, while Z^{rs} and Z^{sr} are called interregional linkages. if X is total output and Y is final demand, the basic structure of IRIO can be formulated into equations as followed:

Regional r:

$$X_1^r = z_{11}^{rr} + z_{12}^{rr} + z_{13}^{rr} + z_{11}^{rs} + z_{12}^{rs} + Y_1^r \quad (1)$$
$$X_2^r = z_{21}^{rr} + z_{22}^{rr} + z_{23}^{rr} + z_{11}^{rs} + z_{22}^{rs} + Y_2^r \quad (2)$$
$$X_3^r = z_{31}^{rr} + z_{32}^{rr} + z_{33}^{rr} + z_{31}^{rs} + z_{32}^{rs} + Y_3^r \quad (3)$$

Regional s:

$$X_1^s = z_{11}^{sr} + z_{12}^{sr} + z_{13}^{sr} + z_{11}^{ss} + z_{12}^{ss} + Y_1^s \quad (4)$$
$$X_2^s = z_{21}^{sr} + z_{22}^{sr} + z_{23}^{sr} + z_{11}^{ss} + z_{22}^{ss} + Y_2^s \quad (5)$$

From the above equations, it can be simplified for the regional input coefficients for regional r that is writen as follows.

$$a_{ij}^{rr} = \frac{z_{ij}^{rr}}{X_j^r} \quad (6)$$

Whereas, the regional input coefficients for regional s can be written as follows.

$$a_{ij}^{ss} = \frac{z_{ij}^{ss}}{X_j^s} \quad (7)$$

Regarding interregional trade coefficients from regional r to regional s, it can be formulated as follows.

$$a_{ij}^{rs} = \frac{z_{ij}^{rs}}{X_j^s} \quad (8)$$

Whereas, interregional trade coefficients from regional s to regional r can be written as follows.

$$a_{ij}^{sr} = \frac{z_{ij}^{sr}}{X_j^r} \quad (9)$$

If equations of regional input and trade coefficients are substituted into equations (1) until (5), it can result in equations as follows.

Regional r:

$$X_1^r = a_{11}^{rr}X_1^r + a_{12}^{rr}X_2^r + a_{13}^{rr}X_3^r + a_{11}^{rs}X_1^s + a_{12}^{rs}X_2^s + Y_1^r \quad (10)$$
$$X_2^r = a_{21}^{rr}X_1^r + a_{22}^{rr}X_2^r + a_{23}^{rr}X_3^r + a_{11}^{rs}X_1^s + a_{22}^{rs}X_2^s + Y_2^r \quad (11)$$
$$X_3^r = a_{31}^{rr}X_1^r + a_{32}^{rr}X_2^r + a_{33}^{rr}X_3^r + a_{31}^{rs}X_1^s + a_{32}^{rs}X_2^s + Y_3^r \quad (12)$$

Regional s:

$$X_1^s = a_{11}^{sr}X_1^r + a_{12}^{sr}X_2^r + a_{13}^{sr}X_3^r + a_{11}^{ss}X_1^s + a_{12}^{ss}X_2^s + Y_1^s \quad (13)$$
$$X_2^s = a_{21}^{sr}X_1^r + a_{22}^{sr}X_2^r + a_{23}^{sr}X_3^r + a_{11}^{ss}X_1^s + a_{22}^{ss}X_2^s + Y_2^s \quad (14)$$

if equations (10) until (14) is formed into matrix model, it can be written as follows,

$$\begin{vmatrix} a_{11}^{rr} & a_{12}^{rr} & a_{13}^{rr} & a_{11}^{rs} & a_{12}^{rs} \\ a_{21}^{rr} & a_{22}^{rr} & a_{23}^{rr} & a_{21}^{rs} & a_{22}^{rs} \\ a_{31}^{rr} & a_{32}^{rr} & a_{33}^{rr} & a_{31}^{rs} & a_{32}^{rs} \\ a_{11}^{sr} & a_{12}^{sr} & a_{13}^{sr} & a_{11}^{ss} & a_{12}^{ss} \\ a_{21}^{sr} & a_{22}^{sr} & a_{23}^{sr} & a_{21}^{ss} & a_{22}^{ss} \end{vmatrix} \begin{vmatrix} X_1^r \\ X_2^r \\ X_3^r \\ X_1^s \\ X_2^s \end{vmatrix} + \begin{vmatrix} Y_1^r \\ Y_2^r \\ Y_3^r \\ Y_1^s \\ Y_2^s \end{vmatrix} = \begin{vmatrix} X_1^r \\ X_2^r \\ X_3^r \\ X_1^s \\ X_2^s \end{vmatrix} \quad (15)$$

or can be simply writen as follows,

$$AX + Y = X \quad (16)$$

or

$$X = (I - A)^{-1}Y \quad (17)$$

where I is Identity matrix, Y is Final demand, X is Total output, $(I - A)$ is Leontief matrix, $(I - A)^{-1}$ is Inverse Leontief matrix.

Injection in Input-Output Model

Equation (17) can be used to find out the impact of the 35.000 MW electricity supply program on economy. Injection in the model is defined by final demand (Y), representing the value of investment that is planned to be absorbed in electricity industry. This research utilizes the 2020-2024 electricity industry investment plan released by the Ministry of Energy and Mineral Resources of Indonesia (KESDM) (Table 2), as the injection in the Input-Output model. There are three types of electricity investment: generators, transmissions, and substations. Investment in power plants is divided into two categories, based on the fuel

used, i.e. fossil and new renewable energy. Power plant investment is the largest investment component of electricity investment which reached 7.70% during the period.

Table 2. Electricity Industry Investment Plan, 2020-2024

Region	2020	2021	2022	2023	2024
	.....		US$ billion	.....	
Sumatera	2.20	2.18	2.90	3.39	2.46
Java	5.81	6.22	5.38	4.60	4.55
Bali & Nusa Tenggara	0.42	0.37	0.44	0.14	0.17
Kalimantan	1.98	0.81	0.52	0.36	0.33
Sulawesi	0.71	0.26	0.75	0.48	0.66
Maluku & Papua	0.24	0.30	0.08	0.01	0.03
Total	11.35	10.14	10.07	8.98	8.20

RESULT AND DISCUSSION

Electricity Development in Indonesia

The theory of neoclassical growth (Solow, 1956; Swan, 1956) stated that investment has effects on community prosperity. One of these investments is electricity. Since Indonesian New Order regime, investment in all economic sectors has been intensified, including in electricity industry. Data from the Central Bureau of Statistics indicates that the consumption of public electricity shows an increase from year to year. The installed capacity of power plants has also increased from year to year. Nevertheless, the development of the electricity sector in Indonesia has differences among regions considering the conditions in Indonesia which have many differences both in terms of topography and regional contours. In addition, several regions in Indonesia also experience power outages more often than other regions.

Several studies empirically show that the investment in the electricity sector can affect economic performance. The use of electricity for economic activities leads to the improvement in economic productivity and growth. However, there are also other researches concluding that actually economic growth affects the increase of electricity consumption. For example, some researchers found that the variable that significantly affects electricity consumption is the consumption of electronic goods (Saidi et al., 2017; Van de Walle et al., 2017; Winkler et al., 2011). Public demand for electronic goods encourages the use of electricity because generally electronic goods are powered by electricity.

The increase in the installed capacity of power plants is accompanied by an increase in the electricity consumption of the Indonesian people. Table 3 shows the electricity consumption of Indonesian people, in which during the 2016 – 2020 period increased by 3.08% per year. This is in line with the increase in installed capacity of power plants in the same period by an average of 3.93% per year (Table 4). Electricity consumption in Indonesia is also used for economic activities, from which the use of electricity should be able to increase the economy as a whole. By region, people living in Java Island consume more electricity than those outside Java. During the 2016 – 2020 period, the average electricity consumption in Java was 71.05% of Indonesia's total electricity consumption. In terms of electricity consumption growth, electricity consumption in Java decreased by 0.75% per year.

Table 3. Energy Sold by Type of Customers, 2016-2020

Customer Group	2016	2017	2018	2019	2020
	.....		GWh	.....	
Java					
Residential	59,481.08	59,665.19	61,593.86	64,963.35	70,330.61
Industrial	60,475.37	63,553.99	67,105.54	67,229.65	61,205.75
Business	26,493.13	27,791.12	29,218.40	31,135.04	28,205.75
Public[1]	8,655.87	8,980.83	9,567.92	10,263.91	9,952.32
Total	155,105.45	159,991.13	167,485.72	173,591.95	169,694.43
Outside Java					
Household	34,153.55	34,792.19	36,238.42	38,770.09	41,825.24
Industry	7,669.95	8,868.38	9,840.96	10,649.00	11,034.11
Business	13,581.25	13,903.67	14,809.00	15,766.21	14,395.00
Public[1]	5,494.12	5,578.35	6,243.77	6,740.92	6,633.97
Total	60,898.87	63,142.59	67,132.15	71,926.22	73,888.32

[1]public customer including social, government office building, and public street lighting.

Table 4. Power Balance by Region in Indonesia, 2016-2020

Customer Group	2016	2017	2018	2019	2020
			MW		
Java					
Installed Capacity	36,712.15	36,517.23	37,721.60	40,174.66	40,685.01
Rated Capacity	34,373.06	33,673.21	34,977.43	41,204.80	33,609.01
Peak Load	33,208.14	25,680.47	27,097.58	26,657.90	24,420.29
Outside Java					
Installed Capacity	17,420.13	19,208.73	19,823.87	21,632.99	22,433.27
Rated Capacity	13,577.40	15,718.18	16,286.63	17,211.77	18,512.64
Peak Load	12,115.08	13,116.68	11,672.35	14,932.80	15,545.95

Table 5. Linkage of Interregional Trade in Indonesia

Destination	Origin					
	Sumatera	Java	Bali and Nusa Tenggara	Kalimantan	Sulawesi	Maluku and Papua
			%			
Sumatera	85.02	4.31	2.38	1.36	2.18	5.72
Java	13.24	90.11	10.38	15.88	12.60	20.51
Bali & Nusa Tenggara	0.44	1.32	83.59	1.46	2.15	0.41
Kalimantan	0.78	2.01	1.87	76.96	3.38	1.02
Sulawesi	0.32	1.55	1.10	3.49	78.22	1.19
Maluku & Papua	0.20	0.71	0.69	0.85	1.46	71.15
Total	100.00	100.00	100.00	100.00	100.00	100.00

Although electricity consumption in Java has decreased, the contribution to Indonesia's GDP is still the highest at 58.59% per year in the same period. Based on the above conditions, it is expected that economic growth outside Java will increase in line with the increase of electricity consumption. Empirically, some researchers found that electricity consumption in the US has a positive impact on economic growth (Wu et al., 2021). Wu et al. (2021) also concluded that expanding access to electricity is able to increase economic growth in rural area in India. Other empirical research showed that, from the macroeconomic perspective, electrification is able to encourage the economic development of a region (Bhattacharyya, 2012; Cook, 2011; Mulder & Tembe, 2008).

Reserve margin is the amount of generation reserves owned by the system based on the total installed generating capacity in a system with a large peak load of the system. Based on the data in Table 5, it can be seen that in 2020 the reserve margin in the Java region was higher than that in the area outside Java. The reserve margin value for the last 5 years (2016 – 2020) shows that the reliability of power plants outside Java decreased, but in Java it increased. The reserve margin value can also show the magnitude of the electricity surplus. In 2020, the amount of electricity surplus in the Java region was 66.60% of the total installed capacity, while outside Java was 44.30%. When compared to the previous year, the electricity surplus in Java increased by 31.36% and outside Java decreased by 1.26%. The increase in the surplus in the Java region was due to a decrease in electricity consumption by the industrial, business and public sectors, by 8.96%, 9.41%, and 3.04%, respectively. The surplus of electricity both in Java and outside Java is expected to be utilized by the industrial and business sectors in increasing production capacity. In addition, there is a need for regulations from the government related to restrictions on the granting of business permits to provide electricity and the use of independent electricity (captive power).

Interregional Trade in Indonesia

Input-Output data for the year of 2016 describes the linkage of interregional trade in Indonesia. The results indicate that Indonesian trade remains to be dominated by the trade in own regions, and only a few of those regions perform interregional trade. Java Island was the highest benefit receiver of interregional trade and intraregional trade. On the other hand, Maluku and Papua were the regions that received the lowest benefit of both interregional and intraregional trade.

Data from Input-Output table also shows contribution of each region in terms of foreign trade.

The analysis results indicate that more than 50% of Indonesia's foreign trade is generated from Java region, followed by Sumatera and Kalimantan, with 24.59% and 15.85%, respectively (Figure 1). This is in line with the distribution of industrial area in Indonesia, where 61.16% of industrial areas are located on the island of Java, 29.75% on the island of Sumatra, and 5.79% on the island of Kalimantan.

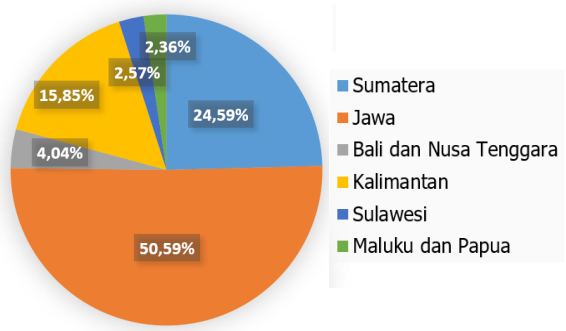

Figure 1. Regional shares by Indonesia's total export

Indonesia's 2020 export structure based on islands can be divided into two categories based on the largest contribution, i.e. the island group with the largest contribution from the manufacturing sector and the island group with the largest contribution from the mining sector. The first group consists of Java, Sumatra, and Sulawesi, while the second group consists of Bali and Nusa Tenggara, Kalimantan, and Maluku and Papua. Total export to Java Island reaches US$76,523.9 million, of which the manufacturing industry dominates up to 95.56%, followed by the agricultural sector at 2.36%, and oil and gas at 2.03%. Sumatra has a total export value of US$44,697.4 million, the manufacturing industry contributes 86.71%, oil and gas 6.55% and agriculture 3.96%. Sulawesi has a total export value of US$12,666.6 million, the manufacturing industry contributes 90.86%, oil and gas 6.66% and agriculture 2.44%. The islands of Bali and Nusa Tenggara have a total export value of US$1,143.8 million, mining industry 51.74%, manufacturing industry 40.74% and agriculture 7.45%. Kalimantan has a total export value of US$23,262.1 million, the mining industry contributes 68.73%, the manufacturing industry 25.86% and oil and gas 4.94%. The islands of Maluku and Papua have a total export value of US$4,898.0 million, the mining industry contributes 38.31%, oil and gas 36.25% and the manufacturing industry 24.73%.

Table 6. Leading Industries based on Shares of Foreign Export and Regional Output, and Total Backward and Forward Linkages

Region	Indicator	Leading Industry[1]		
		1	2	3
Sumatera	Share of Foreign Export	I-13	I-08	I-23
	Share of Regional Output	I-13	I-31	I-33
	Backward Linkages > 1	-	-	-
	Forward Linkages >1	I-33	I-13	I-12
Java	Share of Foreign Export	I-15	I-33	I-19
	Share of Regional Output	I-31	I-33	I-13
	Backward Linkages > 1	-	-	-
	Forward Linkages >1	I-19	I-33	I-48
Bali & Nusa Tenggara	Share of Foreign Export	I-40	I-10	I-41
	Share of Regional Output	I-31	I-33	I-40
	Backward Linkages > 1	-	-	-
	Forward Linkages >1	I-33	I-28	-
Kalimantan	Share of Foreign Export	I-09	I-12	I-13
	Share of Regional Output	I-09	I-31	I-13
	Backward Linkages > 1	-	-	-
	Forward Linkages >1	I-12	I-19	I-10
Sulawesi	Share of Foreign Export	I-22	I-13	I-12
	Share of Regional Output	I-31	I-13	I-33
	Backward Linkages > 1	-	-	-
	Forward Linkages >1	I-33	I-13	-
Maluku & Papua	Share of Foreign Export	I-10	I-12	I-33
	Share of Regional Output	I-31	I-49	I-10
	Backward Linkages > 1	-	-	-
	Forward Linkages >1	I-33	-	-

[1]see Appendix

The leading industries of each region can be valued from three indicators, namely share of export, share of output, and backward linkage index and forward linkage index (Table 6). According to the analysis of export share, each region has various specifications based on the first leading industry. Moreover, the classification of leading industries based on share of output indicates that almost all regions (Java, Bali and Nusa Tenggara, Sulawesi, and Maluku and Papua) have a similar leading industry, which is construction. In addition, construction also becomes the second leading industry in Sumatera and Kalimantan. Infrastructure development programs accelerated by the national government in the whole regions in Indonesia also become a logical reason of the improvement of construction sector, in addition to the development carried out by the private sectors.

Furthermore, backward and forward linkages were also analyzed in order to find out the relationship of one sector to other sectors upstream and downstream. The backward linkage relates to the linkage of one sector to the supply of raw materials for that sector (input providers), while forward linkage indicates the linkage of one sector to the sector that

sells products produced from that sector. If the value of backward linkage and forward linkage value is more than one, then the sector can be indicated to be a leading sector. The findings suggested that that there was no leading industry in a region. This means that there was no single industry where input fulfillment and input sales were concentrated in one area. No backward linkages value was worth more than one, meaning that the fulfillment of raw materials for an industry did not only come from one region but from others.

Impact of 35,000 MW Electricity Program on Regional Output

The Leontif's inverse matrix is a matrix that describes the output multiplier of each industry. This value can also be interpreted as the response of industry to the changes in exogenous variables (final demand). Changes in exogenous variables can occur in various scenarios, including: a) one industry in one region; b) one industry in several regions; c) one industry in the entire region; d) more than one industry in one area; e) more than one industry in several regions; f) more than one industry in the entire region. Each industry will provide a response that can be seen in two ways: a) the response of the industry within the region itself; and b) industrial response outside the region. The total value of the industry response is referred to as the total impact on output owing to changes in exogenous variables.

Table 7. Impact of Electricity Investment on Total Output

Region	2020	2021	2022	2023	2024
	..... US$ billion				
Sumatera	7.32	7.26	8.90	9.85	7.49
Java	16.57	17.13	15.45	13.37	12.90
Bali & Nusa Tenggara	1.03	0.91	1.07	0.35	0.44
Kalimantan	7.61	4.31	3.42	2.58	2.51
Sulawesi	1.78	0.77	1.85	1.23	1.63
Maluku & Papua	0.96	1.11	0.65	0.51	0.46
Total	35.28	31.50	31.35	27.90	25.43

The results presented in Table 7 shows the total impact of the estimated injection of the electricity industry on the economy within the region itself and between regions. The analysis highlights that the Java region receives the greatest benefits from investment in the electricity industry. This is rationally acceptable due to the fact that most of the industry was located in this region. Electricity industry investment in this region was able to provide an average multiplier effect on the economy of 2.84. This value was smaller than the national average of 3.11. The smallest multiplier value was obtained by Bali and Nusa Tenggara (2.48) and the highest was obtained by Maluku and Papua (15.20). The total output value in Table 7 still contains the value of spillover effect (Table 8) and feedback effect (Table 9).

Table 8. Value of Spillover Effect of Electricity Investment by Region

Region	2020	2021	2022	2023	2024
	..... US$ billion				
From Sumatera to					
Java	0.99	0.98	1.31	1.53	1.11
Bali & Nusa Tenggara	0.01	0.01	0.01	0.01	0.01
Kalimantan	0.11	0.11	0.15	0.18	0.13
Sulawesi	0.03	0.03	0.04	0.04	0.03
Maluku & Papua	0.23	0.23	0.31	0.36	0.26
Total	1.37	1.36	1.82	2.12	1.54
From Java to					
Sumatera	1.48	1.60	1.38	1.17	1.15
Bali & Nusa Tenggara	0.02	0.02	0.02	0.01	0.01
Kalimantan	1.49	1.60	1.38	1.18	1.16
Sulawesi	0.13	0.14	0.12	0.10	0.10
Maluku & Papua	0.16	0.17	0.15	0.12	0.12
Total	3.27	3.52	3.04	2.58	2.55
From Bali & Nusa Tenggara to					
Sumatera	0.06	0.05	0.06	0.02	0.03
Java	0.26	0.20	0.26	0.08	0.11
Kalimantan	0.19	0.15	0.20	0.06	0.08
Sulawesi	0.01	0.01	0.01	0.00	0.00
Maluku & Papua	0.01	0.00	0.01	0.00	0.00
Total	0.53	0.40	0.53	0.17	0.23
From Kalimantan to					
Sumatera	0.16	0.06	0.04	0.03	0.03
Java	0.47	0.19	0.12	0.09	0.08
Bali & Nusa Tenggara	0.01	0.00	0.00	0.00	0.00
Sulawesi	0.03	0.01	0.01	0.00	0.00
Maluku & Papua	0.01	0.00	0.00	0.00	0.00
Total	0.68	0.28	0.18	0.12	0.11
From Sulawesi to					
Sumatera	0.03	0.01	0.03	0.02	0.03
Java	0.26	0.10	0.28	0.18	0.25
Bali & Nusa Tenggara	0.00	0.00	0.00	0.00	0.00
Kalimantan	0.21	0.08	0.23	0.14	0.20
Maluku & Papua	0.00	0.00	0.00	0.00	0.00
Total	0.52	0.19	0.55	0.35	0.48
From Maluku & Papua to					
Sumatera	0.01	0.01	0.00	0.00	0.00
Java	0.07	0.09	0.02	0.00	0.01
Bali & Nusa Tenggara	0.00	0.00	0.00	0.00	0.00
Kalimantan	0.08	0.10	0.03	0.00	0.01
Sulawesi	0.00	0.00	0.00	0.00	0.00
Total	0.16	0.21	0.05	0.01	0.02

The value of the spillover effect is the output value received by a region due to investment in another region. On average, electricity investment in the Sumatera region is able to contribute to the region approximately US$1.64 billion per year, of which Java

becomes the region that benefits the most. Electricity investment in the Java region is able to provide an average additional output in other regions of US$2.99 billion per year, of which Kalimantan region receives the largest impact. Electricity investment in Bali and Nusa Tenggara, Kalimantan, Sulawesi, as well as Maluku and Papua contributes to the economy as much as US$0.37 billion per year, US$0.27 billion per year, US$0.42 billion per year, US$0, 09 billion per year, respectively. Java is the region that receives the greatest impact from electricity investment in Bali and Nusa Tenggara, Kalimantan and Sulawesi. Meanwhile, Kalimantan region receives the biggest impact from electricity investment in Maluku and Papua region.

Table 9. Value of Feedback Effect of Electricity Investment by Region

Region	2020	2021	2022	2023	2024
	.....		US$ billion	.....	
Sumatera	80.13	79.50	106.00	123.57	89.74
Java	318.55	343.50	296.07	251.91	248.55
Bali & Nusa Tenggara	0.73	0.56	0.74	0.24	0.32
Kalimantan	16.98	6.93	4.42	3.12	2.85
Sulawesi	2.70	1.00	2.86	1.84	2.53
Maluku & Papua	0.32	0.40	0.11	0.02	0.04
Total	419.42	431.89	410.19	380.69	344.02

The value of the feedback effect is the amount of value received by a region due to investment from that region which has had an impact on other regions and then has a back impact on the region of origin. The results show that Java region has the largest feedback effect value compared to other regions. The average feedback effect received by Java region is about US$291.71 million per year or 73.44% of the total feedback from electricity investment in Indonesia. Maluku and Papua region receive the smallest feedback effect, which is US$0.18 million per year. It can affect the economic growth as Sitorus and Yuliana (2018) found that there is inequality between the economic growth of province in Java and outside of Java.

Research Implication

Based on the findings, there are some policy implications that should be implemented. First, electricity has an important role in development, so it is necessary to strive for areas that are still "dark" to have electricity. Some results of previous studies show that the development of the electricity industry can increase the economic growth of a region (Kumari & Sharma, 2018; Tiwari et al., 2021). The presence of electricity in areas that are still "dark" can reduce disparities among regions in Indonesia. IRIO's 2016 table shows that the electricity industry is an industry that provides the main output multiplier in the economy of every province in Indonesia. This applies in particular to the 433 villages that do not have electricity, most of which are located in eastern Indonesia (Papua, West Papua, East Nusa Tenggara, and Maluku). The government can encourage the use of new and renewable energy in providing electricity in the region. Renewable energy as a power plant provides good benefits for environmental sustainability and reduces energy subsidies.

Secondly, to reduce the development gap between Java and outside Java, it is necessary to accelerate and reallocate several national strategic industries on various islands in Indonesia based on the advantages of each region. Some results of previous studies show that the development of the electricity industry is able to encourage the development of other industries (Hadi et al., 2021; Rosenberg, 1998). This reallocation will lead to more benefits from the 35,000 MW development being enjoyed by the electricity-producing regions. The value of the spillover effect of electricity investment going to the Java region will be smaller. Examples are the construction of Bintuni Industrial Zone in West Papua Province based on the gas processing industry (petrochemicals, fertilizers, etc.) and Ketapang Industrial Zone in West Kalimantan Province focused on the alumina industry. With the future plans regarding equality of distribution of electricity supply throughout all regions in Indonesia, local governments are also encouraged to create new business centers in order to take advantages of the abundance of electrical energy, and to contribute to economic improvement. Currently, Indonesia is experiencing an excess of electricity supply both in Java and outside Java. The industry is expected to be able to take advantage of the excess electrical energy that exists today to increase production. In addition, industry is expected not to provide independent electrical energy (captive power).

CONCLUSION AND SUGGESTION

The consumption of electricity in Indonesia increases in recent years, especially in powering economic activities. In 2021, Indonesia's electrification ratio would reach 99.4%, having a 0.2% increase from

the previous year. However, the distribution of electricity has not been spread evenly, impacting the inter-regional trade in Indonesia. The results of this study indicate that Java region receive the highest benefit of electricity investment due to the fact that majority of economic industries are located there. Moreover, electricity investment in Java region contributes to interregional trade, with the largest spillover effect to other regions. The average spillover of Java region was approximately US$2.99 billion per year. In addition, Java region became the largest receiver in terms of the value of feedback effect, with a value of US$291.71 million per year, while Maluku and Papua region was the region with the smallest feedback effect at US$0.18 million per year. Thus, the government must redistribute economic centers in the island of Java to other regions in Indonesia. Some policy implications include supplying electricity to areas that have not been electrified with new and renewable energy. Moreover, it is necessary to accelerate and reallocate national strategic industries to areas outside Java so that electricity development there can be well absorbed. The government should encourage local authorities to plan a new business center in order to take advantage of the abundance of electrical energy that will come.

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Appendix. Classification 52 industry at Input-Output Table, 2016

Code	Name of Industry	Code	Name of Industry
I-01	Food Corps Agriculture	I-27	Other Processing Industries, Machinery and Equipment Repair and Installation Services
I-02	Farming Horticulture Crips Annuals, Annual Horticulture and etc	I-28	Electricity
I-03	Annual and Annual Plantations	I-29	Gas Procurement and Ice Production
I-04	Farming	I-30	Water Supply, Waste Management, Waste and Recycling
I-05	Agricultural and Hunting Services	I-31	Construction
I-06	Forestry and Logging	I-32	Car, Motorcycle and Repair Trade
I-07	Fishery	I-33	Wholesale and Retail Trade, Not Cars and Motorcycles
I-08	Oil, Gas and Geothermal Mining	I-34	Rail Transport
I-09	Coal and Lignite Mining	I-35	Land Transport
I-10	Metal Ore Mining	I-36	Sea Freight
I-11	Mining and Other Quarry	I-37	River Lake and Crossing Transportation
I-12	Coal Industry and Oil and Gas Refinery	I-38	Air Freight
I-13	Industry of Food and Beverage	I-39	Warehousing and Supporting Services for Transport, Post and Couriers
I-14	Industry of Tobacco Processing	I-40	Accommodation Provision
I-15	Industry of Textile and Apparel	I-41	Food and Drink Provision
I-16	Industry of Leather, Leather Goods and Footwear	I-42	Private Information and Communication Services
I-17	Industry of wood, goods made of wood and cork and woven goods from bamboo, rattan and the like	I-43	Financial Intermediary Services Other Than Central Bank
I-18	Industry of Paper and Paper Goods, Printing and Recording Media Reproduction	I-44	Insurance and Pension Fund
I-19	Industry of Chemical, Pharmaceutical and Traditional Medicine	I-45	Other Financial Services
I-20	Industry of Rubber, Goods from Rubber and Plastic	I-46	Financial Support Services
I-21	Industry of Non-Metal Mineral	I-47	Real Estate
I-22	Industry of Base Metal	I-48	Company Services
I-23	Industry of Metal, Computer, Electronic, Optical and Electrical Equipment	I-49	Government Administration, Defense and Mandatory Social Security
I-24	Industry of Machinery and YTDL Equipment	I-50	Private Education Services
I-25	Transportation Industry	I-51	Health Services and Private Social Activities
I-26	Furniture Industry	I-52	Other Private Services

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Correlation between satisfactory level and visitors number in Cibodas Botanic Gardens, Indonesia

Imawan Wahyu Hidayat[1]*, Winarni[2] and Dwi Novia Puspitasari[3]

[1]Research Center for Plant Conservation and Botanical Gardens - National Research and Innovation Agency (BRIN) the Republic of Indonesia, Indonesia
[2]Directorate of Scientific Collection Management - National Research and Innovation Agency (BRIN) the Republic of Indonesia, Indonesia
[3]Bureau for Public Communication, General Affairs, and Secretariat - National Research and Innovation Agency (BRIN) the Republic of Indonesia, Indonesia

*Correspondence email: imawan.wahyu.hidayat@brin.go.id

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ABSTRACT

The level of service quality delivered to the customers in a tourism business might be represented by a satisfaction index. A higher index means that the service is more satisfying and eventually might attract more customers. However, does the increasing number of customers always reflect a better service quality? This study aims to analyze the level of customer satisfaction and its correlation to the number of visitors to Cibodas Botanic Gardens. The satisfaction index was analyzed based on nine criteria, complying with the regulation of the Minister of State Apparatus Utilization and Bureaucratic Reform, Republic of Indonesia. The analysis started by distributing the questionnaires, which gained results from 1,321 respondents from 2017 to 2019. The number of visitors was obtained by inventorying the number of the sold tickets monthly. Pearson test (r) was used to examine the correlation between the satisfaction index and the number of visitors, and a t-test was used to evaluate the level of significance (α = 0.05). The findings show that the index from 2017 to 2019 was relatively stable: 80.8, 80.15, and 80.93 (scale of 25 to 100), respectively. On the other side, the number of visitors tended to rise each year by 24% to 26% instead. The test shows that the correlation was positive but weak (r = 0.236) with no significance. These results provide an overview description and for operators' consideration to manage the site in their policies. The efforts focus not only on attracting more visitors but also on enhancing the quality of the services.

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INTRODUCTION

The increasing demand for sightseeing has driven a significant leap in the tourism industry, making it one of the economy's leading sectors in many countries. In 2019, tourism had crucial impacts on world economies with USD 8.9 trillion contributions to the worlds' GDP (World Travel and Tourism Council, 2019a). The tourism industry has also developed rapidly, gives prosperity, provides numerous job opportunities, and serves visitors with various recreational events and experiences (World Tourism Organization, 2019). In

Indonesia, tourism contributed 5.7% of the total economy to GDP or USD 63.6 billion, providing over 12.5 million jobs or 9.7% of the entire employment (World Travel and Tourism Council, 2019b).

Next, the value of tourism needs to enhance day by day. Therefore, the destination image must be well managed through planning and good maintenance, and be well organized by the stakeholders (Rosa et al., 2018). Understanding tourist preferences is a valuable input for tourism operators in planning and business processes (Sohrabi et al., 2020). Destination image is an impression created by tourists in their minds through some compression, i.e., cognitive, affective, and conative. These are also matters related to how someone sees a destination (Lai & Li, 2016). This image, when meeting the tourists' expectations, can result in certain level of satisfaction and willingness to visit again. Tourist loyalty is a more challenging and demanding matter because the determinants of this behavior are more complicated. The studies on destination loyalty indicate that one of the most decisive factors in the next visit to a tourist destination is their satisfaction with prior experiences staying there (Engeset & Elvekrok, 2015). To discover how a tourist knows about a location, most of these studies assume that it is essential to examine the satisfaction level (Engeset & Elvekrok, 2015).

The satisfaction of tourism customers provides an apparent description of the product of tourism and the tourism operator's ways of developing services based on the accepted feedback (Kanwel et al., 2019). A particular characteristic that can help with customer satisfaction can be achieved when destinations fulfill or replace the expectations when tourists visit a destination (Hill & Alexander, 2016).

Cibodas Botanic Gardens (CBG) is a government unit conducted under the National Research and Innovation Agency (BRIN) (Presidential Regulation Republic of Indonesia, 2021). It has primary duties and obligations as an ex-situ conservation site of wet tropical mountainous plants, a facility for developing related research and education, and also tourism spot, especially ecotourism. CBG ecotourism provider offers not only regular sightseeing through the beautiful scenery of the garden landscape but also educational tours (such as introduction to its plant collections, plant morphology, and their characteristics, as well as explanation and practice of the plant propagation process via vegetative and generative procedures). The activities also involve introduction to the gardens and tropical rain forest description, where tourists are guided into a particular area of pristine forest that still exists in the CBG. Another activity is one where tourists receive explanation about plant herbarium and the equipments to create it, and then practice making it.

As a public service provider in ecotourism, it is crucial for CBG to offer a good quality of service for the customers. Hundreds of thousands of tourists visit CBG each year. To preserve the loyalty of visitors, customer satisfaction is one of the critical values to achieve it. Previous studies describe that tourist satisfaction is the most crucial indicator of visitors' loyalty to any attraction (Canny, 2013; Chen et al., 2016; Chiu et al., 2016). However, public services performed by government officials has not yet met the expectations (Minister of State Apparatus Utilization and Bureaucratic Reform Republic of Indonesia, 2017). It is apparent from the complaints submitted through various media. If the complaints are not well handled, the low reputation may cause social distrust in the quality of the government's services. One of the efforts to enhance the public service is to conduct a satisfaction survey by measuring customer satisfaction regarding the services' quality.

A previous study has examined the level of satisfaction of services delivered by CBG, using lesser respondents and earlier version of regulation guidance (Hidayat & Winarni, 2017). However, it failed to describe its correlation with the visitor's number phenomenon. Therefore, this study aims to analyze the level of customer satisfaction with CBG's service quality, represented by the index of satisfaction using the latest guidance, and to analyze the relationship between this index and the number of visitors: are they inter-correlated or independent? This study is expected to be able to describe the performance of the concerned service unit to be a valuable input for future development.

RESEARCH METHOD

The study was conducted at Cibodas Botanic Gardens (CBG), Cianjur, West Java. CBGs' geographical location is at 6.735 to 6.748 South and 107.003 to 107.016 East. It is located at the eastern mountainside of Mount Gede-Pangrango, West Java. CBG occupies an area of ± 85 hectares with an altitude ranging between 1,300-1,425 meters above sea level. It has a wet tropical climate with the rainfall rate of

2,950 mm per year, approximate temperature of 20 °C, and humidity of 80.82%. In a year, there are seven to eight wet months there (Sujarwo et al., 2019). Based on the Schmidt-Ferguson classification, the climate of CBG is the type of C to B, or less wet to wet, based on Koppen, and thus CBG can be included in tropical rainforest climate or wet tropic 'Af' (Beck et al., 2018).

The study was conducted by distributing questionnaires to be filled out by respondents. This process was performed in 2017, 2018, and 2019. The questionnaires consisted of two sections. The first section was related to the respondent demographic characteristics. The questions were about gender, age, education, and occupation. In section two, the respondents were asked to evaluate their satisfaction regarding the received services. These questions indicate the quality of the services by CBG as a government public service unit (Minister of State Apparatus Utilization and Bureaucratic Reform Republic of Indonesia, 2017). There were nine questions regarding the service quality, i.e. (1) service requirements; (2) service procedures; (3) service completion time; (4) service charge; (5) service-specific suitability; (6) operator's competence; (7) operator's behavior; (8) management of complaints/ suggestions/ inputs; (9) supporting infrastructures. The description of each service quality variable is explained in Table 1.

The respondents must supply a value for each variable. Each variable had a weight rating based on the Likert scale of importance, from 1 to 4. Value 1 is for 'poor' service quality, value 2 for 'fair' level, value 3 for 'good' service, and value 4 for service quality at an 'excellent' level. The study randomly selected respondents from the garden customers who had been served by the CBGs' operator.

The number of respondents was calculated using the Krejcie and Morgan equation (Riyanto & Hatmawan, 2020), with the formula:

$$n = \frac{x^2 \cdot N \cdot P \cdot (1 - P)}{(N - 1) \cdot \alpha^2 + x^2 \cdot P \cdot (1 - P)} \quad (1)$$

n is the minimum size of the sample or the number of respondents, x^2 is chi-square, N is the population's size, P is the proportion of the population ($P = 0.5$), and α is the level of error ($\alpha \leq 0.1$). In 2017, it begins to apply the new regulation of the survey procedures. Then to fulfill the requirements, the CBG operator established that the survey plan used $\alpha = 0.1$ and $N = 500{,}000$. Then, $x^2 = 2.7055$, so the minimum of respondents (n) is 68. Next, in 2018 and 2019, the accuracy has been raised. The value of $\alpha = 0.05$ then $x^2 = 3.8415$, with the range of N from 500,000 to 1 million, so the minimum of respondents (n) is 384. The number of respondents was 1,321, with details: 296 respondents in 2017, 589 in 2018, and 429 in 2019. Therefore, the number of respondents in those three years has fulfilled the requirement.

Table 1. The Description of Service Quality Variables

No	Variable	Description
1	Service requirements (SR)	Requirements that must be fulfilled in administering a type of service, both technically and administratively.
2	Service procedures (SP)	Standardized service procedures for service operators and recipients, including complaints.
3	Service completion time (CT)	The period required to complete the entire service process for each type of service.
4	Service charge (SC)	Fees are charged to service recipients in administering and, or obtaining the services from the operators.
5	Service-specific suitability (SS)	Results of services provided and received following the provisions that have been determined.
6	Operator's competence (OC)	Abilities possessed by the operators include knowledge, expertise, skills, and experience.
7	Operator's behavior (OB)	The attitude of operators when providing the services.
8	Managing the complaints/ suggestions/inputs (MC)	The procedures in the management of customer complaints and the follow-up.
9	Supporting infrastructures (IS)	Any materials which can be used as a tool in achieving goals and objectives and the availability of the proper infrastructures to support the services.

Source: Minister of State Apparatus Utilization and Bureaucratic Reform Republic of Indonesia (2017)

The next set of data was the number of visitors to CBG. The CBG tourists are charged in the form of entrance tickets. Therefore, the number of visitors was acquired from the number of sold tickets recorded monthly from 2017 to 2019 by the Subunit of Services and Information of CBG. The data were processed by a series of calculations. The average value of each variable was formulated as:

$$\overline{X_i} = \frac{\sum X_i}{N} \quad (2)$$

$\overline{X_i}$ is an average value of a variable of service of i (the value is between 1 to 4); ΣX_i is the total value number of the variable of service of i; N is the total number of the respondents at the period; i is the number of variables (1,2,3, 9). Each variable has a weight value, 1/9 or 0.11 so that the average weight value of the variable of services i was formulated as $\overline{X_i}' = \overline{X_i} \times 0.11$. To simplify the interpretation, the value was expected in range 25-100, each average weight value was multiplied with constants (c) of '25'. Then, the satisfaction index (SI) was formulated as:

$$SI = \sum \overline{X_i}' \times c \quad (3)$$

The stratification of SI is based on a value range of 25 to 100. The value of 25 to 64.99 is a 'D' level, meaning the quality of services is 'poor'; value 65.00 to 76.6 has a 'C' level or 'fair' or low; value 76.61 to 88.30 has a 'B' level, meaning 'good' quality; and, value 88.31 to 100 has an 'A' level or 'very good' quality.

Furthermore, to analyze the correlation between SI (x) and the number of visitors (y), a Pearson correlation coefficient test was conducted with the formula:

$$r = \frac{n\sum x_i y_i - \sum x_i \sum y_i}{\left[(n\sum x_i^2 (\sum x_i)^2\right]^{1/2} \left[(n\sum y_i^2 (\sum y_i)^2\right]^{1/2}} \quad (4)$$

To test their relationship, a hypothesis was then arranged that H_0: $r = 0$; H_1: $r \neq 0$. The value of $r = 0$ means no correlation between the satisfaction index (x) and the number of visitors (y). In reverse, the value of $r \neq 0$ means that there is a correlation. If r-value does not exceed |1| when approaching the value of -1, it means that there is a negative linear relationship. When it approaches the value of 1, it means that there is a positive linear relationship. A strong correlation occurs when $r \geq 0.6$, strong positive and $r \leq -0.6$, strong negative; $0.4 \leq r \leq 0.59$ is moderate positive, $-0.59 \leq r \leq -0.4$ is moderate negative; $0.2 \leq r \leq 0.39$ is weak positive, $-0.39 \leq r \leq -0.2$ is weak negative; and, $0 < r \leq 0.19$ is very weak positive, $-0.19 \leq r < 0$ is very weak negative (Meghanathan, 2016).

Next, there was also a significant degree evaluation with a t-test ($\alpha = 0.05$). If, $r \neq 0$, and p-value < α, it means that the correlation between two variables is significant. On the other hand, p-value > α means that the correlation between two variables is not significant.

RESULT AND DISCUSSION

Characteristics of the Respondents

Table 2 provides the detailed characteristics of the respondents of the study. This study indicates that questionnaire respondents were seemingly dominated by female visitors all year. Next, almost 90% of the respondents were dominated by young (≤ 17 to 30 years old) and adults (≥ 31 to 45 years old), or 60% and 29%, respectively. Only a few visitors were in the middle-age, ≥ 46 years old (6.8%).

Table 2. Respondent Characteristics

Variable Category	2017[a] (*n*=296)	2018[b] (*n*=596)	2019[b] (*n*=429)
Gender			
Male	117	251	182
Female	179	332	247
Not answered	0	13	0
Age			
≤ 17 years	51	91	30
18-25 years	168	160	96
26-30 years	20	68	110
31-35 years	20	122	107
36-40 years	15	56	11
41-45 years	6	22	23
46-50 years	10	47	11
> 50 years	6	12	4
Not answered	0	18	37
Education			
Elementary school	2	0	1
Junior high school	21	55	60
High school	146	319	233
Diploma	10	43	18
Bachelor & Post graduate	113	150	93
Not answered	4	29	24
Occupation			
Government employee	42	52	33
Private employee	33	123	116
Entrepreneur	10	89	37
Student	184	171	179
Others	27	161	64

[a] *error* = 0.1; [b] *error* = 0.05

Data in Table 2 show that young and adult individuals are concerned with educational tours, ecotourism, and other similar tourism because they are enthusiastic in pursuing their curiosities and sense of environmental awareness, as well as learning new things while traveling (Canosa et al., 2020; Petroman et al., 2016). Nature-based tourism is one of the methods to achieve people's affective necessities and maintain individual mental health (Cheng et al., 2014).

The most substantial number of respondents is in the young cluster who are still studying in school or college, so the highest education level group is high school or below (63.4%), followed by diploma, bachelor and post graduate (32.3%). These young respondents also impact the occupation group characteristic where the most dominant group is the student (40.4%) followed by private employees (20.6%).

Satisfaction Index (SI)

Next, the detailed results of 2017 to 2019 questionnaires data regarding the service quality of CBG so can be explored in Table 3. Based on the average weight sum, the calculations of the satisfaction index ($\sum \bar{X}_i' \times 25$) from 2017 to 2019 were 80.8, 80.15, and 80.93, respectively. All the values indicate that the satisfaction index was in the 'good' level, meaning that the CBG's quality service was in the 'B' grade (Minister of State Apparatus Utilization and Bureaucratic Reform Republic of Indonesia, 2017). A slightly lower value occurred in 2018 but the value then rose again next year, still in the same range.

All variables in all years have a good evaluation value (≥3). Nevertheless, the highest and the lowest variable in each year are different. In 2017, the operator's behavior received the highest valuation. Some studies have also suggested the importance of the operator's good responsibility in serving the customers to build their loyalty and willingness to pay more (Chan et al., 2015; Mody et al., 2017). Next, ways of managing the complaints/suggestions/inputs received the highest appreciation by the respondents in 2018 and 2019. In the service business, complaints should be appreciated as a sign of a unit's achievement evaluation, and a tool of expressing some issues or errors in internal operations that require a fast response to prevent the customers from leaving (Ozkan & Boz, 2020). Evaluation from customers is essential to achieve customer satisfaction. It also allows possible future customers to consider from the shared previous experiences (Massawe, 2013).

While still categorized within the 'good' evaluation, the lowest variables from 2017 to 2019 were service procedures, supporting infrastructures, and service completion time, respectively. The operators should pay more attention to these variables because this can be an initial signal of consumer dissatisfaction in the future if not appropriately managed. The proper treatment to the issue will not only immediately replicate purchases but also earn the institution a reputable name and customer loyalty (Su et al., 2018; Wang et al., 2014).

Table 3. Data Analysis of the Service Quality Satisfaction Questionnaires

Variable (X_i)	2017			2018			2019		
	Total value (ΣX_i)	Average ($\bar{X}_i$)	Average weight ($\bar{X}_i'$)	Total value (ΣX_i)	Average ($\bar{X}_i$)	Average weight ($\bar{X}_i'$)	Total value (ΣX_i)	Average ($\bar{X}_i$)	Average weight ($\bar{X}_i'$)
Service requirements (SR)	948	3.203	0.356	1902	3.191	0.355	1376	3.207	0.356
Service procedures (SP)	917	3.097[b]	0.344	1906	3.198	0.355	1385	3.228	0.359
Service completion time (CT)	961	3.245	0.361	1830	3.071	0.341	1324	3.087[b]	0.343
Service charge (SC)	991	3.349	0.372	1897	3.183	0.354	1384	3.227	0.359
Service-specific suitability (SS)	922	3.116	0.346	1891	3.172	0.352	1364	3.179	0.353
Operator's competence (OC)	963	3.254	0.362	1911	3.206	0.356	1397	3.257	0.362
Operator's behavior (OB)	1019	3.444[a]	0.383	1973	3.311	0.368	1440	3.356	0.373
Managing the complaints/ suggestions/inputs (MC)	922	3.116	0.346	2092	3.510[a]	0.390	1489	3.471[a]	0.386
Supporting infrastructures (IS)	965	3.260	0.362	1796	3.013[b]	0.335	1338	3.120	0.347
Total (Σ)			3.232			3.206			3.237

[a] the highest of $\bar{X}_i$ in a year.
[b] the lowest of $\bar{X}_i$ in a year

Visitors Number

Furthermore, based on the number of visitors from 2017 to 2019 (Table 4), the number tends to rise by year, approximately 24% to 26%. This fact also potentially increases revenues for CBG. The highest visits occurred from June to August. This period contributes 31.2% to 39.6% of the total visitors in a year. It coincided with long school holidays.

Table 4. The Number of Visitors to CBG, 2017-2019

Month	2017	2018	2019
January	56,654	62,488	54,053
February	25,154	17,891	41,612
March	34,539	24,677	52,417
April	42,785	35,497	69,474
May	44,701	50,760	24,864
June	37,653	97,123	165,515
July	80,527	95,167	99,342
August	49,637	63,902	67,306
September	43,382	55,530	63,594
October	37,307	51,048	58,809
November	30,270	43,056	60,695
December	54,457	69,655	82,019
Total	537,066	666,794	839,700

Based on sold tickets recorded from Subunit of Services and Information of CBG

In every January and December, the number of visitors is also high. It occurred due to the impact of the end-of-year holidays and the possibility of the leave taken by employees at the beginning of the year. This dynamic number of visitors can also be explored in other nature-based tourism (Siswantoro et al., 2012; Wahid et al., 2016). The holidays and leave of the employee affect the tourist behavior in making decisions in their traveling periods. The dynamics can be included as a seasonal behavior (Sofiyan et al., 2019). On the contrary, the lowest visiting occurred from February to March and from October to November each year.

Relationship between Satisfaction Index and the Number of Visitors

Based on the satisfaction index, the level of CBG's quality services remained at a 'good' level. There was no significant increase in the respondent's appreciation of the quality of service they experienced while in CBG. There was even a slight decrease in the index in 2018, although it remained in the same category. Based on the average values of each variable in all years, the highest scoring variable was managing the complaints/suggestions/inputs in year 2018, with a score of 3.51. The lowest scoring variable, supporting infrastructures, was also achieved in 2018 with a score of 3.013 (Table 3). Managing the complaints in 2018 had the highest positive gap compared to that in 2017, with $\Delta = 0.394$. The operator considers this issue seriously and gives various outlets for customer complaints. CBG's operator accepts not only direct or face-to-face complaints but also several electronic media, making it easier for customers to submit their inconveniences while being in the garden.

Some advantages to constructing appropriate complaint management are stimulating customers' loyalty, enhancing the connection between customers and the provider, and maintaining the reputation. It might also prevent customer migration to other providers, resolve the same problems that might repeat in the future, and lead to more profitability (Magatef et al., 2019; Ogbeide et al., 2017; Ozkan & Boz, 2020). Complaints are not always a harmful matter for the unit even they could supply an opportunity for the division to recognize its issues and weaknesses of processes, in the definition of services to come up with solutions to manage these problems (Magatef et al., 2019).

In 2017, four variables were higher than in other years: service completion time, service charge, operator's behavior, and supporting infrastructures. But, in 2018, only one variable was higher than in other years. It was managing the complaints/ suggestions/inputs. And, in 2019, their service procedures were appreciated higher than in other years. The service requirements, service-specific suitability, operator's competence were slightly higher than in other years.

These facts show that the operator has not significantly been able to increase customer satisfaction year by year. It is still too far, and a lot of work has to be improved by the operator to gain the service quality to be an excellent level. However, to meet customer satisfaction, CBG is unable immediately to attempt the improvement without considering the standard regulations. CBG as a government unit is attached to several regulations and bureaucratic obstacles that must be obeyed. For example, improving and (or) increasing the quality of infrastructure(s), especially at medium or large scale must have been planned and approved in advance by the higher authority a year earlier, likewise with budgeting policy. The bureaucratic culture has

become a weak point of Indonesian tourism. The bureaucratic system appears to be rigid and inadaptable, addressing the worlds' tourism development (Hernanda et al., 2018; Yusriadi et al., 2019).

Furthermore, although the satisfaction index tended to be stable in the same period, the number of customers for CBG kept increasing year by year. These facts then were tested using the correlation test, resulting in r as many as 0.236. The value indicated a correlation between the satisfaction index and the number of visitors. The number was positive; it means that the increase of satisfaction index was linear with the number of visitors. However, this is a lower positive linear relationship that includes those in the range of $0.2 \leq r \leq 0.39$, or weak positive (Meghanathan, 2016). Next, the t-test showed that the correlation has no significance (p-value > α). This can be inferred that the correlation between the satisfaction index and the number of visitors is positive but weak and has no significance.

The above assessments indicate that the high number of visitors is not always related or depends on the satisfaction level, and vice versa. These might be gained by an intensive promotion and publicity, the availability of time of vacation or holidays (seasonal behavior), a short distance, a reasonable cost, the uniqueness of the attraction, etc. (Marsiglio, 2015; Poduska et al., 2014; Stemberk et al., 2018). Advances in media, especially social media, are also suspected of influencing promotion and publicity to a broader range of potential consumers of CBG. In late 2021, it was recorded that more than ten thousand followers of the CBG's Facebook page and more than 176,000 people checked in CBG. Social media marketing efforts might have an indirect impact on satisfaction through social identity and perceived worth (Chen & Lin, 2019).

Nevertheless, in the service business, customer satisfaction must not be ignored. To keep the loyalty of the customers, the values of satisfaction must be maintained on a high level. A high level of satisfaction may emerge as a positive experience for customers. The customers' expectations at pre-travel and post-travel have been consistently fulfilled (Chiu et al., 2016).

A customer-oriented organization is better protected from the competition. Loyal customers are less affected by a new product in the market or by a lower-priced competitor. If there is any change in customer needs, the company can anticipate, or the customers are willing to wait. There is no genuinely loyal customer if a company is too slow. Still, even in such a situation, a customer-oriented company has a higher chance of regaining its lost customers and its position in the market (Massawe, 2013). A positive "word-of-mouth" from satisfied customers is good advertising and publication. This destination image straightly influences the visitors' perception of the meaning and revisit motives, and it implicitly guides to satisfaction and recommendation purposes (Kanwel et al., 2019; Lai & Li, 2016; Rosa et al., 2018).

The 'good' service quality which has been gained by CBG needs to be managed and needs to be enhanced to gain a sustainable relationship with the customers. The increase in tourist satisfaction may lead to an advance in the income and benefits of CBG. Therefore, identifying and acknowledging the perceptive and behavioral outcomes of customer satisfaction has significant intentions for destination management.

Research Implication

This study presents an advanced knowledge of tourism activities in CBG by investigating the level of visitor satisfaction and also its link with the number of visitors. Findings indicate the satisfaction level is at the 'B' grade or 'good' quality. CBG has been successful to maintain their good quality services delivered to visitors at all variables of satisfaction. Furthermore, there is a correlation between satisfaction level and the number of visitors, and the value is positive. However, this correlation is insufficient to describe the increase of visitors' number that occurs in the period. The current research has various implications for marketing and tourism research from a theoretical standpoint.

First, a positive destination image has put CBG in a competitive advantage over other similar nature-based tourism destinations. Destination image, tourist satisfaction, and perceived value can be crucial factors of destination loyalty in the context of tourism. Destination image refers to a tourist's overall perception of a location and is connected to their decision-making, destination selection, subsequent assessments, and future plans (Jeong & Kim, 2020). This destination image might be the other predominance of CBG compared to other nature-based tourist destinations surrounding Puncak, West Java. CBG offers beautiful scenery and a fresh atmosphere

of typical views of the mountains of West Java, with trees and plants configurations that might not be found in others. According to Lu et al. (2020), one of the essential sources of such a pleasurable experience is the destination's aesthetic features, which are viewed as image metrics in tourism. Destination aesthetics are among qualities and attributes that a tourist appreciates from a place that is different from their recognizable surroundings. CBG visitors, who are dominated by urban people, demand a different atmosphere compared to their daily lives, which is rushed, crowded, and intense. These individuals desire isolation or relaxation during vacation experiences to meet psychological demands and to get away from the monotony of everyday life (Yu et al., 2019).

CBG's sceneries and circumstances promote a sense of companionship and a sense of passion. These perceived values might be supported as a motivation for the visitors to consider revisiting in the future (Filep & Matteucci, 2020). As one of the tourist destinations established in the colonial era, CBG also has an advantage in the memorable experience for their visitors. Memorable experience refers to pleasant travel experiences that are remembered and reminisced over after the activity has ended (Yu et al., 2019). This positive memory is a corresponding policy for developing a competitive benefit in the tourism market sector (Coudounaris & Jafarguliyev, 2021). With so many tourists having visited CBG, their experiences have largely been passed down through their groups, families, and even across generations. Visitors who are pleased with their experience are more likely to tell others about it, plan a return visit, and even suggest them to their groups (Nugraha et al., 2021).

Second, the use of social media needs to be developed in a more intensive promotion and publicity effort. This study has suspected that the promotion and publicity efforts carried out on social media might influence tourist attractions to visit CBG. With CBG's limited budget in terms of promotion and marketing, social media is one of the most reasonable solutions, which might be developed as an important part of the online marketing strategies. Social media marketing is interpreted as commercial marketing occasions or operations that use social media in an effort to acquire positively impact consumers' investment behavior (Chen & Lin, 2019). GBG's staff, especially in the Subunit of Services and Information, should be able to deliver various information regarding general conditions, the attractiveness of CBG, events, and other beneficial news to customers and potential customers. A one-way information transmission of traditional mass media has transformed into a form of interactive two-way direct communication (Kaplan & Haenlein, 2010).

Third, the improvement of supporting infrastructures in the garden. This study has shown that the condition of the CBG infrastructure has received complaints and received low ratings from respondents. Even though it has become a classic problem, infrastructure development still has to be done. Recreational facilities are an integral part of physical infrastructure, which is fundamental for overall economic and tourism development. Each of these components encourages tourism development, particularly by increasing the attractiveness and competitiveness of a destination. Visitors would expect infrastructures and the facilities in their chosen destination to be comparable to what they enjoy at home, especially those that have become the essential element of everyday life recreation (Mandic et al., 2018).

The fourth implication is that this study suggests that the CBG operator or management office establish a comprehensive and easy-to-understand procedure for visitors. CBG's operator should make it easier for the public to access information about the type of procedures for its services. That way, tourism services can run more effectively and efficiently with clear and transparent information to tourism service users, including cost information and open resolution procedures. A good service system will result in good service quality as well. With clear and definite process and procedures implementation, any form of deviation that might occur in the beginning can be identified (Sahid et al., 2019).

CONCLUSION AND SUGGESTION

The study results indicate that the quality service of CBG is at a 'good' level. The quality tends to be stable, but the number of visitors keeps increasing. The correlation between the satisfaction index and the number of customers is positive, but the degree is weak and insignificant. The rise in the number of visits in this study is unrelated to the visitors' perception of service quality. CBG's efforts to attract visitors are on the right track. However, they still require a significant

effort to maintain and enhance customer satisfaction to a higher level.

Some performances that need to be improved immediately are service procedures, completion time, and supporting infrastructures. The operator might utilize the advance of the current information technology to improve their efforts. That way, CBG does not only rely on face-to-face service. The infrastructures improvement must also be planned and well-conducted to ensure the visitors' convenience in the garden. This evaluation can lead to a standardized value and impartial assessment for the performance of CBG's related units.

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Evaluating the effect of transport infrastructure on the employment in Vietnam

Zhen Yu and To Boi Luu*

Department of World Economics, School of Economics and Management, Wuhan University, China

*Correspondence email: cathy_lau88@yahoo.com.vn

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ABSTRACT

During the process of international economic integration, the labor issue plays a vital, urgent, and long-term role in the sustainable development of the economy. The impact of employment on a country's investment decisions is significant. The material underpinning of a nation's socio-economic growth is its transport infrastructure. The impact of infrastructure upgrades on employment in Vietnam's economic sectors is the focus of this article. Furthermore, the study investigates whether the Vietnamese government's annual investment in infrastructure development benefits employees as projected (using data from the Vietnam General Statistics Office (VNGSO) for 19 economic sectors from 2005 to 2019). The results of the System Generalized Method of Moments (System-GMM) show that improving the quality of transport infrastructure can significantly increase employment rates in different sectors. The data show that transport infrastructure plays a key role in ensuring smooth connectivity of the entire national, regional and local economies. It reduces transport costs and facilitates the mobility of workers.

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INTRODUCTION

The problem of unemployment is a global phenomenon in the context of a market economy. There are no exceptions, regardless of whether the country is developing or has developed industries. Therefore, many nations around the world have become more focused on reducing unemployment, creating secure jobs, and stabilizing workers' lives. This is also true in Vietnam. Despite its enormous population, Vietnam has a relatively young population pyramid and has begun to enter the golden age of population growth with the most abundant human resources in history. Although the country benefits from the golden population structure, the said structure also puts pressure on policymakers. Thus, one of the main factors driving government investment decisions is the employment effect. The creation of more employment opportunities is typically viewed as a social and political investment.

It is well known that transport plays a particularly important role in the socio-economic development of any country in the world (Maparu & Mazumder, 2021; Muvawala et al., 2021; The Council of Economic Advisers (CEA), 2018; Wang et al., 2020). By establishing a spatial bridge between regions, socio-economic activities can be carried out between the country and the world, as well as ensuring national security and defense. Among the most important elements in a complete transport infrastructure system

are roadways, railways, inland waterways, and aviation. Investing in transport infrastructure can increase access to economic opportunities. As a policy tool, it can be used to drive growth in isolated regions. A contemporary and modern transport infrastructure system will create conditions for equal development among territories, reducing the disparity in living standards between residential areas. Simultaneously, spatial isolation from economic opportunity can have a negative impact on employment. Thus, employment and connectivity are intimately linked (Chakrabarti, 2018). The increase in employment opportunities brought about by infrastructure investment is sighted as the main political and social driving force (Glaeser & Ponzetto, 2018). With the current transport infrastructure, the economy will have conditions for rapid, stable, and sustainable growth. In contrast, underdeveloped infrastructure systems are the main obstacle to development. Because of this, infrastructure development has always been at the center of Vietnam's development policies and is always been a priority for government investment. Vietnam's socio-economic development strategy is geared towards 2020 and Resolution No. 13-NQ / TW dated January 16, 2012 of the eleventh Central Committee of the Central Committee on building synchronous infrastructure, which has the goal of making Vietnam a modern industrialized country by 2020. Transport infrastructure is one of the four focus areas with the requirement to ensure connectivity among major cities and economic centers. Road infrastructure is also commonly discussed in trade agreements. Transport infrastructure is often involved in trade facilitation. Indeed, many studies on trade facilitation in recent years have addressed the infrastructure factor (Jordaan, 2014; Sakyi et al., 2018; Yu & Luu, 2020). Once again, this underscores the importance of a country's transport infrastructure for economic development.

Recent studies on infrastructure are primarily economic in nature (Agbelie, 2014; Bilotkach, 2015; Breidenbach, 2020; Brugnoli et al., 2018; Chen & Haynes, 2015; Cigu et al., 2018; Elburz et al., 2017; Leduc & Wilson, 2017; Melo et al., 2013). These studies have important implications for policymakers and economic researchers. Infrastructure benefits are mainly categorized based on the type of transport used. This includes researches in examining the benefits of investing in highway infrastructure and showing that government investment in infrastructure has positive benefits for the economy (Agbelie, 2014; Chen & Haynes, 2015; Leduc & Wilson, 2017; Li et al., 2016). Aviation transport investments have also been studied in recent years (Bilotkach, 2015; Breidenbach, 2020; Brugnoli et al., 2018; Li & Loo, 2016; Rashid Khan et al., 2018; Van de Vijver et al., 2016). While the majority of studies demonstrate that investments in air transport are beneficial, others show that there is no clear benefit of investments and that the implications on different sectors of the economy vary. Bilotkach (2015) showed that air passenger traffic affects employment and average wages but there are different impacts on varying industries in an economy. Tveter (2017) considered the influence of air transport on regional development. The research shows a positive but insignificant impact on population and employment. According to this research, air transport does not have a significant impact on the region. Furthermore, researches have shown that the impacts of air transport infrastructure range from positive to negative to completely unaffected (Breidenbach, 2020; Brugnoli et al., 2018). Recent decades have seen an increase in investments in railway infrastructure as well. Railway infrastructure has a positive impact on production and labor (Carbo et al., 2019; Sobieralski, 2021; Zhang et al., 2019). As the availability of rail transport infrastructure increases, the unemployment rate will decrease when constant conditions prevail (Tyndall, 2017). Nelson et al. (2019) showed that in areas where railway infrastructure is located, economic resilience is better during recessions. Railway infrastructure investment is generally considered to have a positive effect on economic development. Recent years have seen extensive research into measuring transport infrastructure. Maparu & Mazumder (2021) through road, rail, air, and port infrastructure surveyed the causality between transport infrastructure and urbanization of India from 1991 to 2011. Wang et al. (2020) reviewed the impact of road and rail transport infrastructure on economic growth in countries participating in China's Belt and Road Initiative. Sobieralski (2021) used a dataset of highways, railways and aviation to examine the impact of different transport infrastructure investments on employment in the United States from 1990 to 2018. Ndubuisi et al. (2021) utilized panel data covering 45 sub-Saharan African countries from 1996 to 2017 to examine the impact of digital infrastructure on employment. The empirical measure of digital

infrastructure that this article uses is an aggregate of four indexes: employing internet usage, fixed broadband subscription, fixed telephone endowment, and mobile cellular subscription. By using different means of transport such as ports, roads, railways, and aviation, Ahmed et al. (2021) studied transport infrastructure and industrial output in Pakistan from 1972 to 2017. Muvawala et al. (2021) explored the socio-economic impacts of transport infrastructure investment in Uganda by estimating the impact of road transport infrastructure investment on Uganda's economic performance. In continuation with previous studies, this paper examines rail, road, inland waterway, and aviation infrastructure, as well as the impact of infrastructure improvements on employment sizes in Vietnam's economic sectors.

When estimating latent endogeneity, System-GMM is frequently used. This includes using this method to measure the wage effect (Lemieux, 1998; Van Reenen, 1996), examining the relationship between educational openness and economic growth (Fukase, 2010), studying the relationship between income and democracy (Heid et al., 2012), and measuring the impact of trade facilitation on economic growth and social welfare in Africa (Sakyi et al., 2017, 2018). System Generalized Method of Moments (henceforth: System-GMM) can be seen to be an appropriate choice to solve the potential endogenous problems associated with estimation.

The aim of this study is to examine the impact of infrastructure improvements on labor force size in Vietnam from 2005 to 2019. The influence of infrastructure upgrades on Vietnam's job sectors is the focus of this article. This research examines whether jobs are constantly created as a result of the continuous Vietnam government's investment in infrastructure development. There have been very few studies on Vietnam's infrastructure in terms of industry labor size in recent years. Therefore, this research will contribute to the economic development of Vietnam. This method has been used in recent years to address endogeneity concerns in estimates (Chakrabarti, 2018; Grundke & Moser, 2019; Sakyi et al., 2017, 2018). The studies show that transport infrastructure has the potential to improve economic opportunities. The quality improvement of transport infrastructure has significant potential to increase employment rates in various sectors. In general, the improvement and upgrading of transport infrastructure are increasingly advanced. Apart from generating connectivity to meet the needs of freight and passenger transport, it also supports Vietnam's socio-economic sustainable development. This result is consistent with other previous studies showing that Vietnam's transport infrastructure has improved significantly over the years. This enhancement contributes to the development of the economy (Garcia-Puente, 2013; Phi et al., 2019).

RESEARCH METHOD

The research was conducted in Vietnam using quantitative approach. The VNGSO (Vietnam General Statistics Office) industrial classification was used to operate research objects into Vietnam's economic sectors.

Table 1. List of Economic Sectors in Vietnam

No.	Economic sector names
1	Agriculture, forestry and fishing
2	Mining and quarrying
3	Manufacturing
4	Electricity, gas, stream and air conditioning supply
5	Water supply, sewerage, waste management and remediation activities
6	Construction
7	Wholesale and retail trade; repair of motor vehicles and motorcycles
8	Transport and storage
9	Accommodation and food service activities
10	Information and communication
11	Financial, banking and insurance activities
12	Real estate activities
13	Professional, scientific and technical activities
14	Administrative and support service activities
15	Activities of Communist Party, socio-political organizations; public administration and defence; compulsory security
16	Education and training
17	Human health and social work activities
18	Arts, entertainment and recreation
19	Other service activities

Source: VNGSO

The research sample included 19 economic sectors of Vietnam from 2005 to 2019 (Table 1). The data taken from VNGSO's database included employment by economic sector, transport infrastructure, number of people graduating from high school in Vietnam, State budget expenditure, Gross Domestic Product (GDP), and the ratio between total import and export of goods to GDP. The main variable is the transport infrastructure variables, including data on passenger traffic and the volume of freight traffic transferred through four modes of transport, such as railways, roads, inland waterways, and aviation transport.

Table 2. Variables Description and Data Sources

Variable	Definition
Emp	Employment by economic sector
TINF	Transport infrastructure data includes data on the number of passenger traffic and the volume of freight traffic transfer through four modes of transport: Railways, road, inland waterways and aviation transport.
Edu	Number of people graduating from high school in Vietnam
TO	The ratio between total import and export of goods to GDP
Budget	State budget expenditure such as education, health, and public infrastructure construction
GDP	Gross domestic product

Source: VNGSO

All data on transport infrastructure were gathered through annual surveys conducted by Vietnamese government entities, covering enterprise surveys, investigations of individual production and commercial premises, and investigations of transport and warehousing activities. The number of passengers and the actual transit distance were used to calculate the number of passenger traffic data. A passenger-kilometer is the unit of measurement (Pers.km). The formula for the calculation is as follows.

The number of passenger traffic = number of carried passengers x the actual transport distance.

An actual number of passengers is the number of passengers transported during the period, regardless of the distance traveled. The actual transport distance is the government-specified fare distance. The number of people transferred under each contract for leased passenger vehicles is based on the number of seats in the vehicle, and each passenger is counted only once. The volume of freight traffic is determined by both the amount of freight carried and the actual distance traveled. Ton-Kilometer is the measurement unit (Tons.km). The following is the calculating formula.

The volume of freight traffic = volume of goods transported x the actual shipping distance.

The number of goods moved during a period, regardless of distance, was referred to as the volume of goods transported. The actual weight of the transported products was used to calculate the volume of the transported goods. If the weight of bulky products delivered by vehicles could not be determined directly, it was approximated to be 50% of the vehicle's tonnage. Alternatively, the actual volume of goods was computed based on an agreement between the vehicle owner and the owner of the commodities.

This paper used the System-GMM panel data of estimation technology to solve potential endogenous problems. In recent years, this method has been used to address endogeneity concerns in estimations (Chakrabarti, 2018; Grundke & Moser, 2019; Sakyi et al., 2017, 2018). The following equation was used to analyse the influence of transport networks on employment in the Vietnamese economy.

$$\mathrm{Emp}_{it} = \beta_0 + \gamma \mathrm{Emp}_{it-1} + \beta_1 \mathrm{TINF}_t + \beta_2 \mathrm{Edu}_t + \beta_3 \mathrm{TO}_{it} + \beta_4 \mathrm{Budget}_{it} + \beta_5 \mathrm{GDP}_{it} + \delta_i + \delta_t + \varepsilon_{it} \quad (1)$$

where t represents the time and i represents the economic sectors of Vietnam. Specifically, i indicates the economic sectors (1, .., 19), t is time (2005, …, 2019). Other variables are defined in Table 2. The results of each infrastructure option are presented in this study, along with several control variables that have been included to the estimate. The control variable is government's budget expenditure, that has goal of limiting the influence of government intervention on job creation across industries. In principle, government intervention may help the country's job situation. These selection control variables are widely used in recent studies such as Edu (Fageda & Gonzalez-Aregall, 2017; Ndubuisi et al., 2021; Sobieralski, 2021), GDP (Awaworyi Churchill et al., 2021; Brugnoli et al., 2018; Zhang et al., 2017) and TO (Ndubuisi et al., 2021; Wang et al., 2020). Because government expenditure on infrastructure can lower unemployment, the government budget variable is managed in this study (Chakrabarti, 2018; Leigh & Neill, 2011). δ_i and δ_t are economic sector-specific and time-specific fixed effects respectively.

The summary statistics of variables employed in the study are shown in Table 3. The table's values are logarithmic in nature. The number of observed variables, the mean, standard deviation, minimum, and maximum are all included. There were 285 variables to consider when estimating the impact of transport infrastructure from 2005 to 2019. The transport infrastructure variable was the focus of this estimate, and it was represented by four variables: rail transport, road transport, inland waterway, and aviation transport. Variables Edu, TO, Budget and GDP were the four control variables.

Table 3. Summary of Statistics of Variables, 2005-2019

Variable	Obs	Mean	Std. Dev.	Min	Max
Employment (person)	285	6.4908	1.6862	1.9444	10.8433
Rail transport (Pers.km and Tons.km)	285	8.3558	0.2884	8.1047	9.3886
Road transport (Pers.km and Tons.km)	285	11.0663	0.5632	10.2448	12.6288
Inland waterways transport (Pers.km and Tons.km)	285	9.9056	0.4755	9.2783	11.3215
Aviation transport (Pers.km and Tons.km)	285	9.6056	0.7459	8.645	11.5758
All transport (Pers.km and Tons.km)	285	9.7333	0.5095	9.0682	11.2287
Edu (person)	285	4.5597	0.1959	4.3873	5.5948
TO (%)	285	1.7358	0.5674	0.8109	2.5767
Budget (US$)	285	3.4112	0.7366	1.4715	5.3991
GDP (US$)	285	4.8695	0.2579	4.4468	5.3026

Source: Authors' calculation based on VNGSO data VNGSO

RESULT AND DISCUSSION

Infrastructure and Employment in Vietnam

In addition to being one of the fastest-growing economies in ASEAN, Vietnam places a high priority on the development of transport infrastructure. Vietnam's infrastructure has expanded significantly in recent years. Vietnam has reaped many economic and social benefits from this expansion of investment (Banomyong et al., 2015; Tran, 2018). Figure 1 presents the trend of transport infrastructure in Vietnam from 2005 to 2019. Road transport was the most popular mode of travel, but primarily used for short distances. Inland waterway transport, on the other hand, had a lower volume than road transport but became the primary mode of long-distance transporting goods. Railways were a very potential means of transport, but freight and passenger traffic volumes were still quite low. Although aviation transport had a modest volume of transport, it had the highest value-to-weight ratio of any method of transport. Road and aviation transport were two transport methods that people regularly employed in terms of passenger traffic. In this era, road transport was the most utilized means of transport.

Road and inland waterway transport of goods always won out over other means of transport. Logistics in Vietnam can be seen to benefit from investments in infrastructure expansion. Vietnam shares borders with China, Laos, and Cambodia, and the country's coastline spans from north to south. As a result, Vietnam is a country with a strong maritime and road transport development with a coastline of 3,200 km, 19,000 km of inland waterways and 45 main routes used for goods transport. Vietnam is well exploiting the inland waterway network for transport activities. When it comes to highways, Vietnam's network is very evenly distributed across the country. Vietnam's road system has a total length of 570,448 km, in which 24,136 km are national, 816 km are highways, 25,741 km are provincial, 58,347 km are district, 26,953 km are urban, and 144,670 km are commune. Despite the fact that road transport is more expensive than inland waterway transport, it is the most prevalent mode of transport. The fundamental reason for this is the flexibility of time in the roadway transport operation. As a result, cargo transport by road is always the best option. The high transport costs show that, despite the Vietnamese government's ongoing expansion of transport systems, it has yet to bring significant efficiency. Therefore, transport costs are greater than in many ASEAN countries. (Nguyen, 2019; Pham et al., 2020).

In general, the quantity of passengers and freight traffic on roads, inland waterways, and aviation transport tended to rise with time. While other forms of transport have caught up to the world's latest technologies, Vietnam's rail transport remains uncompetitive. Throughout the period 2005 to 2019, railway transport saw a range of growth rates. Since 2015, the volume of freight transported by train had fluctuated, while the number of passengers using this mode of travel declined. This inconsistent growth is due to the underdeveloped infrastructure policies of the Vietnamese government (Banomyong et al., 2015) and the quality of the current transport network that is not synchronized (Nguyen, 2019).

The expansion of transport systems has increased workers' travel options and allowed Vietnam to reap the benefits of aggregation and specialization. Travel expenses are also reduced, and workers have easier access to better positions and pay. As a result, the unemployment rate fell.

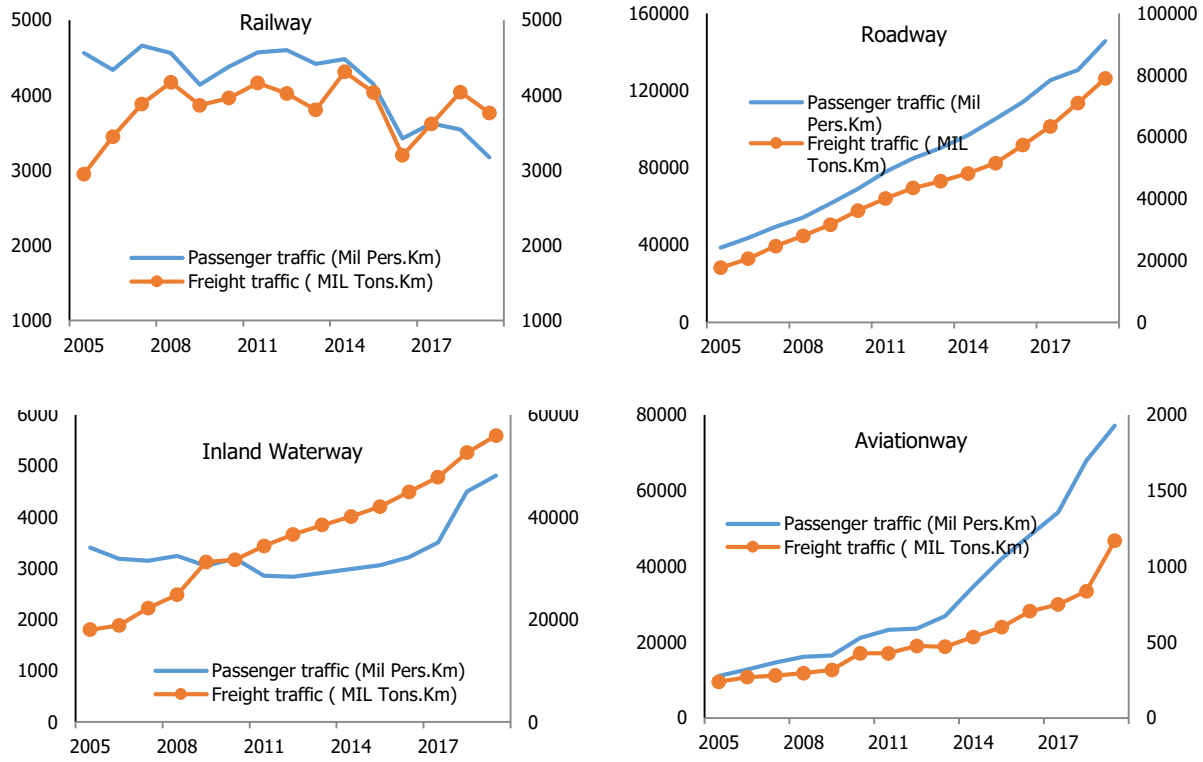

Figure 1. Transportation infrastructure in Vietnam, 2005-2019 (Source: VNGSO)

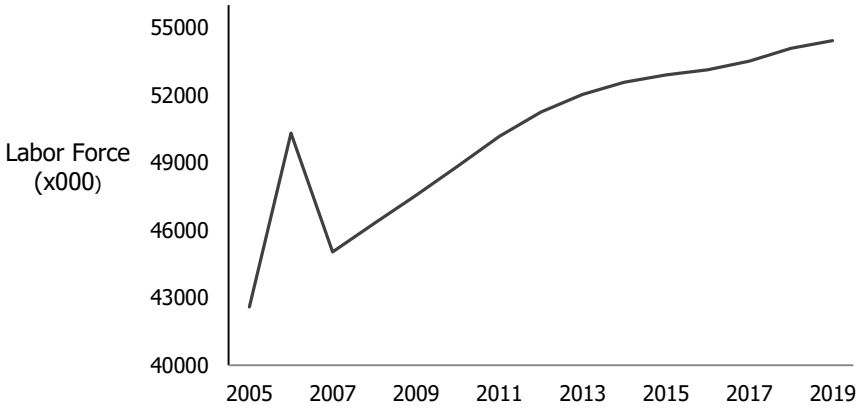

Figure 2. The labor force (15 years of age and above) in Vietnam, 2005-2019 (Source: VNGSO)

The labor market in Vietnam has always been a labor surplus (Tran, 2018) and employment growth has lagged GDP in recent years (Abbott et al., 2017). Figure 2 illustrates that since entering the World Trade Organization in 2007, Vietnam's employment has increased dramatically. Although there was a substantial variation from 2005 to 2007, the number of jobs in Vietnam has consistently climbed during the years since 2007. Vietnam's employment growth was modest, averaging 1.92% from 2005 to 2019. Vietnam's economic reform project is still incomplete (Jenkins, 2004) and the economy is primarily focused on agriculture (Jenkins, 2004; Tran, 2018), which explains its relatively modest growth. Despite the fact

that Vietnam's economic structure has evolved, the process has been rather slow (Abbott et al., 2017; MOLISA & ILO, 2010).

Base Specification of the Estimate

The experimental results produced from the System-GMM estimations are reported and discussed in this section. The basic findings of the economic impacts of Vietnamese transport systems on employment were presented first. The research then used the System-GMM estimations to tackle the endogenous problem. Finally, it employed different measures to describe the infrastructure quality of Vietnam. The World Economic Forum Global Competitiveness Reports (WEFGC) collects these data through annual surveys that are widely used in scientific study (Cheewatrakoolpong & Rujanakanoknad, 2011; Jordaan, 2014; Sakyi et al., 2017, 2018).

The findings of the estimate's basic specification are shown in Table 4. Five models were used to report the effect outcomes of infrastructure factors. The results were rail transport (Model 1), road transport (Model 2), inland waterway transport (Model 3) aviation transport (Model 4), and all transport impacts (Model 5). The effect of transport networks on employment in Vietnam was estimated using System-GMM in Tables 5 to 9. Each table in this study contains five models. Control variables distinguished these models, which were then included to the estimate. Edu (Model 1), TO (Model 2), Budget (Model 3), GDP (Model 4) were all included as control variables in each model, with Edu, TO, and Budget being captured in the same model (Model 5). Table 10 shows the results of the robustness check. As previously stated, several measures representing the quality of Vietnam's infrastructure were used in this paper.

The base specification results are shown in Table 4. The findings of the random effects model are presented in this table, with Hauman's test p>0.05. The Hausman test determines if a fixed or random model is used. According to the estimated coefficients assessing the impact of transport infrastructure on employment across industries, improving the mode of transport system had a substantial potential to increase employment in Vietnam's economic sector.

Table 4. Base Specification of the Estimate

Variable	Model 1 (Rail)	Model 2 (Road)	Model 3 (Inland waterways)	Model 4 (Aviation)	Model 5 (Total)
Rail transport	1.216***				
	(0.233)				
Road transport		1.114***			
		(0.214)			
Inland waterways transport			1.478***		
			(0.284)		
Aviation transport				1.854***	
				(0.356)	
All					1.362***
					(0.261)
Edu	0.257	0.257	0.257	0.257	0.257
	(0.277)	(0.277)	(0.277)	(0.277)	(0.277)
TO	4.259***	3.638***	6.095***	8.770***	5.321***
	(0.253)	(0.304)	(0.381)	(0.842)	(0.284)
Budget	-0.0361	-0.0361	-0.0361	-0.0361	-0.0361
	(0.0356)	(0.0356)	(0.0356)	(0.0356)	(0.0356)
GDP	-6.676***	-6.671***	-12.17***	-20.51***	-10.48***
	(0.570)	(0.570)	(1.042)	(2.548)	(0.785)
Constant	23.08***	22.01***	42.15***	74.76***	36.64***
	(2.550)	(2.665)	(3.157)	(8.828)	(2.492)
Fixed industry effect	Yes	Yes	Yes	Yes	Yes
Fixed time effect	Yes	Yes	Yes	Yes	Yes
R-square	0.9317	0.9317	0.9317	0.9317	0.9317
Number of group	19	19	19	19	19

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

Table 5. System-GMM Estimates of the Effect of Rail Transport on Employment

Variable	Model 1 (Edu)	Model 2 (TO)	Model 3 (Budget)	Model 4 (GDP)	Model 5 (Total)
Emp_{it-1}	0.897***	0.934***	0.895***	0.934***	0.923***
	(0.0291)	(0.0203)	(0.0258)	(0.0210)	(0.0206)
Rail transport	0.523***	1.078***	0.494***	1.165***	1.116***
	(0.199)	(0.122)	(0.111)	(0.126)	(0.243)
Edu	0.000850				0.0744
	(0.244)				(0.281)
TO		-0.539***			-0.0605
		(0.0320)			(0.0980)
Budget			0.0609		0.117***
			(0.0475)		(0.0426)
GDP				-1.244***	-1.202***
				(0.0728)	(0.253)
Constant	-3.473***	-7.383***	-3.427***	-2.990***	-3.356***
	(0.789)	(1.020)	(0.850)	(0.832)	(1.284)
No. of observations	285	285	285	285	285
No. of sectors	19	19	19	19	19
AR(2)	-0.36	-1.73	-0.58	-1.34	-1.68
AR(2) p-value	0.720	0.083	0.565	0.181	0.092
Hansen stat	18.89	18.96	18.87	18.94	18.91
Hansen p-value	0.529	0.460	0.925	0.461	0.757

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

Table 6. System-GMM Estimates of the Effect of Road Transport on Employment

Variable	Model 1 (Edu)	Model 2 (TO)	Model 3 (Budget)	Model 4 (GDP)	Model 5 (Total)
Emp_{it-1}	0.912***	0.929***	0.863***	0.929***	0.903***
	(0.0236)	(0.0206)	(0.0370)	(0.0215)	(0.0274)
Road transport	-0.148	0.825***	0.166***	1.048***	0.882***
	(0.110)	(0.101)	(0.0589)	(0.123)	(0.257)
Edu	0.844***				0.263
	(0.218)				(0.332)
TO		-0.901***			-0.411***
		(0.0741)			(0.135)
Budget			0.0855		0.113***
			(0.0670)		(0.0400)
GDP				-2.449***	-1.398***
				(0.211)	(0.385)
Constant	-1.405***	-6.853***	-1.016*	1.043**	-2.940***
	(0.289)	(1.024)	(0.588)	(0.425)	(1.103)
No. of observations	285	285	285	285	285
No. of sectors	19	19	19	19	19
AR(2)	-0.76	-1.21	-0.78	-0.38	-1.61
AR(2) p-value	0.445	0.225	0.437	0.701	0.107
Hansen stat	18.95	18.97	18.76	18.96	18.39
Hansen p-value	0.800	0.459	0.174	0.648	0.496

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

In Models 1 to 5, the majority of the mode of transport infrastructure coefficients were significant at the 1% level. These findings empirically confirm the study's hypothesis that transport infrastructure has a favorable impact on employment growth across economic sectors. As previously stated, transport infrastructure has the capacity to expand economic opportunity access. The results of the five models back the claim that transport infrastructure boosts labor productivity (Agbelie, 2014; Carbo et al., 2019; Chen & Haynes, 2015; Leduc & Wilson, 2017; Li et al., 2016; Sobieralski, 2021; Tveter, 2017; Zhang et al., 2019). It also backs up Chakrabarti's (2018) idea that being geographically isolated from economic opportunities can hurt employment.

Economic Impacts on the Employment

Tables 5 to 9 provide the estimated coefficients for quantifying the influence of transport infrastructure on employment, and each table has five models with different control variables. Tables 5 to 9 about the regression findings show that all of these coefficients are statistically significant at the 1% level. The results reveal that upgrading the quality of transport infrastructure had a significant impact on overall employment rates. The transit coefficient in Model 1 was not positive after adjusting the Edu variable, as shown in Tables 5 to 9. After adjusting for education, Ndubuisi et al. (2021) studies the digital infrastructure and employment in the services sector in African countries found comparable outcomes.

When compared to other means of transport, railway transport had a number of advantages, including a big transport volume, high productivity, and the competitive value of a large economy. The railway traffic coefficients were statistically significant and positive. At a 1% level, a 1.116% growth in rail transport would result in a 0.923% rise in employment opportunities across all industries. This indicates that investing in railway infrastructure has a favorable impact on job creation. This finding is in line with earlier research on railway transport systems (Carbo et al., 2019; Sobieralski, 2021; Zhang et al., 2019). The availability of railway infrastructure and employment are linked in that as railway investment grows, and so does the rate of employment (Tyndall, 2017). Rail transport is critical for emerging countries to grow their own economies, as well as to integrate and expand commerce with other countries in the region. Table 6 shows the impact of road transport infrastructure on employment. The road transport coefficients were positive and statistically significant, according to the findings. A 0.882% improvement in the road transport element would result in a 0.903% increase in job possibilities across sectors at a 1% level. This demonstrates that road transport has strong economic benefits, and transport upgrading is usually promoted as a growth strategy. Vietnam is one of the world's 20 largest and most densely populated countries (O'Connor et al., 2020). Transport infrastructure is critical for ensuring the smooth connectivity of the national, regional, and local economies. Improved transport lowers transport expenses and makes it easier for workers to get to work (Gibbons et al., 2019). As a result, strengthening infrastructure is one of the most important prerequisites for ensuring economic development and raising local people's living standards.

Table 7. System-GMM Estimates of the Effect of Inland Waterways Transport on Employment

Variable	Model 1 (Edu)	Model 2 (TO)	Model 3 (Budget)	Model 4 (GDP)	Model 5 (Total)
Emp_{it-1}	0.910***	0.927***	0.861***	0.932***	0.907***
	(0.0242)	(0.0204)	(0.0375)	(0.0175)	(0.0241)
Inland waterways transport	-0.131	0.764***	0.237***	0.940***	0.735***
	(0.139)	(0.0977)	(0.0747)	(0.110)	(0.251)
Edu	0.790***				0.396
	(0.244)				(0.325)
TO		-0.712***			-0.395***
		(0.0535)			(0.133)
Budget			0.0684		0.131***
			(0.0570)		(0.0432)
GDP				-1.881***	-0.922**
				(0.137)	(0.378)
Constant	-1.480***	-5.597***	-1.458**	0.545	-3.506***
	(0.324)	(0.900)	(0.650)	(0.482)	(1.271)
No. of observations	285	285	285	285	285
No. of sectors	19	19	19	19	19
AR(2)	-0.57	-1.36	-0.97	-1.73	-2.10
AR(2) p-value	0.565	0.173	0.331	0.084	0.036
Hansen stat	18.93	18.96	18.76	18.96	18.16
Hansen p-value	0.839	0.838	0.538	0.704	0.696

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

Table 8. System-GMM Estimates of the Effect of Aviation Transport on Employment

Variable	Model 1 (Edu)	Model 2 (TO)	Model 3 (Budget)	Model 4 (GDP)	Model 5 (Total)
$\mathrm{Emp}_{\mathrm{it-1}}$	0.910***	0.929***	0.890***	0.947***	0.935***
	(0.0237)	(0.0180)	(0.0279)	(0.0146)	(0.0183)
Aviation transport	-0.0803	0.852***	0.0649*	1.220***	1.251***
	(0.0693)	(0.0838)	(0.0393)	(0.106)	(0.181)
Edu	0.766***				-0.0834
	(0.186)				(0.217)
TO		-1.203***			0.130
		(0.0887)			(0.109)
Budget			0.0789*		0.113***
			(0.0475)		(0.0389)
GDP				-3.808***	-4.232***
				(0.258)	(0.388)
Constant	-1.899***	-5.377***	0.0543	7.440***	9.048***
	(0.322)	(0.687)	(0.335)	(0.255)	(1.144)
No. of observations	285	285	285	285	285
No. of sectors	19	19	19	19	19
AR(2)	-0.84	-1.59	-0.75	0.08	0.21
AR(2) p-value	0.398	0.112	0.451	0.940	0.836
Hansen stat	18.95	18.99	18.78	18.98	18.85
Hansen p-value	0.800	0.457	0.969	0.837	0.843

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

Table 9. System-GMM Estimates of the Effect of all Transport on Employment

Variable	Model 1 (Edu)	Model 2 (TO)	Model 3 (Budget)	Model 4 (GDP)	Model 5 (Total)
$\mathrm{Emp}_{\mathrm{it-1}}$	0.908***	0.933***	0.882***	0.933***	0.920***
	(0.0245)	(0.0196)	(0.0311)	(0.0218)	(0.0228)
All transport	-0.0816	0.911***	0.175***	1.140***	1.103***
	(0.121)	(0.106)	(0.0622)	(0.123)	(0.246)
Edu	0.720***				0.0812
	(0.229)				(0.328)
TO		-0.895***			0.0396
		(0.0691)			(0.0974)
Budget			0.0727*		0.133***
			(0.0429)		(0.0408)
GDP				-2.411***	-2.567***
				(0.187)	(0.341)
Constant	-1.653***	-6.621***	-0.954*	1.336***	1.645*
	(0.262)	(0.950)	(0.541)	(0.379)	(0.958)
No. of observations	285	285	285	285	285
No. of sectors	19	19	19	19	19
AR(2)	-0.69	-1.54	-0.70	-0.93	-1.28
AR(2) p-value	0.489	0.123	0.481	0.352	0.202
Hansen stat	18.93	18.99	18.82	18.94	18.88
Hansen p-value	0.839	0.797	0.534	0.755	0.841

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

In regard to inland waterways transport, Table 7 shows the economic potential of inland waterways transport on employment. Inland waterways transport coefficients were positive and statistically significant. A 0.735% rise in inland waterways transport would result in a 0.907% increase in employment possibilities across all sectors at a 1% level. Inland waterways in Vietnam total more than 19,000 kilometers, with 45 main channels used to move products. The inland waterway transport business is in a good place right now. Indeed, the existence of an inland waterway network certainly provides numerous economic benefits, assisting businesses in lowering costs, expanding their scale, and providing more job possibilities for workers. Similarly, the regression findings in Table 8 demonstrate the economic

potential of aviation transport in terms of job creation. Aviation transport coefficients were positive and statistically significant. A 1.251% improvement in features of air transport would result in a 0.935% rise in employment possibilities across sectors at a 1% level. People find it more convenient to travel by using air transport because it saves them time. The regression results suggest that aviation, along with other modes of transport infrastructure, plays a critical role in the promotion and development of the economy. In terms of the overall impact of transport infrastructure on employment, Table 9 shows that a 1.103% upgrade in all transport infrastructure would enhance employment opportunities by 0.935% across sectors at a 1% level.

The System-GMM method's regression results reveal that transport infrastructure had an impact on economic sector job opportunities. The transport infrastructure coefficient in Model 1 of Tables 6 to 9 was not positive after controlling for the Edu variable. Overall, the majority of the employment effects of transport infrastructure were positive and statistically significant at the 1% level. These findings empirically confirm the study's hypothesis that transport infrastructure has a favorable impact on employment growth across economic sectors. The transport infrastructure serves as a vital link between various economies. The regression results also demonstrate that transport plays a critical role in the economy, particularly in emerging countries.

Robustness Checks

The robustness checks results (Table 10) shows five models, each of which is distinguished by form of transport infrastructure. The impact of transport infrastructure on employment was positive according to regression studies. WEFGC collected these indicators, which also had positive results. Models 1 and 4's regression results suggest that rail and aviation transport have beneficial effects on employment. A 4.631% upgrade in rail transport infrastructure would result in a 0.922% increase in job opportunities across industries at a 1% level. A 1.925% enhancement in air transport infrastructure would increase job opportunities by 0.895% across industries at a 10% level.

Table 10. The Economic Impacts of Transport Infrastructure on Employment

Variable	Model 1 (Rail)	Model 2 (Road)	Model 3 (Inland waterways)	Model 4 (Aviation)	Model 5 (Total)
Emp_{it-1}	0.922***	0.915***	0.917***	0.895***	0.910***
	(0.0220)	(0.0271)	(0.0254)	(0.0413)	(0.0263)
Rail transport	4.631***				
	(0.654)				
Road transport		-1.296***			
		(0.428)			
Inland waterways transport			-4.036***		
			(0.433)		
Aviation transport				1.925*	
				(1.099)	
All transport					0.146
					(1.504)
Edu	0.663***	1.106***	1.166***	0.669	-0.452***
	(0.145)	(0.0897)	(0.196)	(0.449)	(0.149)
TO	-0.0481	-0.969***	-1.398***	-0.533	0.127***
	(0.126)	(0.198)	(0.178)	(0.325)	(0.0418)
Budget	0.115**	0.0817**	0.0631*	0.351***	0.0756
	(0.0485)	(0.0392)	(0.0381)	(0.122)	(0.427)
GDP	-1.360***	1.490***	3.846***	-0.635	0.999***
	(0.298)	(0.497)	(0.478)	(0.566)	(0.181)
Constant	-3.222**	-5.310*	-13.58***	-5.930*	-4.131*
	(1.493)	(2.930)	(1.851)	(3.376)	(2.393)
No. of observations	285	285	285	285	285
No. of sectors	19	19	19	19	19
AR(2)	-1.71	-2.09	-2.07	-1.55	-0.83
AR(2) p-value	0.088	0.037	0.039	0.122	0.408
Hansen stat	18.81	18.73	18.26	18.56	17.11
Hansen p-value	0.534	0.474	0.691	0.613	0.646

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

In general, improved transport infrastructure boosts the economy and improves employees' access to jobs. Transport infrastructure, in general, plays a critical role in the creation of jobs for employees. The development and upgrading of transport infrastructure is progressing at a rapid pace, not only to fulfill the needs of freight and passenger transport, but also to aid Vietnam's socio-economic sustainability. Simultaneously, the findings reveal that the Vietnamese government's recent investment in infrastructure development has resulted in the creation of new jobs for employees.

Research Implication

The issue of labor plays a key role in the development of sustainable economies on a long-term basis during times of international economic integration. The biggest advantage Vietnam has is its abundant labor force and young labor structure. Vietnam is in the period of the golden population structure when it has a large population in the working age group. This is considered a favorable opportunity to improve labor efficiency and contribute to the economic growth of the country. However, Vietnam's workers still face a lot of pressure from the under-employed. Thus, one of the main drivers of government investment decisions is the employment effect. The cost of investment in infrastructure development tends to increase over the years. It can show that infrastructure development is an important prerequisite to promoting socio-economic development, which can reduce underemployment.

Infrastructure plays a particularly important role in Vietnam's social and economic development. A well-developed infrastructure system will promote economic growth and increase economic productivity and efficiency, which will contribute to solving social problems. The primary barriers to development, on the other side, are underdeveloped infrastructure systems. In many developing countries today, the lack and weakness of infrastructure have led to the stagnation of resource flows and difficulties in absorbing investment funds, which have a negative impact on economic growth.

The rapid development of Vietnam's economy necessitates the development of advanced transport infrastructure. Besides improving traffic and goods transport, it also helps Vietnamese workers find jobs. This study demonstrates the significance of transport infrastructure for overall employment in Vietnam across all economic sectors. The following are some of the consequences of this research.

Transport infrastructure has a huge impact on overall employment across all industries. The construction of transport infrastructure will aid in the economy's resource optimization. At the same time, comparative advantages between areas in Vietnam's economic sectors can be exploited (Chakrabarti, 2018; Glaeser & Ponzetto, 2018; Nguyen, 2020). Furthermore, improved transport infrastructure aids the development of logistics. This is one of the most crucial aspects of boosting competitiveness (Mangla et al., 2016; Montoya-Torres et al., 2016; Nguyen, 2020). As a result, it is critical to focus on refining and improving Vietnam's transport infrastructure in order to promote the country's economic and social development.

The improvement of transport infrastructure is one of Vietnam's core objectives in its socio-economic development strategy. Government expenditures on infrastructure expansion and construction create a large quantity of social benefits. The growth in freight traffic and passenger traffic proves that the Vietnamese government's improvement and extension of transport infrastructure is working. Despite the fact that estimates show that railway infrastructure has a positive impact on overall employment across industries from 2005 to 2019, the volume of freight traffic and the number of persons using railway infrastructure are falling, according to VNGSO data. As a result, it is clear that Vietnam's railway infrastructure is still in need of modernization. This is also the general conclusion of recent research (Le & Tran, 2021; Nguyen, 2020).

Lastly, implementing trade facilitation measures can generate significant economic benefits from transport infrastructure (Jordaan, 2014; Sakyi et al., 2017, 2018; Yu & Luu, 2020). Although the majority of trade facilitation agreements deal with procedures in the realm of products import and export, they also deal with improving domestic infrastructure. Construction of innovative transport infrastructure is critical to enhancing Vietnam's investment climate. The importance of developing transport infrastructure is demonstrated in the study. At the same time, it emphasizes the significance of adhering to trade facilitation measures that are enforced.

CONCLUSION AND SUGGESTION

Investments aimed at increasing employment levels are considered incentivized and preferred investments. Transport infrastructure projects such as railways, aviation and roadways are considered the focus of many public infrastructure investments. This study also shows government investment in infrastructure development every year has the expected result of creating jobs for workers. The findings of the System-GMM regression suggest that enhancing transport infrastructure has a large potential to enhance employment rates across industries. A 1.116% increase in rail transport would result in a 0.923% increase in employment possibilities. A 0.882% rise in the road transport component would also result in a 0.903% increase in job opportunities across sectors. When it comes to the effects of inland waterway and aviation transport, the results are also favourable. Improved transport lowers transport expenses and makes it easier for workers to get to work. Although the government is always concerned about job creation for workers, Vietnam still has many reform restrictions, putting a lot of pressure on the issue of job creation for employees.

Vietnam needs to push up its development and enhancement of transport infrastructure in order to provide links between regions and create ideal conditions for employees to access jobs. Simultaneously, it is vital to focus on adopting a regional and municipal transport infrastructure plans. The true role of the plan must be determined, allowing for the elimination of ineffective plans that do not follow the sector's development, both locally and regionally. The plans must be extremely synchronized throughout the many sectors involved in socio-economic growth. It is vital to rebalance investment ratios and procedures in the development strategy, as well as to ensure the efficient use of investment capital sources for roads, trains, aviation, and waterways. The growth rate must be forecasted in the work plans, and this projection must be made at a strategic level. At the same time, it is vital to emphasize the investment's practical benefits, i.e., the benefits that people, communities, and regions obtain when transport infrastructure projects are implemented.

Vietnam's rapid economic expansion needs the building of advanced transport infrastructure. Infrastructure development can help with underemployment. The development of improved transport infrastructure aids in the efficient use of the economy's resources. At the same time, it aids in the greater utilization of comparative advantages between regions in economic sectors. Furthermore, effective transport infrastructure aids logistics development. Although it is estimated that rail transport infrastructure has a positive impact on overall employment across industries, according to VNGSO data, the volume of freight traffic and the number of people using railway infrastructure are declining. As a result, Vietnam's railway infrastructure still needs to be upgraded. In order to execute trade facilitation, it is also necessary to improve transport infrastructure. The development of cutting-edge transport infrastructure is crucial to improving Vietnam's business climate.

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Asymmetric response of unemployment rate to export shock in Indonesia: Does educational attainment matter?

Sielvia Sari[1]*, Mohamad Khusaini[1], and Makoto Kakinaka[2]

[1]Faculty of Economics and Business, Brawijaya University, Indonesia
[2]Graduate School for International Development and Cooperation, Hiroshima University, Japan

*Correspondence email: sarisielvia@gmail.com

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ABSTRACT

Indonesia has long struggled with a high rate of unemployment. Export, one of the aggregate demand's components, typically affects the unemployment rate as argued by Keynes. Therefore, this study attempts to evaluate the asymmetric response of unemployment rate to export shock in Indonesia. Employing a Local Projection method, the analysis incorporates three important features: the asymmetric effects of export shock (positive or negative), business cycle (boom or slump), and educational attainment of workers (highly-educated or less-educated). Dataset consisted of province-level annual panel data of 18 provinces in Indonesia where the main ports for export activity are located, spanning from the years of 1990 to 2019. This study finds significant differences in the unemployment rate dynamics between less-educated and highly-educated workers. A positive export shock during the boom reduced the unemployment rate for less-educated workers, and the effect is more persistent. In contrast, highly-educated unemployment rate decreased when a positive export shock occurs during the slump period, and the effect was rather in the short run. These results suggest some policy implications such as strengthening the domestic market, relaxing export regulation on labor-intensive industries, and diversifying export products to enlarge job opportunities for highly-educated workers with varied qualifications.

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INTRODUCTION

An increase in export is typically associated with a decline in the unemployment rate. Keynes (1937) addressed this issue by considering aggregate demand. A shrink of aggregate demand, where export is one of its components, causes a decrease in labor demand and leads to unemployment in the short run. Someone may be unemployed even if they are willing to work under the current market condition because of the excess labor supply. Keynes argued that markets have no self-balancing mechanism to achieve full employment. Thus, government intervention is required to stimulate aggregate demand (Cornwall and Cornwall, 1997). In contrast, increasing aggregate demand will stimulate labor demand, so that the unemployment rate will decline. This effect will be extremely favorable to countries with abundant labor. Heckscher-Ohlin Theory suggests that the differences in the relative endowments of capital and labor drive trades among countries. Those with relatively plentiful labor tend to export labor-intensive products.

Therefore, an increase in export will reduce the unemployment rate in a labor-abundant country (Dutt et al., 2009).

Countries are inevitably exposed to an export shock in the global market, but how the unemployment rate responds to an export shock differs depending on the direction of the shock, whether the response is positive or negative, i.e., asymmetric responses of the unemployment rate to an export shock (Gaffard and Saraceno, 2012). A positive export shock will decrease the unemployment rate. The increasing global demand will stimulate domestic producers to expand their exports, leading to higher labor demand. In response to this situation, the unemployment rate may fall immediately due to a positive export shock. On the other hand, a negative export shock will raise the unemployment rate. It follows the similar logic, but in the opposite direction, a decrease in external demand induces decreasing labor demand and the increasing unemployment rate (Horvath and Zhong, 2018). However, it may take some time for labor market adjustments, so that the unemployment rate may rise at a slower pace partly due to a tight employment contract or labor union involvement. If an employer lays off a permanent employee or fires a worker before the termination of the employment contract, the employee is entitled to substantial severance money, which is a big burden for the employer. In addition, labor union generally provides protection against mass layoffs. As a result, employers cannot immediately reduce their workers even while facing a negative export shock.

Such asymmetric effects are a critical consideration when addressing unemployment. The government needs to implement different policies to recover from negative export shock and take advantage of positive export shock. The response of the unemployment rate to export shock, either boom or slump, is also influenced by the business cycle. As a fundamental circumstance, different labor market conditions between boom and slump can induce different effects of export shocks on the unemployment rate. During an economic boom (slump), labor markets are generally tight (loose) with excess demand for (supply of) labor (Hall, 2011; Siklos, 2002). A clear overview of how countries' business cycles (boom and slump) relate to the asymmetric effects of (positive and negative) export shocks on the unemployment rate is necessary for the government to arrange appropriate adjustments. Therefore, this study focuses on taking into account the asymmetry of both export shocks with the consideration of business cycles, which is one of the main contributions to the literature since it has not been examined by other research.

Furthermore, this study argues that the response of the unemployment rate to an export shock varies depending on educational attainment. Previous studies reveal that highly-educated workers are more resilient to shocks, and inversely less-educated workers are more sensitive to shocks (Eriksson et al., 2021; Liang, 2021). Although a positive export shock can lower the unemployment rate in general, the impact is more pronounced for the less-educated. This kind of workers typically performs manual routine tasks in mass production or often referred to as a blue-collar workers. Besides, the less-educated workers bear a higher risk of being detached from the job when a negative export shock occurs, while at the same time firms tend to keep their highly-educated workers. Highly-educated workers are more likely to master a certain skill, have been invested in on-the-job training, and have a stronger network, allowing them to have long-term ties with the firm (Mincer, 1991). Not to mention this situation is also linked to the business cycle. A shock during different business cycles might have different effects, which have not been examined extensively in previous studies. This study expects that boom and slump influence the asymmetric impacts of export shock on the different educational groups of the unemployment rate. Therefore, portraying educational attainment differences with respect to the business cycles and asymmetric export shocks will extensively signify the employees' tight or loose ties to the labor market.

In the case of Indonesia, Indonesia has to cope with a high rate of educated unemployment and an increasing-but-not-absorb-the-labor-well export. The problem of unemployment should be taken seriously since, as Staehr (2021) discovered, unemployment is one of the proxies for capacity pressures that might predict future changes in export. In total, according to data published by BPS (Indonesian Central Bureau of Statistics), less-educated people accounted for most of the unemployment in Indonesia from 1990 to 2019. Highly-educated unemployment should not be neglected mainly since its level has remained above 10% since 2015. According to Siddiqa (2021), developing countries need to spend more money on education if they wish to reduce unemployment. It has been found that local governments spending in the

form of policy programs can reduce unemployment (Imamah et al., 2020). Government spending does, in fact, tend to raise the human development index through GDP (Gross Domestic Product) which enhances a person's chances of finding work (Fatsabit and Yusran, 2019; Arfiyansyah and Khusaini, 2018). For export, manufactured goods account for the majority over periods and contribute the most to Indonesia's GDP. Meanwhile, this high share of manufacturing sector is the opposite of its labor absorption. In 2019, national manufacturing industries only employed 18,928,035 persons over 15 years old, accounting for roughly 16% of all workers (BPS, 2019).

Also, Indonesian export policies have their own set of difficulties. According to Faradila and Kakinaka (2020), being in an industrial estate increases firm productivity but fails to promote export activity. Adam et al., 2021), Erbahar (2020), and Wahyudi and Maipita (2018), on the other hand, discovered that a diversification strategy can help boost exports by expanding the job opportunities that may hire workers with various characteristics and mitigate the potential adverse effects of recessions abroad. Moreover, endowed with abundant human resources, Indonesia should prioritize labor-intensive industries, for example, by imposing a relaxation of export regulations for firms' operating in the labor-intensive sector, compared to capital-intensive firms. Participating in trade agreements or bilateral treaties is also supposed to promote trade and create investment opportunities (Htwe et al., 2020). One such organization is World Trade Organization (WTO), which gives aid for trade, targeting developing countries to improve their trade capacity, policy, and regulations (Kim et al., 2020). Those actions and policies for export promotion might be focused on sectors in which the country has a comparative advantage rather than sectors with high unemployment, as Ugarte and Olarreaga (2021) and Jin et al., 2019). Overall, considering several aspects will present a more thorough picture of the problems that have plagued Indonesia for long periods and what kind of actions must be implemented.

The study aims to investigate the response of unemployment rate to export shock in Indonesia, accounting for three aspects: (i) asymmetric effects of positive and negative export shocks; (ii) boom and slump as the business cycles; and (iii) educational attainment of workers divided into the highly-educated and less-educated. The combination of these three factors is rarely found in international trade studies. The body of literature mostly focuses on the effect of export on unemployment in general, even without considering unanticipated shocks. This research is expected to contribute studies concerning the asymmetric impact of export on the unemployment rate in developing countries.

RESEARCH METHOD

This study used annual province-level data sourced from the Indonesian Central Bureau of Statistics (BPS). Data coverage included 18 provinces in Indonesia where the major ports for export activity are located, i.e. Bali, DKI Jakarta, West Java, Central Java, East Java, West Kalimantan, South Kalimantan, East Kalimantan, Lampung, Papua, Riau, South Sulawesi, Central Sulawesi, Southeast Sulawesi, North Sulawesi, West Sumatera, South Sumatera, and North Sumatera. The research period ranged from 1990 to 2019, covering economic boom and slump including the 1997 Asian Financial Crisis and the 2008 Global Financial Crisis.

This study considered the unemployment rate as an outcome variable (Y). This study divided the unemployment rate into three groups to see the differences. They were (i) total unemployment rate; (ii) the unemployment rate for highly-educated workers; and (iii) the unemployment rate for less-educated worders. The total unemployment rate encompassed all levels of educational attainment, even individuals who have never attended a formal educational institution. The unemployment rate for highly-educated encompasses them who are university graduates (diploma, bachelor, or post-graduate degree). The unemployment rate for less-educated covers senior high school, junior high school, primary school graduates, and those who did not finish primary education.

This study also employed export data of FOB (Free on Board) export value. Export shocks are considered the treatment variable, measured by structural residuals of the log of real export derived from a Structural Vector Autoregressive models (henceforth: SVAR) model. Other variables employed in this study included GDP, provincial GRDP data, inflation rate, exchange rate, and labor participation rate.

The study tried to construct the export shock variable using the SVAR model as a preliminary step

before continuing to the empirical analysis. The Local Projection (LP) method was employed in three rounds to get a thorough understanding by incorporating important features.

Preliminary Step: Export Shock

This study built a Structural VAR (SVAR) model to get the export shock for each province in Indonesia. The SVAR model comprised four endogenous variables and three exogenous variables. Those four endogenous variables were the log of real exchange rate, inflation rate, the log of real export, and the log of real GRDP (Gross Regional Domestic Product). Three exogenous variables considered in this study were the log of US real GDP, trend, and its square value. Two lags were selected for the model specification. The specification of the SVAR model is presented by this equation:

$$A_0 z_t = \alpha + \sum_{i=1}^{n} A_i z_{t-i} + \varepsilon_t, \quad (1)$$

where z_t refers to a vector of variables and ε_t represents a vector of serially and mutually uncorrelated structural innovations. The structural residual of the log of real export was later used as the shock variable $\mathrm{SHOCK}_{i,t}$ in the Local Projection (LP) model.

Empirical Analysis: LP Method

This study employed the LP method to examine the asymmetric response of unemployment rate to export shock in Indonesia. Using OLS model, the LP method by Jordà (2005) is robust to misspecification (Olea and Møller, 2020) and accommodates nonlinearities compared to VAR. It also has a lower bias than VAR estimators (Li *et al.*, 2021). In addition, the LP method provides for a more flexible estimation of impulse response on data dynamics (Barnichon and Brownlees, 2019). The analysis consisted of three rounds: (i) without considering any asymmetry, also known as baseline model; (ii) incorporating the asymmetric effects of export shock; and (iii) incorporating the asymmetric effects of export shock accounting for business cycles.

The first round was to estimate the symmetric impulse responses of the unemployment rate to an export shock without considering any asymmetry. In the first round, the LP method was conducted following this baseline model:

$$Y_{i,t+h} - Y_{i,t-1} = \beta_1^h SHOCK_{i,t} + \theta^h X_{i,t} + \lambda_i^h + \delta_t^h + \varepsilon_{i,t}^h, \quad (2)$$

for the time horizon h=0,1,2,3,4. $Y_{i,t}$ denotes the unemployment rate as an outcome variable, distinguished into 3 categories: total, highly-educated, and less-educated. $X_{i,t}$ denotes control variables consisting of the inflation rate lags, the growth rate of real per capita GRDP, and labor participation rate. λ_i^h is the country's fixed effect, and δ_t^h is the time-specific effect. In this baseline the LP model, the Impulse Response Functions (IRFs) were computed using the estimated coefficients β_1^h. For robustness check, this study added the real exchange rate depreciation rate, the share of GRDP of the manufacturing sector, and the share of GRDP of the agricultural sector to the control variables. This model included 1-3 lags of independent variables. The same additional variables also applied for the robustness check in the second and third rounds of empirical analysis in this study.

In the second round, this study incorporated the asymmetric responses of unemployment rate to a positive or negative export shock. The extended model of the LP is as follow:

$$Y_{i,t+h} - Y_{i,t-1} = \beta_1^h PS_{i,t} + \beta_2^h NS_{i,t} + \theta^h X_{i,t} + \lambda_i^h + \delta_t^h + \varepsilon_{i,t}^h, \quad (3)$$

for the time horizon h=0,1,2,3,4. $Y_{i,t}$ denotes the unemployment rate and $X_{i,t}$ denotes other controls like the first round. The variable $SHOCK_{i,t}$ from the baseline model is differentiated into two dummy variables, namely positive export shock (PS) and negative export shock (NS). The value of PS equals shock if $SHOCK_{i,t}$ is bigger than zero; PS=0 otherwise. Also, the value of PS equals shock if $SHOCK_{i,t}$ is less than zero; NS=0 otherwise. In this extended the LP model, the impulse responses are computed using the estimated coefficients β_1^h and β_2^h. While β_1^h denotes the positive export shock, β_2^h denotes the negative export shock.

In the third round, this study further incorporated the business cycles differentiated into boom and slump into the LP model, allowing to discuss how the asymmetric responses relate to the two states. In each round, the unemployment rate was divided into three groups based on educational attainment: total, highly-educated, and less-educated. The estimated model of the LP is as follow:

$$\begin{aligned} Y_{i,t+h} - Y_{i,t-1} = {} & \beta_1^h I_{i,t} PS_{i,t} + \beta_2^h (1 - I_{i,t}) PS_{i,t} + \\ & \beta_3^h I_{i,t} NS_{i,t} + \beta_4^h (1 - I_{i,t}) NS_{i,t} + \theta^h X_{i,t} + \lambda_i^h + \\ & \delta_t^h + \varepsilon_{i,t}^h \end{aligned} \quad (4)$$

for the time horizon h=0,1,2,3,4; $Y_{i,t}$ denotes the unemployment rate and $X_{i,t}$ denotes other controls. This study applied the Hodrick-Prescott (HP) Filter to derive the cyclical components (CC) of the log of real GRDP (business cycles) for each province, denoted by a dummy variable I. Variable I equals one or indicates a boom if CC is positive. Otherwise, variable I equals zero or slump if CC is negative. In the third model, the Impulse Response Functions (IRFs) were computed using these four estimated coefficients β_1^h, β_2^h, β_3^h, and β_4^h. Each coefficient denotes a different stage of the business cycles as well as asymmetry in export shocks. The coefficient of β_1^h indicates the impulse response of a positive export shock during the economic boom, β_2^h indicates the impulse response of a positive export shock during the economic slump, β_3^h indicates the impulse response of a negative export shock during the economic boom, and β_4^h indicates the impulse response of a negative export shock during the economic slump. From these three LP models formed, empirical evidence would be obtained regarding the asymmetric response of the unemployment rate to an export shock in Indonesia from 1990 to 2019.

RESULT AND DISCUSSION

Unemployment and Export in Indonesia

Indonesian exports experienced an upward trend, although the value has decreased slightly in recent years. The highest ever exports peaked in 2011, as much as US$203,496.6 million, and declined slowly afterward until it reached US$167,525 million in 2019 (Figure 1). Manufactured goods were the biggest Indonesia's exports across periods. Although total export gradually fell in the last decade, the export share in the manufacturing sector has increased considerably. In 2019, it shared around 75.55% of total exports. In terms of GDP, the manufacturing sector also appeared to have the largest contribution. Although it was on the decline from 28.84% in 2003 to 19.7% in 2019, as shown in Figure 2, its contribution was still the biggest among all sectors. The second biggest share after the manufacturing sector was the agricultural sector, accounting for only 12.72%. Conversely, the manufacturing sector's high share was the contrary of its labor absorption. Indonesia manufacturing industries absorbed the third-largest employment, while the biggest absorption was in the agricultural sector, followed by the wholesale and retail commerce and automobile and motorcycle repair sectors (Table 1). Only 18,928,035 people above the age of 15 worked in Indonesia's manufacturing industry in 2019, accounting for around 16% of all workers (BPS, 2019).

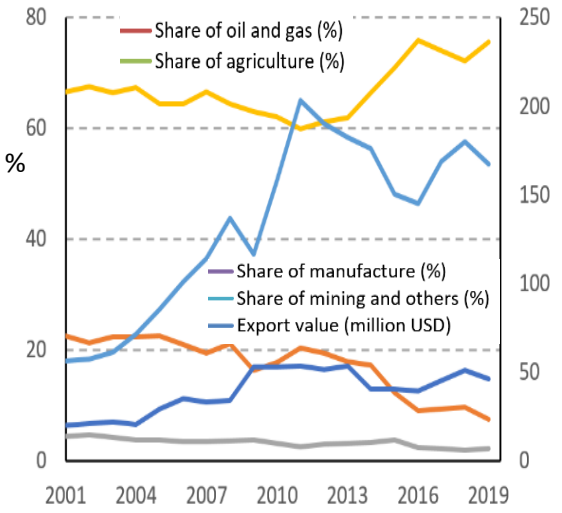

Figure 1. Indonesia's export value and share, 2001-2019

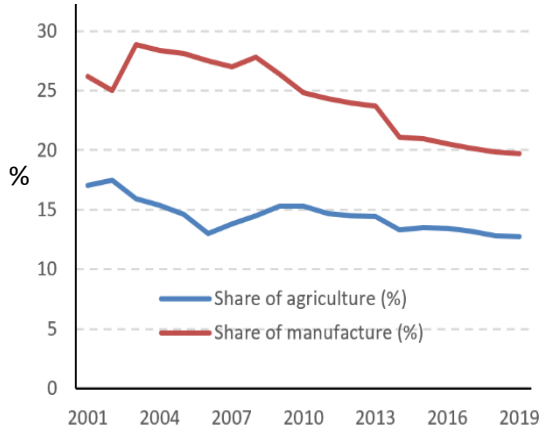

Figure 2. Share of agricultural and manufacturing sector to GDP in Indonesia, 2001-2019

From 1990 to 2019, less-educated people dominated the unemployment in Indonesia (BPS, 2019). The trend increased quite sharply until 2005, then gradually decreased. In 2005, the less-educated unemployment accounted for 94.08% of total unemployment, while in 2019 it accounted only for 83.73%, as shown in Figure 3.

On the other hand, higher education graduates made up about 16.27% of the overall unemployed in Indonesia in 2019. Although not as prevalent as the

low education group, unemployment among those with a high level of education should not be ignored, particularly since the rate has been rising in recent years. It has been above 10% since 2015, whereas it was only 9.51% of the total unemployment in 2014.

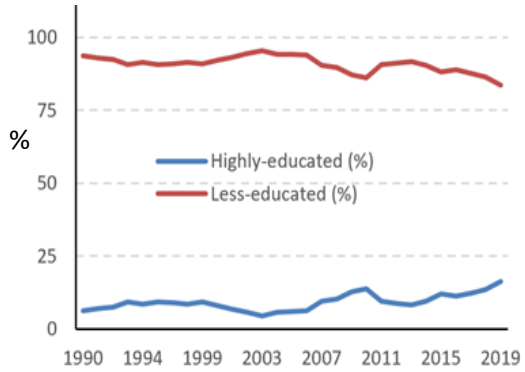

Figure 3. Share of unemployment by educational attainment in Indonesia, 1990-2019

Exchange rates, inflation, and GRDP are also linked to exports. Exports, which are international trade activities, were influenced significantly by the exchange rates of trading partner countries' currencies or typically represented in the US$ exchange rate. Indonesia's export performance has improved slightly since 2005 (Figure 4, panel A). The apparel business, for example, illustrates how poor and diminishing global value chain integration was owing to costly regulations: although rivals heavily relied on imported fabrics, Indonesian raw material import limitations applied. Meanwhile, the real effective exchange rate based on consumer prices in Indonesia was relatively stable (Firgure 1, panel B).

Inflation is also seen to have a negative impact on exports. Considering the structure of the company, some of them are capital-intensive industries that will engage machines and technology more than human resources (Wulandari, Utomo, Narmaditya, & Kamaludin, 2019). They might recruit workers to be machine operators and managerial teams, but not as many as labor-intensive industries. Hence, if they decided to spend money on appliances and invest in technology, they had to consider the price and its maintenance fee. As the cost usually rises over time, inflation may bring a cost-push effect. Later, it influenced their production output. In the recent years, Indonesia's inflation fluctuated but was relatively lower than the average of the G20 emerging market economies (Figure 5). GDRP or GDP, on the other hand, represents a region's economic strength as a fundamental ecosystem for export activity. US GDP is incorporated here as it reflects the global economic conditions.

Table 1. The Order of Average of Labor Absorption and Share of GDP by Sector in Indonesia, 2001-2019

Labor Absorption		Rank	Share of Gross Domestic Product	
A	Agriculture, Forestry, and Fishing	1st	C	Manufacturing
G	Wholesale and Retail Trade	2nd	G	Wholesale and Retail Trade
C	Manufacturing	3rd	A	Agriculture, Forestry, and Fishing
F	Construction	4th	F	Construction
P	Education	5th	B	Mining and Quarrying
R, S, T, U	Other Services Activities	6th	H	Transportation and Storage
I	Accommodation and Food Service	7th	K	Financial and Insurance Activities
H	Transportation and Storage	8th	J	Information and Communication
O	Public Administration, Defense and Compulsory Social Security	9th	O	Public Administration, Defense and Compulsory Social Security
K	Financial and Insurance Activities	10th	P	Education
Q	Human Health and Social Work	11th	I	Accommodation and Food Service
M, N	Business Activities	12th	L	Real Estate Activities
B	Mining and Quarrying	13th	R, S, T, U	Other Services Activities
J	Information and Communication	14th	M, N	Business Activities
E	Water supply, Sewerage, Waste Management, and Remediation	15th	D	Electricity and Gas
L	Real Estate Activities	16th	Q	Human Health and Social Work
D	Electricity and Gas	17th	E	Water supply, Sewerage, Waste Management, and Remediation

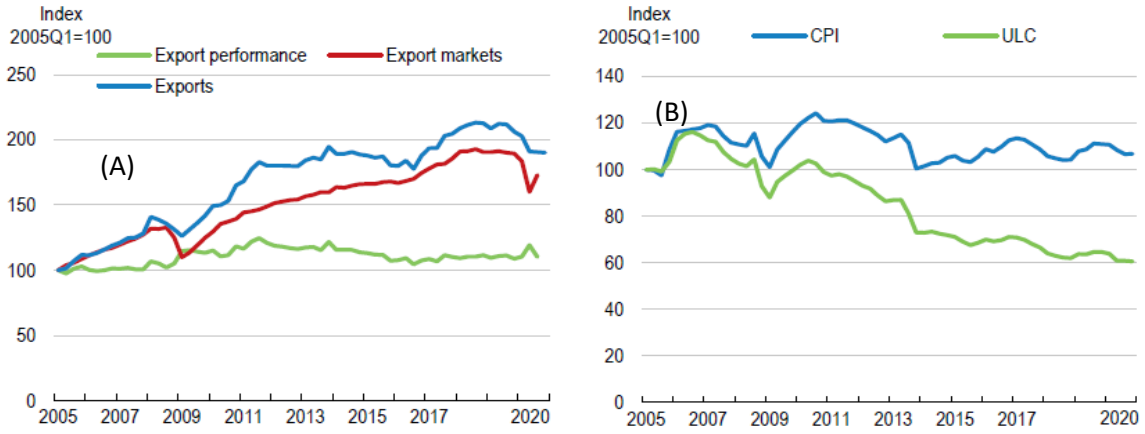

Figure 4. Export Performance (A) and Real Effective Exchange Rate by Deflator (B) of Indonesia, 2005-2020 (OECD, 2021)

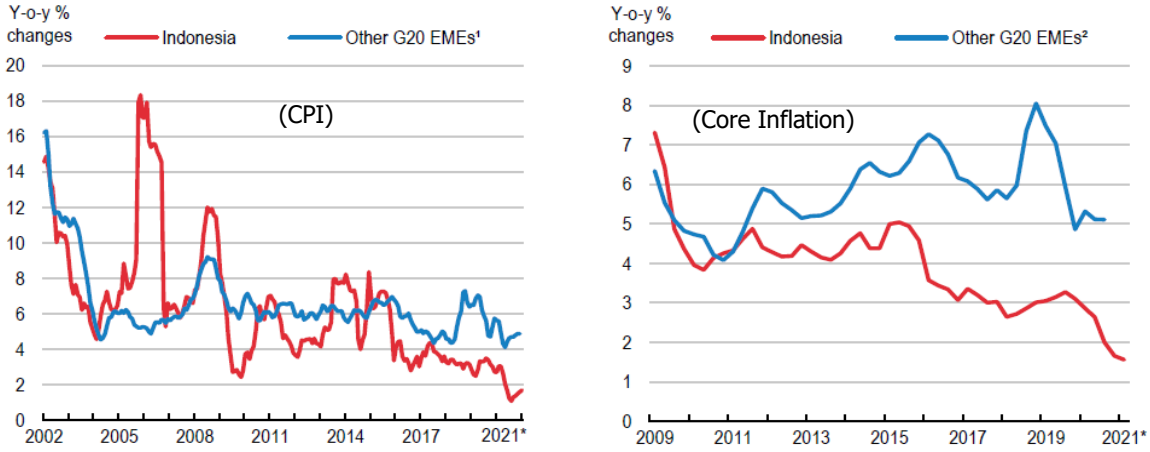

Figure 5. Inflation of Indonesia (CPI and Core Inflation) in comparison with G20 economies, 2002-2021(OECD, 2021)

1st Round: Unemployment and Export

In the first round, this study examined the response of the unemployment rate to an export shock in general without considering either the asymmetry of export shocks or business cycles. This study differentiated the unemployment rate into three categories: total unemployment rate, highly-educated, and less-educated. The LP is powerful to analyze the short-run impact. Therefore, this study focused on the short-run analysis from the year-0 when the shock happened to the year-4 after shock. Table 2 shows no significant changes in all categories of the unemployment rate responding to the export shock. There seems to be a decline in the total unemployment rate and the less-educated, but only less than 1.0% and not significant, so it can be neglected. The highly-educated show ambiguous responses to an export shock over years. These results match with the studies conducted by Yolanda (2017), Costa et al., 2016), Schubert (2011), and Şener (2001).

2nd Round: Incorporating the Asymmetry of Export Shocks

In the second round, this study incorporated the asymmetric effects of export shock into the model while still categorizing the unemployment rate into

three groups. The asymmetric effects of export shock were distinguished between positive and negative.

Due to the positive export shock, the response of the total unemployment rate and the less-educated were ambiguous. The highly-educated shows a 2.847% drop (Table 3), but only in the short run. On the other hand, the responses of the unemployment rate to the negative export shock are negligible as they are not significant at all. These results are the opposite of studies by Eriksson et al. (2021) and Liang (2021), but in line with those conducted by Egger et al. (2020), Artuc et al. (2010), and Şener (2001).

3rd Round: Incorporating Asymmetry and Business Cycles

The third round incorporated business cycles, whether boom or slump, and still incorporated the asymmetric effects of export shock and educational attainment differences. Depicted in Table 4, the results show different responses of the unemployment rate concerning educational attainment, positive or negative of export shock, and the business cycle. A positive export shock decreased the unemployment rate only when the shock occurred during the boom. In addition, when the unemployment rate was categorized into the highly-educated and less-educated, it responded differently to a positive export shock. For other cases, an export shock failed to affect the unemployment rate in every category.

About negative export shock, theory suggests that unemployment rate is increased by a negative export shock. However, our findings show that unemployment rate was not sensitive to a negative shock (resilient). Some scholars found that the less-educated group does not respond to a negative shock because they are not allowed to be unemployed, given their lower incomes and no safety-net. On the other hand, the educated group is more protected, and they are allowed to be unemployed. This can be called as "luxury unemployment" (Kataoka, 2019). However, results show that both the less-educated and the highly-educated was resilient to a negative export shock. In other words, Indonesia's labor market is resilient to a decline in export, which suggests that domestic demand is more crucial for labor market.

Table 2. Symmetric Impulse Responses of Export Shock on the Unemployment Rate

Estimate variable	Year 0	Year 1	Year 2	Year 3	Year 4
Total unemployment rate	-0.131	-0.0957	-0.351	-0.334	-0.510
	(0.252)	(0.195)	(0.328)	(0.294)	(0.453)
Highly-educated unemployment rate	-1.315*	-0.616	-0.948	0.439	0.290
	(0.666)	(0.551)	(0.956)	(0.481)	(0.824)
Less-educated unemployment rate	-0.0428	-0.0901	-0.278	-0.326	-0.577
	(0.281)	(0.205)	(0.327)	(0.318)	(0.483)
Observations	432	414	396	378	360

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

Table 3. Asymmetric Impulse Responses of Export Shock on the Unemployment Rate

Estimate variable	Year 0	Year 1	Year 2	Year 3	Year 4
Positive export shock					
Total unemployment rate	-0.721*	-0.345	-1.016*	-0.605	-0.134
	(0.403)	(0.406)	(0.489)	(0.479)	(0.588)
Highly-educated unemployment rate	-1.552	-1.022	-2.847**	0.282	-0.677
	(1.211)	(1.915)	(1.169)	(1.453)	(1.393)
Less-educated unemployment rate	-0.629	-0.365	-0.819	-0.622	-0.135
	(0.466)	(0.449)	(0.515)	(0.487)	(0.617)
Observations	432	414	396	378	360
Negative export shock					
Total unemployment rate	-0.357	-0.154	-0.163	0.0535	0.723
	(0.457)	(0.211)	(0.555)	(0.467)	(0.801)
Highly-educated unemployment rate	1.156	0.523	-0.480	-0.504	-1.015
	(1.156)	(0.848)	(1.428)	(0.914)	(0.638)
Less-educated unemployment rate	-0.438	-0.195	-0.139	0.0208	0.837
	(0.467)	(0.204)	(0.577)	(0.554)	(0.846)
Observations	432	414	396	378	360

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

Table 4. Asymmetric Impulse Responses of Export Shock on the Unemployment Rate

Estimate variable	Year 0	Year 1	Year 2	Year 3	Year 4
1. During boom					
Positive export shock					
Total unemployment rate	-1.022	-1.057**	-1.824***	-1.096	-0.0867
	(0.592)	(0.441)	(0.629)	(0.664)	(0.923)
Highly-educated unemployment rate	-1.234	-0.549	-3.290*	0.245	0.907
	(1.686)	(2.643)	(1.702)	(2.297)	(1.228)
Less-educated unemployment rate	-1.045	-1.242**	-1.753**	-1.225*	-0.239
	(0.650)	(0.443)	(0.697)	(0.664)	(0.931)
Observations	432	414	396	378	360
Negative export shock					
Total unemployment rate	-0.394	-0.695*	-0.332	-0.240	0.499
	(0.538)	(0.378)	(0.499)	(0.741)	(1.320)
Highly-educated unemployment rate	0.698	-0.836	-1.362	-1.381	-0.150
	(0.631)	(1.464)	(1.004)	(1.386)	(1.312)
Less-educated unemployment rate	-0.404	-0.775*	-0.228	-0.255	0.451
	(0.573)	(0.435)	(0.611)	(0.825)	(1.420)
Observations	432	414	396	378	360
2. During slump					
Positive export shock					
Total unemployment rate	-0.670*	0.360	-0.184	0.627	0.198
	(0.381)	(0.707)	(0.503)	(0.461)	(0.627)
Highly-educated unemployment rate	-2.805**	-1.906	-3.180*	0.243	-2.099
	(1.029)	(2.332)	(1.675)	(1.777)	(2.189)
Less-educated unemployment rate	-0.402	0.591	0.240	0.775	0.311
	(0.453)	(0.721)	(0.563)	(0.491)	(0.692)
Observations	432	414	396	378	360
Negative export shock					
Total unemployment rate	-0.206	0.403	-0.126	0.280	0.984
	(0.594)	(0.483)	(0.899)	(0.441)	(0.575)
Highly-educated unemployment rate	1.459	1.866*	-0.166	-0.0226	-1.823
	(2.189)	(1.002)	(2.115)	(1.294)	(1.363)
Less-educated unemployment rate	-0.341	0.411	-0.154	0.213	1.234*
	(0.566)	(0.480)	(0.872)	(0.537)	(0.600)
Observations	432	414	396	378	360

***, ** and * indicate significance at the 0.01, 0.05 and 0.10 level

Further, for the highly-educated workers, a positive export shock decreased the unemployment rate only when the shock occurred during the slump period, with as big as a 3.18% drop. Still, the effect was rather in the short run. However, for the less-educated workers, a positive export shock decreased almost 2.0% of the unemployment rate only when the shock occurred during the boom period, and the effect was more persistent.

Export Shock and Unemployment

This study also conducted robustness check by adding more variables and got the similar results (Table 5). The results show that the model in this study is robust.

Linking to the theory and literature review, theory suggests that unemployment rate is increased by a negative export shock. However, our findings show that unemployment rate in Indonesia was not sensitive to a negative export shock (resilient). Indonesia's labor market is resilient to a decline in export, which suggests that domestic demand is more crucial for labor market. On the other hand, theory suggests that unemployment rate is decreased by a positive export shock and this study reveals the identical point although the effect varied depending on educational attainment and business cycles. During the economic boom, a positive export shock leads the industries in Indonesia to hire additional personnel to pursue high-mass production. In this circumstance, blue-collar workers or the less-educated ones are mostly required. As a result, the labor demand for less-educated workers rises and the unemployment rate falls. This effect tends to last long generally due to the employment contract and labor union protection. In the case of Indonesia, amidst the Global Financial Crisis of 2008, the Indonesian economy was not so severe compared to other Asian countries. It was stable and performed in good condition due to this

characteristic. Furthermore, the unemployment rate for the less-educated fell from around 90% to under 90% (Figure 3).

Table 5. Effects of Export Shock on Unemployment

Export shock	Highly-educated		Less-educated	
	Boom	Slump	Boom	Slump
Positive	No effect	Decreasing effect (temporary)	Decreasing effect (persistent)	No effect
Negative	No effect	No effect	No effect	No effect

Meanwhile, during the slump, a positive export shock reduces the unemployment rate among the highly-educated. In the years 2000-2003, not long after the Asian Financial Crisis of 1998 hit Indonesia, the unemployment rate for highly educated people fell from around 9% to 4% (Figure 3). The firms tend to take an improvement acceleration approach, and thus they currently require individuals with advanced competencies to explore ideas and perform strategic research and development for the organization. However, because firms typically make rapid efforts, this effect does not persist long. They may hire employees for temporary or outsource to the freelancer that is not embedded as permanent workers. This finding is in contrast with Eriksson et al. (2021), Liang (2021), and Phelps and Zoega (2001). Their studies were conducted in the US and OECD countries, so the different findings reveal the importance of testing the argument in developing countries such as Indonesia. Developing countries respond differently in accordance with business cycles and export shocks compared to developed countries.

Research Implication

This study reveals how the unemployment rate responds to an export shock in Indonesia from 1990 to 2019 depending on educational attainment, export shock asymmetric effects, and the business cycles. Unemployment rate is not sensitive to a negative shock (resilient), which means that Indonesia's labor market is resilient to a decline in export. This result suggests that domestic demand is more crucial for labor market. However, the unemployment rate reacts to a positive export shock. During the slump period, the highly-educated workers in Indonesia respond to a positive export shock more sensitively, rather than the less-educated workers. A positive export shock during the slump reduces the unemployment rate for the highly-educated, and the effect is rather in the short run. In contrast, during the boom period, the less-educated workers respond to an export shock more sensitively. A positive export shock during the boom reduces the unemployment rate for less-educated workers, and the effect is more persistent.

Based on the research findings, the study provides the following implications. First, the importance of devoting to the domestic market. The government needs to strengthen the domestic demand by providing credit for consumption, accelerating the realization of the state budget, and campaigning the use of domestic products. One of the ways is the initiative for prioritizing the purchase of domestic over imported products in the procurement of goods and services by ministries and agencies and increasing the level of domestic components in manufacturing industries. A credit program for consumption will increase purchasing power, and economy will be less reliant on exports and will be able to foresee the negative consequences of foreign market uncertainties. It should be in accordance with the "Bangga Buatan Indonesia" campaign to support domestic producers and avoid import dependency as buying parity rises. Government institutions that prefer domestic goods in procurement may amplify these actions. The study by Faradila and Kakinaka (2020) stated that growing domestic demand in Indonesia allows local manufacturing firms to survive. It means that the domestic market is so potential and government really needs to take action.

Secondly, workers with lower levels of education can be more employed due to the positive export shock during boom. Therefore, the government needs to relax export regulation on labor-intensive industries to attract investors developing a labor-intensive business rather than capital-intensive, such as imposing tax incentives or following up the WTO trade aid for export-promoting policies and regulations (Htwe et al., 2020; Kim et al., 2020). However, instead of targeting the sectors with the highest unemployment rate, incentives should be directed toward critical sectors with a competitive advantage in order to maximize the results (Jin et al., 2019; Ugarte & Olarreaga, 2021). By having abundant human resources, Indonesia needs to prioritize labor-intensive industries. Imposing a relaxation of export regulations for firms' operating in the labor-intensive sector would be beneficial to strengthen export promotion. Providing internal training for the workers can also be an option because it seemingly makes

them more attached to the firm (Mincer, 1991). Employers can improve the efficacy of their performance by offering training to workers with low education. Training can help them enhance their skills without relying on formal education; besides, not all skills are taught in school. This training activity can teach specific skills linked to the company's business operations and core values, which may differ from other firms. The issuance of the 'PRAKERJA' card by the government of Indonesia is a good way to improve the abilities of job seekers in the hopes of better preparing them and lowering the training costs borne by workers or companies, but the implementation needs to be improved (Kurnianingsih et al., 2020). The first distribution of the card, which was targeted largely at mitigating the effects of the Covid-19 pandemic, seems to have failed to achieve the maximum goal because the community and stakeholders were not ready, particularly with regard to the digital learning ecosystem they were targeting. Nonetheless, the card seems to be able to bring more benefits in the long run.

Thirdly, the Indonesian government can still participate in trade agreements or bilateral treaties to promote trade and mitigate the adverse effects if a negative shock occurs (Htwe et al., 2020; Kim et al., 2020). Indonesia has been a member of the WTO since 1950, ASEAN Free Trade Area (AFTA), IJEPA (Indonesian-Japan Economic Partnership Agreement), and other trade agreements. This participation must be maintained and increased by active involvement. It will have a bigger positive impact on Indonesia economy for its ability to influence the organization's policies, such as on the imposing or not-imposing of tariffs and quotas, and even in terms of giving aid to member countries.

Lastly, government and investors may develop a diversification strategy for driving exports such as coal mining instead of manufacture and agriculture sectors (the two most prominent sectors in Indonesia's economy). The broader export products or fields are expected to enlarge job opportunities for workers with varied qualifications (Adam et al., 2021; Erbahar, 2020); Wahyudi and Maipita, 2018). Encouraging export-market diversification has long been done by developed countries (Adam et al., 2021). Indonesia can adopt this diversifying method which has shown to be able to suppress the potential negative consequences of global market uncertainty, especially because manufactured export commodities will be increasingly difficult to compete in the global market with China's re-emergence as a major competitor.

CONCLUSION AND SUGGESTION

This study has revealed how the unemployment rate responds differently to an export shock in Indonesia from 1990 to 2019, depending on several aspects. Although the unemployment rate does not react significantly or can be considered resilient to the negative export shock, the unemployment rate shows some responses to a positive export shock. The unemployment rate for the highly-educated is reduced by a positive export shock if the shock occurs during slump, and the effect is rather short-termed. In contrast, the unemployment rate for the less-educated is reduced by a positive export shock if the shock occurs during boom, and the effect is more persistent.

The results show a significant reducing effect of the positive export shock on the highly-educated unemployment rate. Therefore, this study suggests the Indonesian government mainly focuses on this by employing an export-diversification strategy. Moreover, the highly-educated unemployment rate has been consistently upper 10% in the recent years. Diversification strategy can enlarge job opportunities for workers with varied qualifications. If Indonesia continues to focus entirely on exports, skilled workers who can be employed in other areas will not be absorbed. Export diversification by developing potential industries that have not previously been prioritized will provide many job opportunities for workforce. The diversifying strategy can also be done by expanding the market.

This study has limitations because the data only include 18 of 34 provinces in Indonesia. This limitation arises from the fact that the complete data are only available at the 18 provinces where the major exporting ports are located. Analyzing the I/O (Input/Output) table can be used to do research involving all provinces, but it usually only allows for five years of data, making it challenging to employ.

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Spatial analysis of region interaction of West-East corridor's strategic economic area of West Sumatera Province, Indonesia

Siska Amelia[12]*, Ernan Rustiadi[3], Baba Barus[3], and Bambang Juanda[4]

[1]Regional and Rural Development Planning, IPB University, Bogor, Indonesia
2Department of Urban and Regional Planning, Krisnadwipayana University, Jakarta, Indonesia
3Department of Soil Science and Land Resources, IPB University, Bogor, Indonesia
4Department of Economic Sciences, IPB University, Bogor, Indonesia

*Correspondence email: amelie93028@gmail.com

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ABSTRACT

The West-East corridor is one of the main gateways to enter West Sumatra Province. The West-East corridor, which passes through 65 districts, has a variety of potentials and problems. This means, the growth rate of each district will be different. The growth rate and strength of the relationship among regions can be observed through the gravity model's spatial interactions. The gravity model can calculate the relative strength of the relationship between regions. To see the strength of the relationship among regions in the West-East corridor, strategic economic areas were taken into considerations based on their distance and several observational variables, which were the total population variable, infrastructure completeness, level of security, and investment value. Observation analysis units consisted of sixty-five sub-districts along the West-East corridor. Mass 1 (M1) was the central government, West Padang district, and mass 2 (M2) was the other 64 sub-districts. The analysis results show that the total population, infrastructure completeness, level of security, and investment value are not only influenced by their closeness to the government/city center. The infrastructure completeness factor can influence the total population in a region. Likewise, the investment value can be influenced by the infrastructure completeness and the level of security in a region.

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INTRODUCTION

Balanced development is the fulfillment of development potential in each region (Rustiadi et al., 2018). If this condition is associated with the stages of economic growth put forward by Rostow, it is related to the take-off precondition. This stage is a transition period in which society prepares itself or is prepared from the outside to achieve growth with continuous development (self-sustained growth). This stage is the transition period in which the conditions for self-help growth are built or created (Jhingan, 2016).

Regional development is aimed to formulate and apply a theoretical framework to economic policies and programs by integrating social and environmental aspects to achieve optimal and sustainable welfare (Nugroho & Dahuri, 2004). Friedmann dan Alonso (1964) posited that the development of a region or district in the long term is more emphasized by

introducing natural resources and regional local development potentials. The potential that can support economic growth, social welfare, poverty alleviation, and efforts to overcome development obstacles in order to achieve development goals is strongly influenced by the components of local resources, markets, labor, investment, government capacity, transportation, and communication and technology.

As stated in Indonesian Law No. 26/2007 concerning Spatial Planning, one of the efforts to accelerate development by utilizing local resources is by identifying strategic districts. A strategic economic area potentially has a significant multiplier effect that is cross-sectoral, cross-spatial (cross-regional), and cross-performer (Bappenas, 2014). Strategic economic areas are areas prioritized for development. According to Sosnovskikh (2017), the area clustering policy is the key and one way to attain local and regional economic development. The strategic economic area as a territory region distinguishes this region from the other regions (Komarovskiy & Bondaruk, 2013). A strategic district is a district prioritized for development where its commodities are developed to improve the community's welfare in the region (Bozhko, 2018).

The strategy to increase economic growth is by developing strategic areas or developing economic corridors. An economic corridor is an integrated infrastructure network in a geographic district designed to stimulate economic development (Brunner, 2013). The economic corridor approach views the transportation network as a tool for transporting goods and services or as a gateway and as a tool to stimulate socio-economic development around the network (Mulenga, 2013). Thus, the corridor economic approach transforms the transportation corridor into a driving engine for socio-economic development. In line with research conducted by Ji & Shao (2017) regarding the Heritage Corridor, a comprehensive action towards conservation and development originating from the 'green way' prioritizes cultural-related conservation and focuses on economic revitalization and environmental protection.

Regional development and superior commodities development are carried out to accelerate regional economic development (Muta'ali, 2015). Conceptually, the role of the strategic area may boost the economy in the region (Ezmale & Rimsane, 2014; Glinskiy et al., 2017) and improve the regional economy (Anwar, 2014; Babkin et al., 2017). Strategic economic areas are expected to act as a growth center or a growth corridor to drive economic growth in the surrounding region (hinterland). As an implementation of the growth center or growth corridor concept, the strategic economic area is expected to be the prime mover of development, capable of driving economic development in the surrounding region. Therefore, the strategic economic area in which the residents are concentrated with various economic and social activities has a quite strong influence on the development of the surrounding regions.

The West-East corridor is one of eleven strategic economic areas in West Sumatera Province. The West-East corridor is one of the axes that connects West Sumatera Province with other regions in the Eastern part of Sumatera. The West-East corridor is one of the main corridors and the gateway of the West Sumatera province in the East region. It is a corridor that has the highest frequency of trade and services. Therefore, based on Governor Regulation No. 73/2013 concerning the West Sumatra Economic Development Master Plan 2013-2025, the West-East corridor is included in one of the economic development regions.

The strength of the relationship among regions in the West-East corridor is based on distance and several dimensions of observation. The strength of the relationship and the level of development of the strategic economic area in the West-East corridor can be observed by looking at the spatial interactions between regions using the gravity model. The basic concept of the gravity model is to analyze the size and distance between one region to another. This model can calculate the relative strength of the relationship between the regions (Muta'ali, 2015). In the gravity model, regions are considered as a mass. Therefore, the relationship between regions can be equated with the relationship between masses. The region's mass also has an attraction which affect each of the two regions with the said attractive strength. This model follows Newton's law of gravity applied and developed in socio-economic interactions, in which there is a parallel relationship between community migration (Rustiadi et al., 2018).

The research aims to study the interaction and the strength of relationship between regions in the West-East corridor in West Sumatra Province.

RESEARCH METHOD

This research was conducted at The West-East corridor, which is one of the main gateways passing through nine regencies/cities, i.e. Padang Pariaman Regency, Agam Regency, Tanah Datar Regency, Lima Puluh Kota Regency, Pariaman City, Padang City, Padang Panjang City, Bukittinggi City, and Payakumbuh City.

Data collection

For examining the strength of the relationship and the level of regional development in the strategic economic area of the West-East corridor, this research employed a combination of qualitative and quantitative methods. The qualitative method involved direct observation in the field by extracting information from various sources related to the development of the West-East corridor. The collected data and information were related to population, crime rate, number of industries, the completeness of infrastructure (the number of markets, sports facilities, banks, hospitals and health centers, hotels, inns/motels/guest houses/hostels, senior high schools, and universities), and investment in the development of the strategic economic area of the West-East corridor. In addition, qualitative data processing was carried out by examining various research results related to regional development. Sources of data used in this research came from the Central Bureau of Statistics (BPS) in the form of *Kabupaten and Kecamatan dalam Angka* (literally meaning Regency in Figures and District in Figures) data in 2020. The investment data were taken from the Agency of Capital Investment and One-Stop Service (DPMPTSP) in each regency or city. Data analysis was performed using the gravity model as an analysis tool. The units of analysis involved in this research were the districts along with the West-East corridor delineation. Analysis of interaction patterns in the analysis unit was carried out using the maximum and minimum clusters, where the grouping was done based on the maximum-minimum value concentration at the observation location (Scott & Janikas, 2004).

The Region Interaction

The basic concept of the gravity model is to study the size and distance from one region to another (Muta'ali, 2015). The use of gravity techniques allows this study to calculate the relative strength of the relationship between regions. In addition to the distance between regions, the potential for interaction between regions was determined by the region's "attractiveness", such as population, economic potential, natural and environmental resource potentials, and regional facilities. The gravity model in this research was used to view the role or strength of strategic economic areas in regional development and enhancement of the regional economy. The measurements were based on the distance of each provincial strategic economic area to the center of government with the district analysis unit.

In this research, to view the interaction of each strategic district in West Sumatra province with the district analysis unit, various combinations of gravity models were produced. The calculation of the interaction between regions used mass 1 and mass 2. Mass 1 is considered unchanged, which is the center of government, while mass 2 varies (Muta'ali, 2015), comprising the districts along the West-East corridor. The calculation and analysis of this gravity model showed which strategic district would provide a more remarkable influence based on several variables. The formula used in the gravity analysis is shown in equation 1,

$$I_{12} = g \frac{m_1 m_2}{r^b{}_{12}} \quad (1)$$

in which I_{12} equals attraction potential and interaction between regions 1 and 2, m_1 and m_2 equal the mass of region 1 and 2, r_{12} is distance between regions 1 and 2, and g equals proportional constant (for example, the value is 1).

Meanwhile, b is distance constant, which depends on the district accessibility value—the better the accessibility, the smaller the constant, thus the interaction potential is more remarkable. Based on the research results conducted by Vooheers (Muta'ali, 2015), a distance rank constant is based on the purpose of the trip, wherein work = 0.5, social = 3, and shopping, business, recreation, and others = 2.

I_{12} value shows the potential of a close relationship between region one and region two. The higher the I_{12} value, the closer the relationship between the two regions; there would be more trips for economic activities or the flow of goods and services between these regions as a consequence of the interaction between regions within one district. Regions with the highest I_{12} score have the characteristics of a central region, a strategic position,

and a high level of region connectivity (Andriyani & Utama, 2011).

$$Interval\ Class = \frac{\sum data}{\sum class} \quad (2)$$

The formula of the class interval is determined by the number of data divided by the number of levels, as shown in equation 2.

RESULT AND DISCUSSION

Interaction of West-East Corridor

The West-East corridor is one of the main corridors connecting West Sumatra Province with the other regions, and it is the gateway to West Sumatra from the Eastern part. A strategic area has characteristics that distinguish the region from the others (Komarovskiy & Bondaruk, 2013). This research aims to view the interaction, linkages, or strength of the relationship between the central area and the others. In this study, the distance measurement between the central region and the other 64 observation regions was carried out using the Euclidean distance method with the assistance of the ArcGIS software (Figure 1). Euclidean distance is a calculation of the distance between individuals based on their geometric distance or straight-line distances in a multidimensional space (Pribadi et al., 2010). This was used to obtain the distance of each district to the center of the observation object (West Padang district). The measurement of the distance between observation objects was carried out on the centroid of each observation object.

In this research, the center of observation was the West Padang district considering that the governor's office and various government offices are located in the region. Therefore, based on the measurement of the distance from the observation center (M1) to 64 other observation areas, the closest distance is North Padang district at 3 km and the furthest distance is Pangkalan Koto Baru district at 121.6 km.

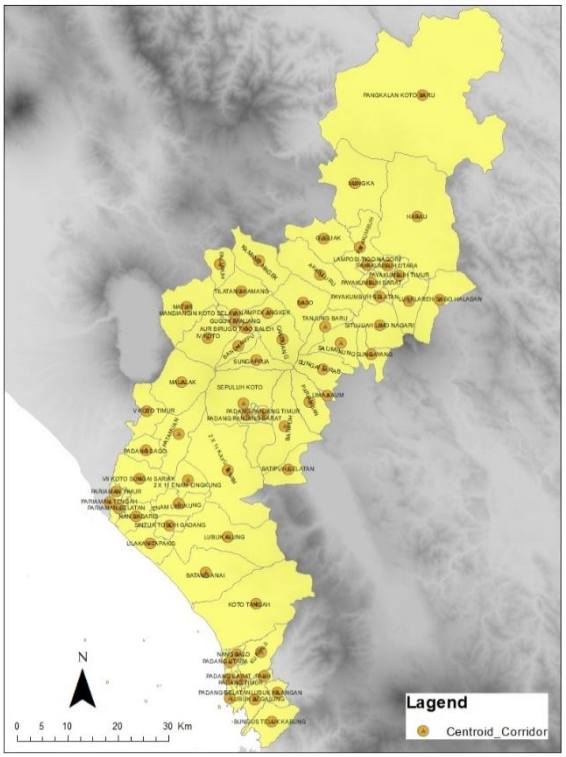

Figure 1. Centroid of corridor

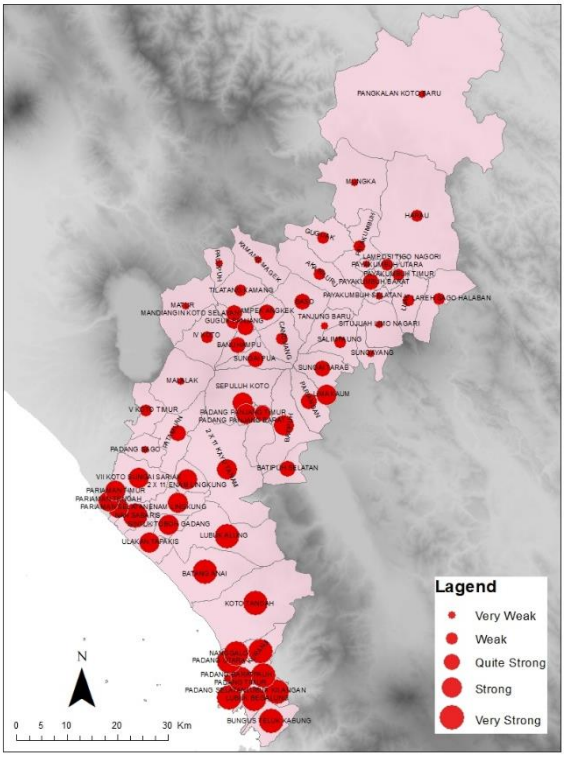

Figure 2. Regional interaction of population

The mass used to observe the interaction of regions in the gravity model is very dependent on the purpose of the analysis (Muta'ali, 2015). Based on research, in general, the mass of an area is the total population. In looking at the economic interactions (equation 1), the variables of GRDP, GRDP per capita, job opportunity, tourism potential, investment, and various other economic variables were used. This research compared the interaction among population variables, investment, number of large/medium/small industries, the completeness of infrastructure (the number of markets, banks, hospitals, health centers, sports facilities, hotels, hostels/motels/guest houses, high schools, and universities), and crime rate.

The observation variables using the gravity model formula (equation 1) produced various interpretation results. To identify the interaction between regions based on the results of previous research studies, the regions were grouped into four to seven classifications. In this study, regional interactions were grouped into five classes, which were very strong, strong, quite strong, weak, and very weak. The classification of the region's strength in this research used the quantile method (Kurniati & Rahardjo, 2015). The quantile method is suitable for data with a linear distribution, where the division of the members of each class is equal. As shown in equation 2, the formula of the class interval determines the number of data divided by the number of levels. Data classification was performed using the ArcGIS 10.3 software. Thus, regional interactions were obtained from classifying each observation dimension.

Figure 2 shows the strength of the relationship between the regional center (M1) and the other regions (M2). The results show that the region interaction was very diverse. Not all areas close to the center had very strong or strong interactions. Some areas that are far from the center also had strong interactions. That happens due to various reasons why people stay in the region, which is not only based on proximity to the center. The completeness of infrastructure (Martinez & Masron, 2020) causes people to stay in the area.

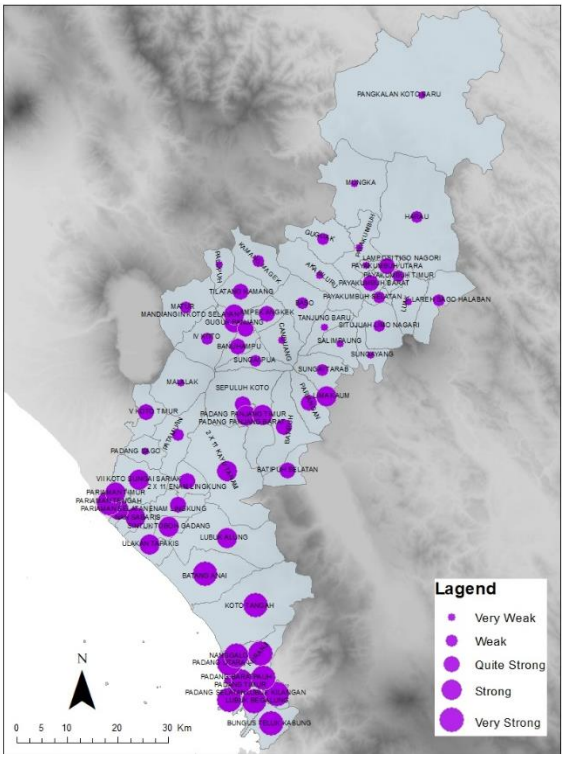

Figure 3. Regional interaction of infrastructure completeness

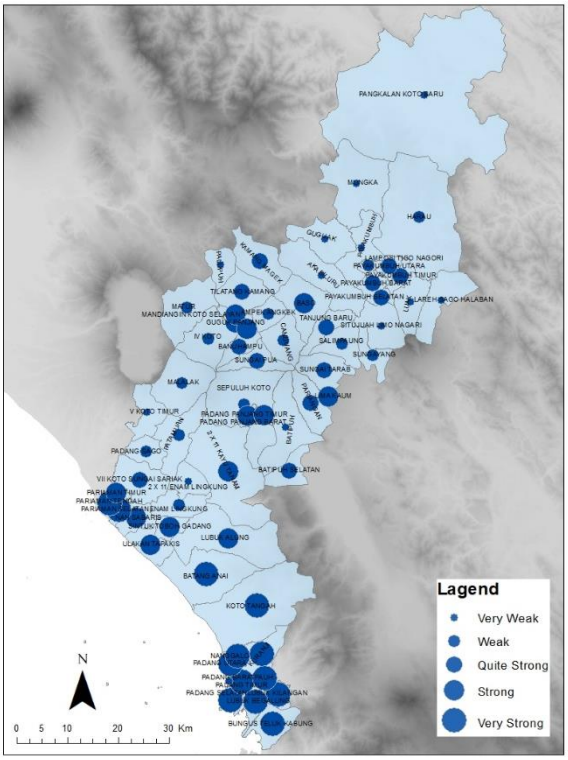

Figure 4. Regional interaction of crime rate

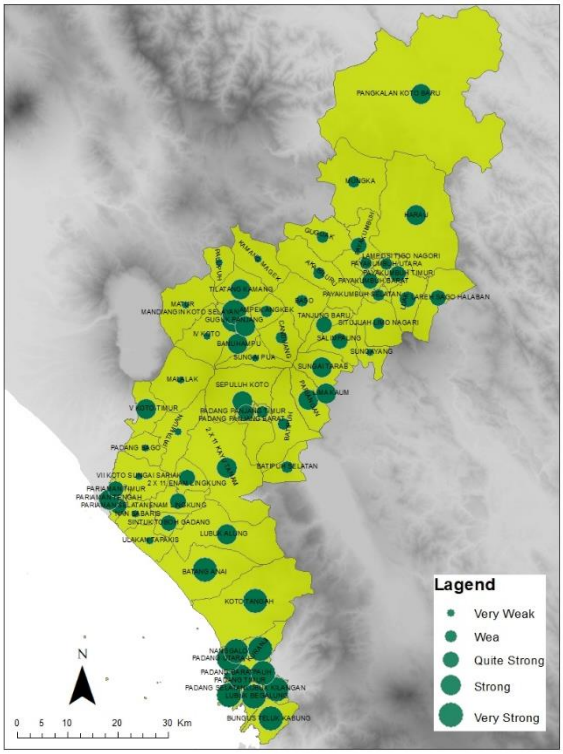

Figure 5. Regional interaction of investment

Environmental quality is also a reason for choosing a place to live (Prayitno et al., 2021). Based on the observation results of the population variable, Padang Sago district, 48 km away from the center of government, had a very weak interaction, while Lima Kaum district that is 59.3 km from the center had a strong interaction. Payakumbuh Barat district is 83 km from the center of government and it had a strong enough interaction. Pangkalan Koto Baru district is the farthest from the center of government (121.6 km) and it had a very weak interaction with the central government.

Figure 3 shows the strength of the relationship between the center (M1) and other regions (M2) based on the infrastructure completeness variables. In this study, the completeness of infrastructure was based on the number of markets, banks, hospitals, health centers, hotels, hostels/motels/guest houses/ inns, high schools, and universities. Pangkalan Koto Baru district is 121.6 miles from the central government, and the infrastructure variable had very weak relationship strength for having relatively little infrastructure completeness. This is in line with research conducted by Martinez & Masron (2020), stating that one of the reasons for someone to live in an area is the completeness of infrastructure in the region. Padang Sago district is 48 km from the government center and had a very weak relationship with the central government, in the sense that the Padang Sago district had relatively little infrastructure. This finding shows that the relationship between populations is directly proportional to the completeness of infrastructure in a region. The Mandiangin Koto Selayan district has a distance of 72.1 km from the central government and had a very strong relationship with it, showing adequate completeness of the existing infrastructure in the district.

Figure 4 shows that several regions close to the central government and low in crime rate had a very weak interaction. For example, 2x11 Enam Lingkung district and V Koto Timur district, which are 40 km and 55 km away from the center of government respectively and low in crime rate, had a very weak relationship strength with the crime rate variable. On the other hand, Baso district and Mandiangin Koto Selayan district had a high crime rate.

The proximity of a region to the central government/city center influences crime rates. In addition, inadequate facilities such as damaged road networks, the lack of communication infrastructure (Arisukwu et al., 2020), community income, and literacy rates may lead to high crime rate (Hajela et al., 2020).

Figure 5 shows the interaction of the center with the other regions based on the investment variable. The Ulakan Tapakis district, which is close to the central government (31 km away) and received small amount of investment value, had a very weak relationship strength. Likewise, Nan Sabaris district which is 37 km away from the central government had a very weak interaction. On the other hand, the Tilatang Kamang district, which is 76.5 km away from the central government and had quite large amount of investment, had a strong interaction with the central government. Both Pangkalan Koto Baru district, the farthest from the central government at 121.6 km, and Harau district almost as far at 98.6 km, had a strong interaction. The results show that the region's proximity to the center does not influence the amount of investment value.

Many factors influence investors' interest in making investments. Several factors include economic stability, ease of bureaucracy, investment-related policies (Hanim & Ragimun, 2015; Melliger & Lilliestam, 2021), institutions (Kuncoro & Rahajeng, 2005), security (Martinez & Masron, 2020; Glinskiy et al., 2017), infrastructure completeness (Kuncoro & Rahajeng, 2005), the availability of supporting technology (Melliger & Lilliestam, 2021), and the provision of incentives (Limanlı, 2015).

The results of the analysis show that the level of security affects investors' interest in making investments. As seen in Ulakan Tapakis and Nan Sabaris districts, both of which are close to the central government, have low investment values and almost high crime rates. Pangkalan Koto Baru and Harau districts are both far from the center but have high investment values and low crime rates. Thus, the level of security in a region becomes a factor to be considered when investing. This is in line with research conducted by Martinez & Masron (2020) and Glinskiy et al. (2017).

Research Implication

The gravity model in this study is used to see the role or strength of each region in the west-east corridor in regional development and improving the economy of the west-east corridor and the province of West Sumatra in general. The use of gravity techniques will calculate the relative strength of the relationship between regions (Leigh & Blakely, 2016). The basic concept of the gravity model is to discuss the size and distance between one area and another. This model can calculate the relative strength of the relationship between regions (Muta'ali, 2015). In the gravitational model, the area is a mass, so the relationship between sites is the same as the masses'. The mass of a region has an attraction, so there is mutual influence between areas which is the force of attraction between areas. This model follows Newton's law of gravity which is applied and developed in socio-economic interactions, where there is a parallel relationship between community migration (Rustiadi et al., 2018). Research carried out using this gravity model includes a study conducted by Thompson et al. (2019). His research examines the effectiveness of predicting two-way traffic volumes in the United States using annual average daily traffic data for various states. Bialynicka-Birula (2015) research which looks at the influence of the art market in European countries on the total exports and imports of works of art, examines the trade in the art using Eurostat international trade data and distances between countries.

The province of West Sumatra, which has large enough local potential compared to national per capita income, has a relatively small Gross Regional Domestic Product (GRDP) per capita. The comparison of the GRDP per capita between the Province of West Sumatra and other provinces on the island of Sumatra is also relatively small. The development of the provincial GRDP per capita on the island of Sumatra for the 2014-2020 period is far below the province of Riau, Riau Islands, North Sumatra, and Jambi. GRDP per capita of West Sumatra Province based on 2010 constant prices was 25.98 million in 2014, and 30.82 million in 2020. The province of West Sumatra has a per capita income that is not too large but a higher value of the Human Development Index (IPM) compared to other provinces in the island of Sumatra.

The HDI value of West Sumatra Province is even above the national HDI average. In 2020 the HDI value of West Sumatra Province was 72.38. The HDI value of West Sumatra province was even higher than the HDI value of North Sumatra province (Figure 1). The potential of West Sumatra's human resources is

relatively high, occupying the third position among the regions in the island of Sumatra, which reached 72.38 in 2020. The HDI value of West Sumatra province was even higher than the HDI value of North Sumatra province (Figure 6). The potential of West Sumatra's human resources is relatively high, occupying the third position among the regions on the island of Sumatra.

The big potential of West Sumatra's resources is not matched by the value of the investment. If we look at the investment in the provinces on the island of Sumatra, West Sumatra occupies the bottom two positions of the investment amount after Aceh. The amount of investment in West Sumatra in 2020 was 3,106.20 billion rupiahs for PMDM (domestic investment) and 1,758.40 billion rupiah for PMA (foreign investment). The amount of investment in West Sumatra for PMDN is in the lowest two positions after Bangka Belitung Islands. Meanwhile, PMA occupies the bottom four positions after Jambi, Bangka Belitung Islands, and Aceh. This small investment causes uneven development in West Sumatra.

The uneven development can be seen from the availability of infrastructure in each district/city. Complete and adequate infrastructure is due to the relatively high investment in urban areas. Increased investment can support regional economic development. Uneven development can also cause a backwash effect, leading to regional leakage in several regions of West Sumatra. According to Rustiadi et al. (2018), the pattern of population movement from underdeveloped areas to developed areas where economic development in developed areas is an attraction for quality workforce migration. This pattern causes those living in less developed areas to be unproductive people. Uneven development can also cause a backwash effect that creates regional leakage in several regions of West Sumatra.

Economic growth in urban areas is more varied in development than in rural areas. Investors are interested in investing in urban areas because they already have urban infrastructure and utilities. The concentration of economic activity that is more concentrated in urban areas than in rural areas supported by a more significant allocation of development budgets in urban areas also causes a gap. The gap causes trouble in the mobilization of goods and services due to limited transportation and communication, so the income per capita of the community is low. Good infrastructure development will ensure efficiency, facilitate the movement of goods and services, and increase the added value of the economy (Skorobogatova & Kuzmina-Merlino, 2017; Hasselgren & Englén, 2016; Sutriadi et al., 2015; Jurgelane-Kaldava et al., 2019).

To create equitable development in the west-east corridor and West Sumatra in general, it is necessary to establish new growth centers. The findings of this study form the basis for local governments to determine new growth centers. According to Perroux's theory of growth pole, in overcoming development inequality, the building new growth pole may function as intermediary development centers and prepare for the development of migration-receiving areas. The existence of a new growth pole can affect the development of the surrounding area. The growth pole acts as a service center for the surroundings.

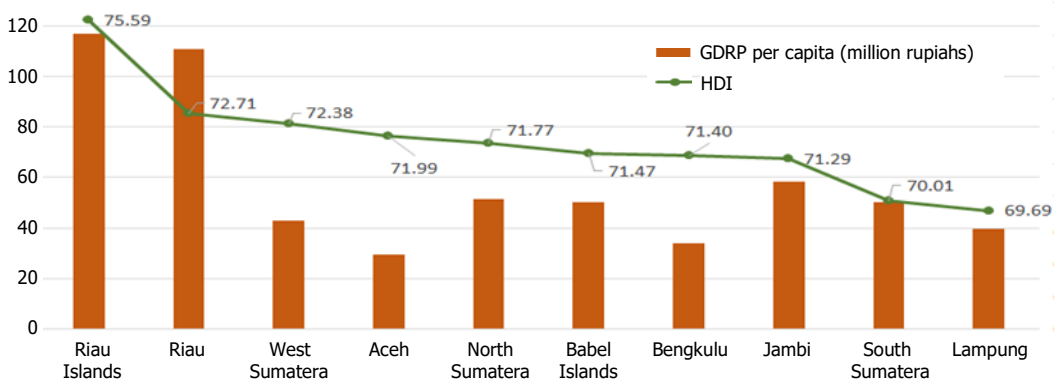

Figure 6. GRDP per capita (at 2010 constant price) and provincial HDI in Sumatra Island in 2020

CONCLUSION AND SUGGESTION

This research attempts to identify the regional interaction/ relationship strength between the central government and the other 64 districts along the West-East corridor. The variables used in this observation comprise population, infrastructure completeness, rate of crime, and investment value. The strength of regional relations and the level of regional development are influenced by the region's proximity to the regional center. One of the reasons people live in an area is the completeness of infrastructure in that particular area.

Padang Timur district, which is 2.4 km away from Padang Barat, is the closest district to the central government. The district interaction of Padang Timur district and the population variable has an intense relationship. The regional interaction of variables infrastructure completeness, level of security, and investment value also has a strong relationship with the central government. The proximity of the regions to the center does not influence investment value. Instead, it is likely influenced by government policies, the completeness of infrastructure, the level of security, and the availability of supporting technology.

The findings of this study form the basis for local governments to determine new growth poles. The existence of a new growth pole will be able to influence the development of the surrounding area. The growth pole acts as a service center for its surroundings. The existence of new growth poles can reduce regional inequality.

This study has limitations, one of which is the establishment of the distance between districts. The distance calculation in this study uses the Euclidean distance as the straight-line distance between the regional centers. The distance calculation in this study does not use distance based on travel time and mileage.

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Development of direct marketing strategy for banking industry: The use of a Chi-squared Automatic Interaction Detector (CHAID) in deposit subscription classification

Anwar Fitrianto[1]*, Wan Zuki Azman Wan Muhamad[2], and Budi Susetyo[1]

[1]Department of Statistics, IPB University, Bogor, Indonesia
[2]Institute of Engineering Mathematics, Universiti Malaysia Perlis, Malaysia

*Correspondence email: anwarstat@gmail.com

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ABSTRACT

A comparison between Chi-squared Automatic Interaction Detector (CHAID) and logistic regression analysis was performed for classification problems on bank direct marketing data. CHAID Performance Comparison and comparison with Logistic Regression (LR) performance were also conducted. Priority performance with two statistical measures was evaluated: classification accuracy and sensitivity in the presence of data containing categorical imbalances. Random over sampling (ROS) was then applied to deal with class balance problems to get better performance of CHAID analysis. Segmentation analysis was also performed using the CHAID approach to improve the performance of the analysis results. CHAID outperforms LR because of its advantages that it can be used to perform segmentation modeling. Direct marketers should pay attention to traits are Duration, Month, Contact, and Housing. To get a higher subscription, the bank must extend the call duration. Based on these results, the banking industry needs to prepare regulations related to human resources, infrastructure, costs, and government support to achieve higher subscriptions.

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INTRODUCTION

Classification is one method that is often used in statistical analysis and machine learning. The method, whose process involves data grouping according to similarities, has been widely used in various fields such as e-commerce, direct marketing, market segmentation, environmental research, medical and social sciences, etc. In direct marketing, many classification approaches have been employed to map potential customers so that the bank can determine correct campaign strategies (Amzile & Amzile, 2021; Rogić & Kašćelan, 2021). Another application of the classification approaches in direct marketing is classifying banking products into meaningful categories. This technique helps the bank determine customers' buying behavior (Ładyżyński et al., 2019). In addition, the selection and marketing strategy of an appropriate bank product will help in promoting the services and product of the business.

Data mining is a process for managing data by extracting previously unknown information from large datasets (Edastama et al., 2021). Besides being useful in classification problems, techniques in data mining can be used to see the relationship between a set of independent variables and a dependent variable (Yang

et al., 2020). Many people use multiple linear regression analysis to see the relationship between the independent and dependent variables. Unfortunately, this approach is not suitable when dealing with the categorical dependent variable, such as nominal or ordinal (Klee et al., 2018). When the dependent variable is categorical, certain procedures such as the use of link function are needed to convert the variable into a continuous scale. This is a common problem that practitioners often face. Market researchers often work with cases using categorical variables such as education level, gender, income level, education level, race, etc. A common example might be a situation where a direct marketer who sells newspaper subscriptions wants to maximize his profits by identifying subscribers who are potential household customer segments. The problem of segmentation or classification like this requires a method that is able to perform modeling for segmenting the customers in which the population needs to be divided into different segments regarding some specified criteria (de Caigny et al., 2018).

Data mining is often used in several industries including insurance and banking. In banking industries, data mining techniques in direct marketing aim to analyze customer data and develop techniques to classify customers based on products and services preferred by customers. In solving classification problems, methods or techniques aim to simplify the classification process. Some of the techniques used in problem classification are decision tree, regression tree, deep learning, Suupport Vector Machine, G-Statistics, CHAID, etc. The Support Vector Machine or SVM model is a supervised learning for classification and regression problems (Sen et al., 2020). The SVM is able to solve classification problems for big data, especially in multi-domain application problems in big data (Ghosh & Sanyal, 2018). Meanwhile, AdaBoost model is a popular model in machine learning that is easy to implement and can be applied to recognition and classification problems. However, for classification problems, this model corrects errors made by weak classifiers, making it more prone to overfitting compared to another learning model. A research has been conducted by Siregar et al. (2020) to use a deep learning method to classify customers who have taken these time deposits into marketing targets. This technique has succeeded in classifying potential customers to deposit money in a bank. Meanwhile, Hao et al. (2020) used ensemble learning techniques to classify banks in Portugal for direct marketing planning purposes. CHAID analysis was used by Díaz-Pérez et al. (2020) to construct the visitor's means of transportation according to geographical origin and few other variables such as length of stay, accommodation establishment, season, age, gender, and education level. The research results are helpful for the policy makers.

The problem faced in direct marketing is how to achieve high accuracy in the classification process based on the accuracy of certain information obtained from customers and considered important by banks (Siregar et al., 2020). The main target of bank direct marketing campaigns is to predict consumers' expectations who have the highest possibility in using the bank services using data mining techniques (Fitriani & Febrianto, 2021). The implementation of the in techniques bank direct marketing is used on bank customer loans. Banks must select customers who have the potential to apply for credit.

In data mining, CHAID has been frequently used as one of the classification methods. Besides being used for discovering the relationship between variables, it can be employed as a predictive model to result in conclusions about a target or dependent variable based on a set of predictors (Xu et al., 2019). In the predictive modeling, the objects will split into partitions. By examining each partition individually, the most influential variable in discriminating each partition is identified from the remaining variables. In direct marketing, Veeramuthu (2019) has applied the methods. The performance of CHAID and CART was compared and it was concluded that most of the variables used were categorical. In the comparison, the study found that CHAID had better performance. Meanwhile, the study also found that if most of the variables used are continuous scale, it is better to use CART. Furthermore, Díaz-Pérez et al. (2020) conducted a study showing that CHAID can be applied to study the segmentation of tourists. In that case, CHAID works based on the tourist's likelihood of revisiting a tourism destination. Using CHAID, they were able to carry out a characteristics identification of travel in each segment, which is very useful for preparing strategies in tourism marketing.

Classification in data mining has problems when the dataset is imbalanced. The imbalanced dataset is a situation when the distribution of the category of interest in the dataset is not approximately equally. Marinakos & Daskalaki (2017) conducted a study

about the problem of classification for an imbalanced dataset. In the paper, comparisons of performance among statistical methods, induction, Machine Learning, and distance-based classification algorithms were conducted. The research aimed to predict potential depositors when the dataset is imbalanced. The concern was the effort to effectively balance the data set during training for the negative effects of imbalance and to improve the correct classification of underrepresented classes.

A research conducted by Kaur et al. (2019) applied few methods, i.e. oversampling, undersampling, boosting, and bagging to determine which method has better performance for handling imbalanced datasets. The predictive performance of CHAID, CART and C5 was thoroughly assessed after resampling approach. In this case, resampling needed to be done to reduce the effect of category imbalance. Two resampling techniques that are often used are random oversampling (ROS) and random undersampling (RUS). In ROS, the technique randomly duplicates the minority class sample to modify the class distribution. Unfortunately, this technique can cause overfitting. Meanwhile, RUS works by discarding the primary random sample, which will also discard the potentially useful sample. When dealing with imbalanced data sets, the performance of the classification technique can be measured in terms of precision and sensitivity. This is because the level of accuracy of the predictive model is adjusted to the size. If this is not done, it will result in a bias towards the favored class. A study by Møller et al. (2019) found that implementing a random resampling strategy improves classification performance for imbalanced data sets using decision trees than applying bagging and boosting.

Banking is a sector that produces data and transactions recorded every day. One of the daily information recorded in the banking industry is the subscription bank deposit. This data need to be classified to expand the business by improving marketing campaigns. This type of data always grows from time to time. With the increasing data, banking institutions will have difficulty predicting whether their customers will subscribe to term deposits or not, so the banking institution must do the most appropriate mechanism to classify the data. One of the classification techniques that can be used is CHAID.

The study aims to conduct classification modeling for bank deposit subscriptions by comparing Logistic Regression (LR) and CHAID classification tree to determine the better method to describe the bank's direct marketing data. One of the direct marketing data that the bank industries need to classify was the bank deposits subscriptions. The logistic regression analysis and CHAID will be used since the two methods have similar functions in classification.

RESEARCH METHOD

Data Description

In this study, secondary data taken from the Kaggle warehouse were used. The data were about direct marketing conducted by banks in Portugal acquired from 41,188 observations consisting of 20 attributes and 2 classes. This dataset were related to direct marketing carried out by Portuguese banking institutions to their potential customers. The marketing campaign was carried using phone calls. Typically, it takes more than one bidding process to the same prospective customer to determine whether to use the products offered or not. The corresponding information about the data is displayed in Table 1.

The potential customers or clients were asked more than once to determine whether the product (bank time deposit) was subscribed. In this study, the dependent variable is ordering bank time deposit, which was coded as 1 if the customer ordered bank deposits and 0 otherwise. There are 17 independent variables consisting of categorical and continuous variables, i.e. Marital status, Age, Education level, Job, Housing, Credit, Balance, Housing, Contact, Day, Month, Duration, Campaign, Day, Previous, Pdays, and Poutcome.

The data were then analyzed using the steps as in Figure 1. The analysis involved specifying independent and dependent variables, comparing logistic regression and the CHAID analysis, checking whether the data were balanced or imbalanced, and conducting more detailed analysis including segmentation of the clients.

CHAID Algorithm

CHAID is a classification technique that uses the Chi-square test as its primary tool. In general, the technique works by studying the relationship between the dependent variable and several independent variables. It is an iterative technique that examines the independent variables used in the classification one-by-one and arranges them based on the level of significance of the independent variables. The

technique works by splitting the dependent variables into two or more categories using regression or decision tree approaches. The selection of the independent variables that significantly affect the classification is based on the Chi-square test. It is a non-parametric test that does not require assumptions and is suitable for testing the relationship between categorical variables.

Table 1. Descriptions of the Data

No.	Abbreviation	Definition	Data Types
Bank client data			
1	Age	Client's age	Continuous
2	Marital	Marital status	Nominal
3	Job	Client's job type	Nominal
4	Education	Client's education level	Ordinal
5	Balance	Average yearly balance, in euros	Continuous
6	Credit	Status, whether the client has credit in default	Binary
7	Housing	Status, whether the client owns housing loan	Binary
8	Loan	Does client has personal loan?	Binary
Items related to current campaign's last contact to the client			
9	Contact	Contact communication type	Nominal
10	Month	Last contact to the client (name of month in that year)	Nominal
11	Day	Last contact to the client (ith day of the month in that year)	Nominal
12	Duration	The duration of the last contact (in second)	Continuous
Other attributes			
13	Campaign	Number of contacts performed to the clients, calculated from the first to the last contact)	Continuous
14	Previous	Number of contacts performed before the campaign and for this client	Continuous
15	Pdays	Number of days which is calculated after the last contact to the client from the previous campaign (it equals -1 when the client was not contacted, previously)	Continuous
16	Poutcome	Outcome obtained from the previous marketing campaign	Ordinal

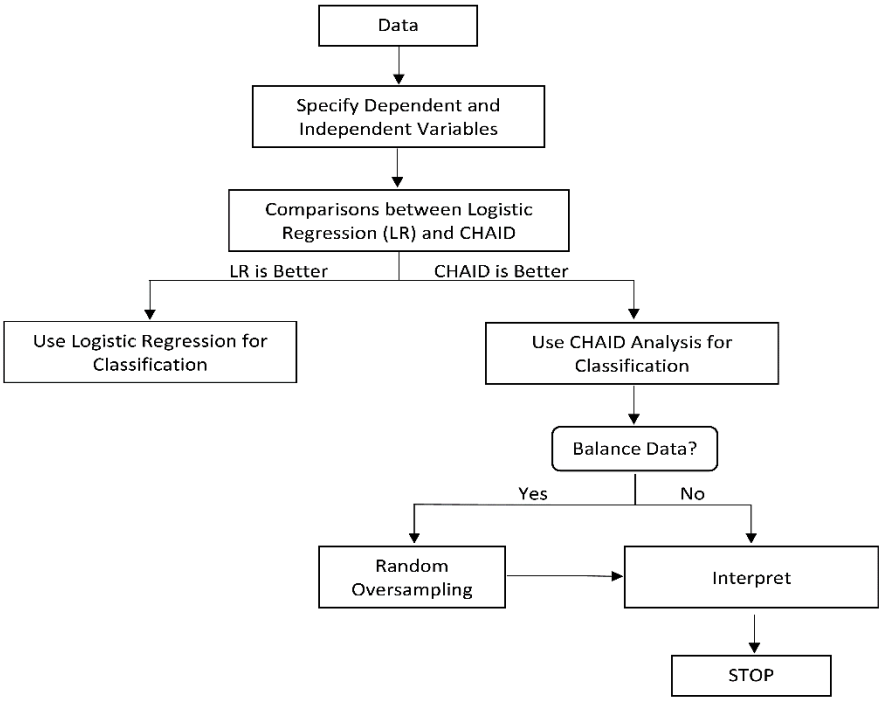

Figure 1. Data analysis step of the study

The classification using CHAID mainly consists of merging, splitting, and stopping conducted repeatedly on each node. The algorithm of CHAID follows the steps mentioned in Aksoy et al. (2018), Bethencourt-Cejas & Diaz-Perez (2017), and Díaz-Pérez et al. (2020). Before carrying out the first step, the continuous predictor must be converted into a categorical predictor variable. Meanwhile, the categorical predictors have categories that were defined naturally. Then, the continuous variables were distributed approximately equally into the categories. The analysis of CHAID method was presented in the form of a tree diagram, making it more exciting and easier to interpret.

Merging was the beginning step of CHAID algorithm. This step merged categorical pairs of each independent variable that provide the most negligible contribution to the dependent variable. The allowed categorization varied according to the type of independent variable. For example, a floating predictor category and a monotonous predictor could only be combined with adjacent categories, while the independent predictors could be combined in any way.

The second step in CHAID was to select the split variable. Independent variables with adjusted p-values in various dependent variables (target variables) were selected to produce the most significant separation (Milanović & Stamenković, 2016). It could be evaluated based on Bonferroni-adjusted p-value. When the p-value of a selected predictor variable falls below the specified value of alpha-to-split, the predictor was selected. In that case, the tree used the independent variable to split with the merged categories. No further splits would be performed if the further adjusted value of the Bonferroni predictor was greater than the specified value of alpha-to-split. In that stage, the process of splitting ended, and each node would become a terminal node.

Merging and splitting steps were repeated on each new node until the specified stopping criteria were met. Research by McCordic & Frayne (2017) discussed a few of the stopping criteria as follows: (i) maximum level number of the tree, (ii) the threshold of the alpha-to-split, (iii) the size of the minimal parent node (the split would not be performed on nodes having smaller than min_{parent} cases), and (iv) the size of the minimal node (The performed split resulted in categories with at least min_{node} each)

Chi-Square Test

The Chi-square test is one of the methods in non-parametric statistical analysis commonly used to examine the association between two categorical variables or for testing the goodness-of-fit of a data set in which the data consist of frequencies. In this study, to examine whether the categorical variables are associated with each other, the Chi-square test was used. The calculation of the test was done by pairing the categorical variables, and the frequencies were displayed in a contingency table (Everitt, 2019). Frequencies of combination between categories were placed in a contingency table cell. The frequency was referred to as observed frequency. The Chi-square statistic is written as

$$\chi^2 = \sum_i \frac{(O_i - E_i)^2}{E_i} \quad (1)$$

where E_i and O_i are the expected and observed frequency of the contingency table, respectively. Referring to Equation 1, the Chi-square statistics were calculated by taking the difference between the observed and expected frequencies of each combination of categories of the variables. This difference was then squared and divided by the expected frequency in that category. The summation of the values were taken for all the categories and the result of the summation was referred to as the Chi-squared value. The Chi-square value was compared with Chi-square table with the corresponding degree of freedom of:

$$d.f. = (r-1)(c-1) \quad (2)$$

where r, c are the number of rows and columns, respectively.

Random Oversampling

In classification techniques, there will be problems when there is a class imbalance due to a situation when the size of the minority class is small, and it is not nearly equal to the class majority. To resolve the problem, certain sampling technique needs to be employed to change the minority class distribution to avoid less representative sample training data. To solve the oversampling problem, a resampling technique needs to be conducted for changing the distribution of the minority class so that underrepresented sample could be prevented. According to Xie et al. (2019), the imbalanced class problem can be solved by conducting oversampling to

the class minority. It is conducted by randomly replicating the existing minority class until the number of samples in the majority class is close to the number of samples in the minority class. When the distribution of minority class and majority class is balanced, then the sample in each makes it possible to train the model to recognize that class accurately. The advantage of doing the oversampling is that it can prevent the selection of samples that may be useful, but it can result in overfitting and produce models that are too complex.

Classification Evaluation

According to Olosunde & Soyinkab (2020), the error rate, also known as the probability of misclassification, needs to be calculated to see the performance of the classification model. A performance measure that can be used is to calculate the apparent error rate (AER), which is formulated as the fraction of observations in a sample that are misclassified by a classification model (Santos et al., 2020). Besides AER, the performance of a classification model can be evaluated based on another measure. The standard performance measurement for classification problems that is commonly used is accuracy. However, for cases with an imbalanced class distribution, it is necessary to use specificity, sensitivity, and precision as additional measurements (Thabtah et al., 2020).

Table 2. Confusion Matrix for Evaluation Classification

Actual	Predicted	
	Negative (No)	Positive (Yes)
Negative (No)	TN	FP
Positive (Yes)	FN	TP

Accuracy is the ability of the model to perform the classification process correctly. Whereas sensitivity refers to correctly classified positives, specificity refers to correctly classified negatives, and precision is the positive predictive value defined as the ratio of correctly predicted entities to the total number of entities classified by the model. The number of entities each group (class) involved in the calculation that is classified correctly will be represented in a confusion matrix. It contains information about actual and predicted classifications which is conducted by the classification model (Hasnain et al., 2020). The structure of the confusion matrix is displayed in Table 2.

Confusion matrix is a method that is usually used to perform the accuracy measures on the concept of data mining. There are four terms to represent the classification results. The four terms are True Positive (TP) which is a positive value that is detected correctly, True Negative (TN) is the number of negative data that is detected correctly, False Positive (FP) is negative data but detected positively and False Negative (FN) is negative data is detected as negative data. The detail of the measures of classification performances are as follows:

The calculation to obtain the apparent error rate (AER) as follows:

$$AER = \frac{FN + FP}{TFN + FP + TP + TN} \quad (3)$$

The predictive model has a measure of accuracy which is formulated as:

$$accuracy = \frac{TP + TN}{FN + FP + TP + TN} \quad (4)$$

The predictive model has a measure of sensitivity which is written as:

$$sensitivity = \frac{TP}{FN + TP} \quad (5)$$

The specificity of the predictive model is computed as:

$$specificity = \frac{TN}{FP + TN} \quad (6)$$

And the model precision is computed as :

$$precision = \frac{TP}{FP + TP} \quad (7)$$

RESULT AND DISCUSSION

CHAID Classification Tree

CHAID analysis is available in various statistical software. Regardless of the software used, there is always a procedure for removing independent variables that do not make a major contribution to the classification modeling. SPSS Modeler version 14.1, which was used to perform the CHAID analysis in this study, automatically excluded independent variables that did not make a significant contribution.

The results of the analysis show that there were 9 out of 16 independent variables used in this study that made a significant contribution to this classification. The variables were Age, Housing, Contact, Day, Marriage, Month, Duration, Previous, Duration, and Poutcome. Meanwhile, the independent variables that did not make a significant contribution to the

formation of the best classification model were Education, Loan, Job, Balance, Default, Days, and Campaign. The default value used for tree depth in the SPSS Modeler in this study was 5. However, to obtain a less complicated classification tree, a tree depth of 4 was used. Meanwhile, the minimum case values in the child and parent nodes used in this study were 0.5% and 0.1%, respectively. Then, the data were divided into training and testing set data with a composition of 70% and 30%. With this composition, the resulting classification tree had 82 terminal nodes and 126 total nodes. The total number of nodes and terminals produced a confusion matrix, and the CHAID classification tree measures of performance are shown in Table 3 and Table 4.

Table 3. Confusion Matrix of the CHAID Analysis

Actual	Predicted			
	Training set		Testing set	
	Negative (No)	Positive (Yes)	Negative (No)	Positive (Yes)
Negative (No)	19142	567	19585	628
Positive (Yes)	1681	958	1623	1027

Table 4. Performance Measure of the CHAID Analysis

	Training set	Testing set
AER	0.1006	0.0985
Accuracy	0.8994	0.9015
Sensitivity	0.3630	0.3875
Specificity	0.9712	0.9689
Precision	0.6282	0.6205

Comparison between CHAID and Logistic Regression

Several machine learning algorithms and logistic regression have been widely used for research in the banking world. An example is to find an effective search in direct bank marketing. In this study, the performance between logistic regression and CHAID was compared based on several measures, the results of which are presented in Table 4 and Table 5. There was a class imbalance in this study where the ratio between the minority class to the majority class was 13:100. As previously explained, imbalanced data conditions will result in low accuracy of the prediction model, leading to bias in the majority class. This condition encouraged the measurement of the performance of the classification model using sensitivity and precision measures.

Based on the analysis, in developing the direct marketing model, both logistic regression and CHAID gave similar performance (Table 5). Logistic regression showed higher precision, but CHAID performance had higher sensitivity. Meanwhile, logistic regression had a higher AER (Apparent Error Rate) value than CHAID. The situation indicates that the misclassified observations for training and testing assigned by logistic regression analysis are higher. Moreover, in segmenting clients, logistic regression analysis failed to perform the task of being a homogeneous group and also to characterize or differentiate each segment. In this case, CHAID performs better. The direct bank marketing development strategy will be greatly helped by analyzing the character for each segment. With the results of the study mentioned at the beginning of this paragraph, it shows that the analysis using CHAID produces better information in relation to direct bank marketing. In addition, due to imbalanced data, the low value of model sensitivity indicates that more than half of potential clients are likely to lose.

Table 5. Comparison Performance between Logistic Regression and CHAID

Algorithm	Error on Training Set	Error on Testing Set	Sensi-tivity	Preci-sion
Logistic Regression	0.1012	0.0993	0.3170	0.6430
CHAID	0.1006	0.0985	0.3630	0.6282

Handling the Imbalance Data

Random oversampling is often used to solve the problem of imbalanced data in order to improve classification performance. In this study SPSS Modeler 14.1 has been used to do this. The thing that needs to be known before doing random oversampling is the distribution of each class of the dependent variable. After getting this information, then random oversampling was implemented by replicating the minority class so that the distribution is more or less the same as the majority class. Implementing the random oversampling produced training data in which the distribution of the minority class to the majority class in the training data had a more balanced ratio, which was 19940:19709. The next analysis implemented CHAID approach on the balanced data to train the classification model. Table 6 and Table 7 present the results of this approach in the form of a Confusion Matrix and several classification performance measures.

It can be seen from Table 7 that with the implementation of random oversampling, in terms of sensitivity and precision, there was an increase in

CHAID performance in the training data. Unfortunately, there had been an increase in the number of false positives, reflecting the poor performance of this CHAID approach in terms of precision on the training data. Due to the model with the desired sensitivity, the number of false predictions would be increased to obtain the most. For this reason, the number of false predictions must be increased in order to obtain the desired condition, which was a high sensitivity value. One way that needed to be done was to segment with the CHAID approach on data already balanced by oversampling.

Table 6. Confusion Matrix of CHAID Classification Tree on Balanced Dataset

Actual	Predicted			
	Training set		Testing set	
	Negative (No)	Positive (Yes)	Negative (No)	Positive (Yes)
Negative (No)	15386	4323	15649	4564
Positive (Yes)	3349	16591	446	2204

Table 7. Performance Measure of CHAID on Balanced Dataset

	Training data	Test data
AER	0.1935	0.2191
Accuracy	0.8065	0.7809
Sensitivity	0.8320	0.8317
Specificity	0.7807	0.7742
Precision	0.7933	0.3257

Of the 16 independent variables used as the basis for classifying clients, after applying random oversampling, 11 independent variables were found as the important variables in carrying out this classification, i.e. Marital Status, Age, Housing, Campaign, Balance, Duration, Day, Month, Contact, Poutcome and Days. Meanwhile, the independent variables that did not contribute significantly to the client classification which were then excluded from the model were Education, Loans, Previous, Default and Employment. In terms of the depth of the classification tree, as mentioned in the previous section, this study used deep tree 4 to reduce complexity. With the increase in the number of certain cases in the training data after implementing random oversampling, the minimum cases for the parent and child nodes were set at 1% and 2%, respectively. In addition, with the proportion of training data and test data with a ratio of 70% and 30%, the total number of nodes was 94 and terminal nodes were 63 in the classification tree. Each sample sub-group was represented by one node in the classification tree.

Analysis of Improved CHAID Classification Tree

The independent variable Duration was the first best variable used to divide clients on the classification tree. Based on this variable, 10 splits were formed as the first split referred to as the parent nodes. With a depth of value of 4, each node would be split into nodes up to a maximum of 4 levels. The node at the lowest level was the root node, with the top node containing all samples and the absolute frequency of each category of independent variables. The proportion and frequency of each client category of independent variables would be contained in each node in the classification tree. Whereas, the terminal node was the last segment that was not further divided. The result of the entire process in this study was the prediction of the percentage of clients in each segment making subscription and non-subscription for the bank term deposit, as presented in Table 8.

Table 8 presents the number of subscripts and the percentage of each segment formed in the classification tree. Of the 63 segments formed, Segment 39 is the segment that has the largest percentage of subscriptions (95.66%). This study found that contacts made with clients were between 259 and 325 seconds, that is, the last contacts were in March, September, October and December. Both information indicates that a high number of subscriptions could be obtained when campaign was launched in March, September, October or December, with a call duration to the client for more than 259, but not more than 325 seconds. The five segments with the next highest subscriptions in a row from high to low were Segment 50 (94.20%), Segment 61 (93.83%), Segment 58 (93.76%), Segment 22 (93.32 %), and Segment 31 (92.92%). In general, Table 8 also provides information that there were 19 segments (31.15%) with a subscription percentage of more than 75%. In general, segments with high percentages values are symbolized by bigger size bubbles (Figure 2). These segments should be used as marketing targets for banking institutions. The characteristics of these segments should be studied in more detail because they are very potential customers.

Table 8. Segmentation of Subscription of the Bank Term Deposit

Segment	Subscription		Non-Subscription		Segment	Subscription		Non-Subscription	
	Frequency	Proportion	Frequency	Proportion		Frequency	Proportion	Frequency	Proportion
		%		%			%		%
1	115	19.56	473	80.44	33	74	18.55	325	81.45
2	42	9.42	404	90.58	34	8	1.70	464	98.31
3	15	2.91	501	97.09	35	516	67.81	245	32.19
4	0	0.00	634	100.00	36	310	39.29	479	60.71
5	0	0.00	1219	100.00	37	379	88.14	51	11.86
6	7	1.18	588	98.82	38	621	94.67	35	5.34
7	501	53.58	434	46.42	39	181	40.13	270	59.87
8	55	7.23	706	92.77	40	194	41.81	270	58.19
9	0	0.00	562	100.00	41	0	0.00	412	100.00
10	14	3.02	450	96.98	42	499	70.18	212	29.82
11	45	10.90	368	89.10	43	537	69.38	237	30.62
12	125	16.19	647	83.81	44	212	48.85	222	51.15
13	451	61.44	283	38.56	45	658	92.68	52	7.32
14	123	30.22	284	69.78	46	368	50.34	363	49.66
15	57	12.13	413	87.87	47	45	7.48	557	92.53
16	383	83.81	74	16.19	48	796	81.73	178	18.28
17	164	28.57	410	71.43	49	268	61.61	167	38.39
18	22	4.97	421	95.03	50	487	94.20	30	5.80
19	0	0.00	403	100.00	51	426	64.74	232	35.26
20	21	4.01	503	95.99	52	559	79.97	140	20.03
21	325	46.90	368	53.10	53	301	45.40	368	54.60
22	447	93.32	32	6.68	54	464	84.98	82	15.02
23	383	66.38	194	33.62	55	433	76.10	136	23.90
24	91	12.22	654	87.79	56	388	87.59	55	12.42
25	45	5.78	733	94.22	57	838	89.15	102	10.85
26	187	28.77	463	71.23	58	436	93.76	29	6.24
27	413	62.39	249	37.61	59	362	81.72	81	18.28
28	159	30.58	361	69.42	60	382	68.58	175	31.42
29	173	43.47	225	56.53	61	1825	93.83	120	6.17
30	347	80.89	82	19.11	62	456	85.55	77	14.45
31	604	92.92	46	7.08	63	1349	91.21	130	8.79
32	216	48.54	229	51.46					

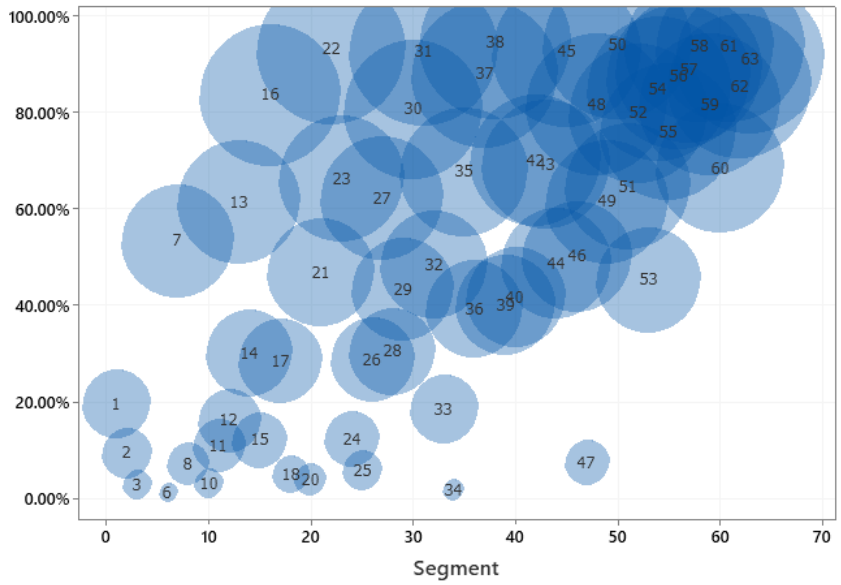

Figure 2. Segmentation of potential bank customers as the size of the bubbles

Research Implication

Data mining, such as classification modeling, is a strategically important area for the banking sector. The research by Idrees (2019) has also examined the use of CHAID as a classification technique for bank deposit subscriptions. In the subscription to bank deposits carried out in this study, it was found that the duration of calls to clients is an important variable to be used to classify clients. More specifically, this study has found that to get a positive response from clients during a campaign, the call duration should not be too short. The longer the call duration, the client will tend to give a positive response. This is in line with a study conducted by Asare-Frempong & Jayabalan (2017). In addition, in order to have a more successful campaign in capturing more customers, direct marketers should also consider contacting the bank's clients either by telephone or cell phone. This is in accordance with what was done by Alexandra & Sinaga (2021). Clients who do not have credit for clients who positively respond to the campaign should be the target of future campaigns (Alexandra & Sinaga, 2021). In order to achieve higher subscriptions, the banking industry needs to prepare several things, such as human resources, infrastructure, costs, and government support in terms of regulation. For human resources, banks need to prepare people who have good communication skills so that customers will feel comfortable receiving phone calls longer than usual. Moreover, the banking industry needs to provide the infrastructure that makes direct marketers comfortable, such as telecommunications equipment. From the government's point of view, the regulations need to support the banking industry to achieve higher subscription rates include lowering interest rates.

Based on the results, in order to achieve a higher subscription, the banking industry needs to prepare regulations related to human resources, infrastructure, costs, and government support. For human resources, banks need to prepare people who have good communication skills so that customers will feel comfortable receiving phone calls for a longer time. For infrastructure, the banking industry needs to provide the infrastructure that makes direct marketers comfortable, such as telecommunications equipment. From the government's perspective, the regulations needs to support the banking industry to achieve a higher subscription include lowering interest rates.

CONCLUSION AND SUGGESTION

This study examines the use of CHAID to classify bank subscription deposits which are useful for segmenting and identifying characteristics that influence customers to subscribe to bank deposits. The classification is based on direct bank marketing data. Before deciding to use CHAID in a more detailed analysis, a comparison was made between logistic regression and CHAID. The result is that CHAID has a better performance than logistic regression. Then a more detailed analysis for segmenting and classifying customers was carried out using CHAID. Because the direct bank marketing data used is imbalanced, a random oversampling technique was used to balance the ratio of minority and minority classes from the training data. The purpose is that the classification model formed can identify minority classes more accurately. The performance of the classification model as measured by the value of sensitivity and precision seemed to improve on the results of the analysis using the CHAID method on balanced training data than on imbalanced training data. The results of the classification modeling formed can be used to target customers who have the potential to subscribe to bank deposits. Based on the obtained classification model, the criteria for potential customers that should be considered include the Housing, Contact, Month, and Duration variables. The results imply that it is recommended targeting clients who do not own any housing loans. Moreover, to capture a higher number of bank deposit subscriptions, the marketing campaign should be launched in March, September, October, and December. Besides that, higher number of bank deposit subscription can be obtained if the direct marketer contacts the clients through mobile phone or telephone at a slightly longer call duration.

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Assessing the determinants of agricultural commercialization and challenges confronting cassava farmers in Oyo State, Nigeria

Olutosin Ademola Otekunrin[1]*, Idris Akanbi Ayinde[1], Rahman Akintayo Sanusi[1], and Oluwaseun Aramide Otekunrin[2]

[1]Federal University of Agriculture Abeokuta (FUNAAB), Nigeria
[2]University of Ibadan, Ibadan, Nigeria

*Correspondence email: otekunrin.olutosina@pg.funaab.edu.ng

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ABSTRACT

This study assesses the agricultural commercialization levels, determinants, and challenges confronting smallholder cassava farmers in Oyo State, Nigeria. This study was conducted in Oyo State, Nigeria using cross-sectional data from 211 smallholder cassava farmers and employing multi-stage sampling procedures. Descriptive statistics, Crop Commercialization Index (CCI), and Ordered Logit Model (OLM) were used to analyze the data collected. The results revealed that 83.9% of the cassava farmers participated in the commercialization of their cassava roots while the remaining farmers were non-participants. The greatest challenge faced by the cassava farmers in the study area was the incessant attacks by the Fulani herdsmen (destroying growing cassava on the farm) while other challenges included cassava cyclical gluts and poor access road. Moreover, OLM revealed that age, farm size, cassava marketing experience and distance to market had significant influence on commercialization levels of cassava farmers. However, in order to enhance increased commercialization levels of cassava farmers and peaceful coexistence in the study area, policies and intervention programmes that will facilitate rural infrastructure development and proffer lasting solution to the farmers-herders crisis should be given upmost priority.

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INTRODUCTION

In recent time, global food demand continues to escalate with increasing world population especially in the developing economies (FAO, IFAD, 2021; Otekunrin et al., 2019a; Otekunrin et al., 2020; Otekunrin & Otekunrin, 2021a). It is evident that subsistence agriculture practiced by about two-thirds of the farmers in the developing countries needs rapid transformation in order to meet the ever-growing food demand in the region and in the world at large. Transformation of subsistence agriculture is a crucial pathway that leads to the growth and development of many low and mediumincome countries especially those that depend mainly on agriculture (Otekunrin et al., 2019a; Pingali and Rosegrant, 1995). Leveraging on the power of comparative advantage, commercialization promotes commerce and productivity that leads to economic growth at the federal level and increases household income that

tends to improve food consumption and nutritional outcomes of both rural and urban households (Carletto et al., 2017; Otekunrin, 2021).

Agricultural commercialization arises when agricultural enterprises depend largely on the market for the sale of produce and for the purchase of production inputs (APRA, 2018). Also, agricultural commercialization implies increased market transactions (that is, market participation) for capturing the gains from specialization (Carletto et al., 2017). Commercialization process comes in different ways. It may be on the output side of production with sales of farm produce or on the input side regarding accumulated use of purchased inputs. The measurement of the degree of commercialization of subsistence agriculture from the output side of production provides avenue to capture the marketing behavior (from pure subsistence to completely commercialized) of individual households (APRA, 2018; Carletto et al., 2017; Otekunrin et al., 2019b; Otekunrin, 2021).

Empirical evidences revealed that smallholder farmers account for about 75% of the population of farmers in Sub-Saharan Africa with similar proportion of land being utilized by them while contributing largely to increased agricultural production in the sub-region (Ayinde et al., 2020; Lowder et al., 2016; Martey et al., 2012; Otekunrin, 2017). In past decades, agricultural commercialization in Africa was usually connected to large scale farming with special focus on cash crops (Martey et al., 2012). Meanwhile, this has changed because popular cash crops are usually cultivated by solely depending on rainfall and unfavorable weather conditions usually lead to dwindling production levels, hence the need for crop diversification (Martey et al., 2012; Obisesan, 2012; Opondo et al., 2017). Consequently, common crops such as cassava and sorghum are being promoted because of their resilience to drought, making them a target for food security strategy in the region (Martey et al., 2012, Obisesan, 2012; Opondo et al., 2017).

Previous empirical studies revealed that commercialization is affected by some determinants such as population and demographic changes, technology, infrastructure, and market (Jaleta et al., 2009). Muricho (2015) posited that health domain is another important factor to be assessed. Moreover, other studies indicated some of the factors affecting agricultural commercialization such as amount of output, access to market information, transaction costs, as well as household characteristics like gender, age, farm size and family size (Hailua et al., 2015; Zhou et al., 2013).

Cassava (*Manihot esculenta Crantz*) is mostly regarded as 21st century staple crop for most smallholder farmers globally and especially in Africa. It is recognized as the most widely cultivated root crop and equally as food security crop in the tropical region. Cassava can survive in areas with uncertain rainfall pattern where other crops may not be successfully cultivated, and that is why cassava is commonly referred to as "drought-tolerant crop" (Otekunrin & Sawicka, 2019). According to Food and Agriculture Organization (FAO), global cassava production stands at 303.6 million tonnes with leading countries like Nigeria, Democratic Republic of Congo (Congo, DR), Thailand and Ghana rank 1st, 2nd, 3rd, and 4th respectively (Table 1). The cassava production in Africa, the largest cassava growing region, reach 192 million tonnes. Whereas, Nigeria retained the top spot as the highest producer of the crop in Africa and globally with about 59 million tonnes and 19.50% share of world total production in 2019 (FAO, 2021; Otekunrin, 2021).

Table 1. Main Countries Producing Cassava in 2019

Global Rank	Country	Production
		Tonnes
1	Nigeria	59,193,708
2	DR Congo	40,050,112
3	Thailand	31,079,966
4	Ghana	22,447,635
5	Brazil	17,497,115
6	Indonesia	14,586,693
7	Cambodia	13,737,921
8	Viet Nam	10,105,224
9	Angola	9,000,432
10	Tanzania	8,184,093
	Rest of the world	77,685,915
	World Total	303,568,814

Source: Authors' compilation using FAO (2021)

Cassava in Nigeria is regarded as the most important crop by production and second most important by consumption (Otekunrin & Sawicka, 2019; SAHEL, 2016). Majority (90%) of the fresh cassava roots are consumed locally as food and about 10% is used for industrial purposes. Nigeria is yet to tap the enormous trade potential of the crop because less than 1% of cassava produced in the country enters the international market (Otekunrin & Sawicka, 2019).

Considering the myriad of problems confronting crop farmers in Nigeria, empirical studies have documented the spate of wanton destruction of crops on farmers' farmland by Fulani herdsmen's cattle.This has become a common phenomenon in the Northern (north-east, north-west and north-central) part of Nigeria (Bello, 2013; Ikhuoso et al., 2020; Salihu, 2018). In recent time, apart from already identified problems such as lack of credit, inadequate farm inputs, inadequate market information and lack of rural infrastructure, crop farmers in the South-west Nigeria now experience similar attacks by the Fulani herdsmen (Obaniyi et al., 2020). While in search for pasture and water for their cattle, herders directed their cattle to crop farmers' farm and the cattle were made to feed on the growing crops and in the process, destroying the crops (such as cassava). This act usually ignites conflict between the affected farmers and the Fulani herdsmen in the community. The menace of Fulani herders' attack on crop farmers' farmland largely poses a threat to increased commercialization and food security in the affected geo-political zones and the country at large. This study, therefore, contributes to the existing body of knowledge by analyzing factors affecting agricultural commercialization and the challenges confronting smallholder cassava farmers in South-West Nigeria.

RESEARCH METHOD

Nigeria is unarguably the most populous country in Africa and the seventh most populous nation in the world. The population of Nigeria was estimated to be 211,814,947 persons (per 14 August 2021) representing 2.64% of total world population (Worldometer 2021). Nigeria is made up of six geopolitical zones in which South-West is one of them. It is located in Western region of Africa with total land mass of 923,768 square kilometer,as a multi-ethnic country with Hausa, Igbo and Yoruba being its three predominant ethnic groups and national languages. The six states in Nigeria'sSouth-West region are Lagos, Ekiti, Ogun, Ondo, Osun and Oyo. The region lies between latitude 9° 4.9199ˡ N and longitude 8° 4.9199ˡ E. It is largely a Yoruba speaking region with diverse dialects within and across the states in the zone. There are two distinct seasons in the zone i.e. rainy and the dry seasons. Agriculture remains the most common means of livelihood of about 70% of the rural population (Lawal and Samuel, 2010; Otekunrin & Otekunrin, 2021b). The main cash crops mostly grown in the zone include cocoa, citrus and timber, while the food crops are cassava, yam, maize, cowpea, melon, and millet. Livestock production include pigs, rabbits, sheep, goats, poultry and snails (Lawal and Samuel 2010; Otekunrin & Otekunrin, 2021b).

Data Collection and Sampling Procedure

We employed multi-stage sampling procedure for the cross-sectional study. In the first stage, Oyo State was purposively sampled as it is regarded as one of the six cassava producing states in the South-West region. The second stage involved random selection of five Local Government Areas(LGAs) known for the production of cassava in the state: Egbeda, Ona-Ara, Ido, Afijio, and Oyo East. In stage 3, 13 villages were selected from the five LGAs. Stage 4 involved random selection of 17 cassava farming households resulting in a total of 221 farming households as respondents. The data were gathered through structured, interviewer-administered questionnaire including the household socioeconomic characteristics, food consumption and expenditure pattern, and other salient household information. After data cleaning, 10 results of the questionnaires were discarded due to incomplete information resulting in 211 cassava farm households as respondentswith 95.5% total responses from the survey.

Crop commercialization Index (CCI)

The cassava commercialization levels of the farmers was estimated using Crop commercialization Index (CCI) by Carletto et al., (2017), Otekunrin et al., (2019b), and Strasberg et al., (1999), expressed as:

$$CCI_i = \frac{Gross\ value\ of\ crop\ sale_{hhi,\ yearj}}{Gross\ value\ of\ all\ crop\ production_{hhi,yearj}} \times 100 \quad (1)$$

Where *hhi*is thei^{th}household in year *j*.With this method of estimation, commercialization levels can be represented by a scale from absolute subsistence farmer ($CCI = 0$) to perfectly commercialized one ($CCI = 100$) (Carletto et al., 2017). This method allows for more than just the usual dicotomy of sellers and non-sellers, or between staple and cash crop producers (Carletto et al., 2017; Otekunrin et al., 2019b; Otekunrin & Otekunrin, 2021b). It also gives information about how much of the harvested households decide to offer for sale in the market. The

crop sold ratio is the ratio of gross value of crop sold and gross value of all crop production (Shively & Sununtnasuk, 2015).

Cassava farmers were categorized based on their cassava commercialization levels. Farmers that did not participate (non-sellers) in the sale of the cassava roots were categorized as zero commercialization level (CCI 1 = 0%) while those that participated actively (sellers) are grouped into 3 (three) categories:Low commercialization level (CCI 2 =1-49%), Medium-High commercialization level (CCI 3 = 50-75%) and Very High commercialization level (CCI 4 = >75%) level (Otekunrin & Otekunrin, 2021b; Otekunrin et al., 2021).

Ordered Logit Model

This model was used to determine factors influencing commercialization levels of smallholder cassava farmers in Oyo State. This analysis is adopted when the dependent variable has more than two categories and the values of each category have an ordered sequential structure where a value is indeed "higher" than the previous one (Torres-Reyna, 2014).

The logit coefficients are in log-odds unit and they are not read as OLS coefficients as such in interpreting.We need to estimate predicted probabilities of Y=1 or the marginal effects which measure changes in the probability of commercialization outcome with respect to change in explanatory variables. The likelihood of falling in any of the levels is estimated using natural log of the cumulative distribution (Booroah, 2002; Obayelu, 2012). A positive marginal effect estimate for a category indicates that an increase in that variable will increase the probability of being in that category while a negative estimate implies a decrease in probability of being in that category.

In the ordered logit model, there is an observed ordinal variable Y which is a function of another variable *y** that is not measured. The latent variable *y** has various threshold points.

In this study, the model specification followed Hussayn et al. (2020), Ogutu et al. (2020), and Oluwatayo and Rachoene (2017).

$$y_i^* = x_i'\beta + \varepsilon_i \quad (2)$$

where$y_i^*$is the latent variable of the commercialization levels of cassava farmer *i*, $x'_i$is a vector of regressors explaining farmer *i*, β is a vector of parameters to be estimated and ε_i is a random error term which follows a standard normal distribution.

Choice rule:

$$y_i = \begin{cases} 1 \ if \ y_i^* \le \mu_1 \ (Zero \ level \ (0\%)) \\ 2 \ if \ \mu_1 \le y_i^* \le \mu_2 \ (Low \ level \ (1-49\%)) \\ 3 \ if \ \mu_2 \le y_i^* \le \mu_3 \ (Medium-High \ level \ (50-75\%)) \\ 4 \ if \ y_i^* > \mu_3 \ (Very \ High \ level \ (>75\%)) \end{cases} \quad (3)$$

in which μ_1 to μ_3 are threshold values for the commercialization levels.

Hence, the dependent variable is the commercialisation levels and it is categorized into four outcomes as mentioned above. As the ordered classes increase,$\beta$is interpreted as: positive (+) signs suggest higher commercialisation level as the value of the variables increase, while negative (-) signs indicate the opposite (Adeyemo et al., 2019). These interplays would be compared to the scales linking several thresholds, μ_i, so as to establish the appropriate commercialisation level for a particular farmer.

The explanatory variables include the following: X_1 *is* age, X_2 *is* gender, X_3 *is* marital status, X_4 *is* household size, X_5 isyear of schooling, X_6 *is* farm size, X_7 *is* farm experience, X_8 *is* farm income, X_9 *is* nonfarm income, X_{10} *is* member of association, X_{11} *is* transport cost, X_{12} *is* food expenditure, X_{13} *is* cassava marketing experience, X_{14} *is* access to credit, X_{15} *is* access to extension, X_{16} *is* access to healthcare services, X_{17} *is* distance to market.

RESULT AND DISCUSSION

Characteristics of Respondents

The socioeconomic description of cassava farming households is presented in Table 2. The results show that the mean age of cassava farmers was estimated to be 50 years, indicating that the cassava farmers are in their advanced age. About 85% of the household heads were men, revealing that cassava production is male dominated. The mean household size in the study area was 6 persons while farmers' mean year spent in school was 6.84 years.

Table 2 also reveals that the mean size of the farmland used for cassava production in the last cropping season was 1.51 hectare. Furthermore, the mean farm income and non-farm income of cassava farmers were N102,682.46 and N47,052.13 respectively. The distribution of cassava farmers by their experience in farming activities (Table 3) indicated a mean cassava farming experience of 15.23 years.

Table 2. Cassava Farmers' Socioeconomic Characteristics

Variable	Description	Mean	Std. Dev	Minimum	Maximum
AGE	Age of farmers (years)	50.18	11.72	27.00	89.00
GEND	Gender of farmers (1 male, 0 female)	0.85	0.36	0.00	1.00
MARSTAT	Marital status of farmers (1 married, 0 otherwise)	0.89	0.32	0.00	1.00
HHSIZE	Number of Household members	6.42	3.18	1.00	20.00
EDUSTAT	Number of years spent in school	6.84	4.93	0.00	16.00
FARMSIZ	Size of the farm used for cassava production (hectare)	1.51	1.05	0.20	4.86
FARMEXP	Cassava Farming experience of the farmers (years)	15.23	10.87	1.00	50.00
FARMINC	Farm income of the farmers (Naira)	102,682.46	74,199.14	0.00	500,000.00
NFARMINC	Non-farm income of the farmers (Naira)	47,052.13	79,839.14	0.00	900,000.00
CASSMRTEXP	Cassava marketing experience of the farmers (years)	11.23	9.68	0.00	45.00
ASSMEMSHP	Member of farmers' association (1 if yes, 0 otherwise)	0.16	0.36	0.00	1.00
TRANSPCOST	Cost of transportation (Naira)	3,668.72	1,419.88	1,000.00	10,000.00
EXTENSION	Access to extension services (if yes 1, 0 otherwise)	0.22	0.41	0.00	1.00
CREDIT	Access to credit facilities (if yes 1, 0 otherwise)	0.05	0.21	0.00	1.00
FOODEXP	Farmers' household Food expenditure (Naira)	21,535.55	11,180.02	2,000.00	60,000.00
DISTANCE	Distance from farm to closest market (Km)	8.54	4.58	1.00	30.00
CASSOUTPUT	Total value of cassava output last cropping season (Kg)	7,814.41	9,342.30	0.00	60,000.00
PRICECASS	Market Price of cassava (Naira)	27,405.21	18,563.61	5,000.00	70,000.00
HEALTH	Access to healthcare services (1 if yes, 0 otherwise)	0.42	0.49	0.00	1.00

Meanwhile, Table 2 also shows that the mean cassava marketing experience of farmers was 11.23 years and this reflects that cassava farmers have considerably long years of cassava marketing experience above 10 years. Proximity to closest market centers enhances increased income, employment opportunities and easy access to farm inputs especially for smallholder farmers. On the average, cassava farmers are 8.54 km far away from the closest market centers as channels for the sale of their harvested cassava roots.

The Levels of Agricultural Commercialization

The agricultural commercialization levels of cassava farmers are presented in Table 3. The results were computed through crop commercialization index (CCI) of each cassava farmers as specified above. The results indicate that about 16% of the farmers did not participate in sale of their cassava produce (non-sellers) in the last cropping season and such farmers are categorized as zero commercialization level (CCI 1). About 21% of the cassava farmers sold between 1-49% of their cassava produce and are categorized as low commercialization level (CCI 2) while the highest% of farmers (33.65%) sold above 75% of their cassava roots in the last cropping season, belonging to the category of very-high commercialization level (CCI 4).

Table 3. Smallholder Cassava Farmers' Commercialization Levels

Crop Commercialization Index (CCI) Level	Frequency	Proportion
		%
0.00-1.00% Zero Level (CCI 1)	34	16.11
1.00-49.99% Low Level (CCI 2)	45	21.33
50.00-75.99% Medium-High Level (CCI 3)	61	28.91
76.00-100.00% Very-High Level (CCI 4)	71	33.65
Total	211	100.00
Mean CCI (%)	53.64	
Minimum CCI (%)	7.62	
Maximum CCI (%)	95.45	

Challenges of Cassava Farmers

Cassava farmers in the study area identified some challenges confronting the production and marketing of cassava produce (Table 4). Cassava farmers pointed out 11 (eleven) leading problems encountered in the production and marketing of cassava roots. About 15% of them identified high cost of agrochemical (pesticides) while about 19% lamented the poor and deplorable condition of the roads that affected the marketability of the farm produce, leading to the reduced income.

The destruction of the growing cassava by the rodents such as grass cutters was also identified by about 37% of the farmers while about 45% mentioned the lack of funds especially in the aspects of farm business expansion and procurement of farm inputs.

Furthermore, about 24% of cassava farmers reported continued cassava cyclical gluts as it affected their cassava marketing in the last cropping season. From all the problems encountered by the cassava farmers in the study area in the last cropping season, the top ranked challenge of the farmers was the invasion of the Fulani herdsmen on their farm, consuming and destroying their growing cassava plants. About 77% (162 out of 211) of cassava farmers lamented the destruction done by the cattle of these herders in the study area which has led to loss of livelihood by the cassava farming households and serious threat to food security in Oyo State and Nigeria. The top 5 challenges confronting cassava farmers and affecting their production and commercialization of cassava produce in the study area are Fulani herdsmen attack, lack of funds, rodents invading the cassava farms, cassava gluts, and poor access road.

Table 4. Challenges Facing Smallholder Cassava Farmers

Problems encountered	Frequency	Proportion %	Rank
High cost of agrochemicals (mostly pesticides)	31	14.69	8
Rodents invading cassava farms (mostly grass cutters)	78	36.97	3
Cassava gluts	51	24.17	4
Fulani herds cattle invading cassava farms	162	76.77	1
Lack of funds	95	45.02	2
Climate change (mostly leading to heavy rainfall)	35	16.59	7
Pilferage (theft of cassava roots on the farm)	10	4.74	11
Lack of government support (credit facilities)	39	18.48	6
Poor access road (deplorable condition of the road)	40	18.96	5
Weed infestation	12	5.69	10
High cost of transportation	21	9.95	9

Determinants of commercialization levels

The factors influencing commercialization levels of cassava farmers are presented in Table 5. This analysis was carried out to assess the determinants of commercialization levels among smallholder cassava farmers. The cassava commercialization categories were ordered and the commercialization level was significant ($p<0.001$) (Table 5). Likewise, the threshold value showing the commercialization levels; $\mu_{1,}\mu_{2,}and\ \mu_{3,}$ (cut1, cut2 and cut3) indicate that a value of the latent variable with -0.5871 or less represented zero commercialization, between -0.5871 and -0.0767 was low commercialization, between -0.0767 and 2.2026 represented medium-high commercialization, while a value ≥2.2026 was very high commercialization. The dependent variable is the commercialization levels (determined from crop share ratio) categorized into four outcomes (1=zero level, 2=low level, 3=medium-high level and 4=very-high level).

The marginal effects give explanations on how the regressors move the probability of cassava farmers' commercialization among the identified categories. The estimated results indicate that age of cassava farmers was significant at 5% level of probability, and had a negative association with the probability of being highly commercialized. The results of the marginal effects show that a unit increase in age would result in 0.0082 decrease in the likelihood of attaining very high commercialization level (CCI 4). The cassava farmers with higher farm size had a higher likelihood of attaining very high commercialization level. The coefficient of the farm size was found to be positive and significant at 5%. A unit increase in farm size was anticipated to result in 0.1065 increase in the likelihood of attaining very high commercialization level (CCI 4) but a unit increase in farm size decreased the likelihood of the farmers belonging to zero, low and medium-high commercialization levels by 4.27%, 1.97% and 4.1% respectively.

Moreover, as the distance from farm to market decreased by a kilometer, the likelihood of the cassava farmers belonging to low commercialization level (CCI 2) increased by 0.41% while as the distance from farm to market increased by a kilometer, the likelihood of farmers engaging in very high level of commercialization (CCI 4) increased by 2.22%. With reference to very high commercialization level (CCI 4), when cassava marketing experience went up by one year, the likelihood of farmers attaining very high commercialization level increased by 3.1% assuming other factors are held constant. Moreover, as access to healthcare services increased by one unit, the probability of farmers increasing their cassava market participation went up by 0.1137, 0.0484 and 0.0839 from zero, low and medium-high commercialization levels respectively.

Table 5. Determinants of Agricultural Commercialization

Variable (X)	Estimated β values	Marginal effects of zero level	Marginal Effect of low level	Marginal Effect of medium-high level	Marginal Effect of very-high Level
Age	-0.0361**	0.0033**	0.0015*	0.0034*	-0.0082**
	(0.0169)	(0.0016)	(0.0008)	(0.0019)	(0.0039)
+Gender	0.3059	-0.0305	-0.0135	-0.0233	0.0673
	(0.4802)	(0.0523)	(0.0225)	(0.0278)	(0.1007)
+Marital Status	-0.1859	0.0161	0.0076	0.0196	-0.0432
	(0.5089)	(0.0414)	(0.0205)	(0.0590)	(0.1204)
Household Size	0.0064	-0.0006	-0.0003	-0.0006	0.0016
	(0.0548)	(0.0050)	(0.0023)	(0.0052)	(0.0125)
Year of schooling	0.0390	-0.0036	-0.0017	-0.0037	0.0089
	(0.0616)	(0.0056)	(0.0027)	(0.0059)	(0.0141)
Farm Size	0.4672**	-0.0427**	-0.0197**	-0.0441*	0.1065**
	(0.2215)	(0.0210)	(0.0010)	(0.0258)	(0.0512)
Farm Experience	-0.0664*	0.0061	0.0028	0.0063*	-0.0151*
	(0.0402)	(0.0038)	(0.0020)	(0.0038)	(0.0089)
Farm Income	5.41e-07	-4.94e-08	-2.28e-08	-5.10e-08	1.23e-07
	(2.38e-06)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Nonfarm Income	1.69e-07	-1.55e-08	-7.13e-09	-1.60e-08	3.85e-08
	(2.31e-06)	(0.0000)	(0.0000)	(0.0000)	0.0000
+Member of Association	1.2462**	-0.0829***	-0.0418**	-0.1748*	0.2995**
	(0.62325)	(0.0307)	(0.0196)	(0.1057)	(0.1462)
Transport Cost	0.0002*	-0.00002*	-9.23e-06*	-0.00002	0.00005*
	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Food Expenditure	0.00002	-1.95e-06	-8.99e-07	-2.01e-06	4.86e-06
	(0.00002)	(0.0000)	(0.0000)	(0.0000)	0.0000
Cassava marketing Experience	0.1371***	-0.0125***	-0.0058**	-0.0129**	0.0312***
	(0.0470)	(0.0048)	(0.0027)	(0.0052)	(0.0103)
+Access to credit	-0.1042	0.0099	0.0045	-2.01e-06	-0.0234
	(0.7653)	(0.0755)	(0.0336)	(0.0000)	0.1692
+Access to Extension	-0.4646	0.0472	0.0205	0.0334	-0.1012
	(0.5302)	(0.0595)	(0.0263)	(0.0276)	(0.1091)
+Access to healthcare services	-1.1316**	0.1137**	0.0484**	0.0839*	-0.2461**
	(0.4795)	0.0503	(0.0241)	(0.0440)	0.1017
Distance from farm to Market	0.0965**	-0.0088**	-0.0041**	-0.0091*	0.0220**
	(0.0405)	(0.0037)	(0.0020)	(0.0049)	(0.0093)
/cut1	-0.5871				
	(0.9453)				
/cut2	-0.0767				
	(0.9350)				
/cut3	2.2026				
	(0.9380)				

***, ** and * denote significance at 1%, 5% and 10% level.

+ is dummy variable from 0 to 1

Figures in parentheses are robust standard errors.

Number of observation=211, Log Pseudo likelihood=-206.70376, Wald chi2 (17)=58.09, Probability >chi2=0.0000, Pseudo R2=0.1778

Research Implication

The description of socioeconomic characteristics as shown in Table 2 indicates that cassava farmers are in their advanced age and this result is similar to findings ofAdepoju et al. (2019) and Adeyemo et al. (2019). The majority (85%) of the household heads were men reflecting the fact that cassava production is male dominated. This result agrees with Adepoju et al. (2019), Awoyemi et al. (2015), and Otekunrin (2011) that cassava production, utilization and marketing are male dominated in South West Nigeria. The mean household size of 6 persons reveals that farmers have relatively large family members which could possibly be available as family labour against short fall of hired labour. This result corroborates the findings of Adepoju et al. (2019) and Kolapo et al. (2020) that a relatively large household size enhances the availability of family labour which reduces constraint on labour demand in cassava production, processing, and marketing (Effiong 2005; Zhou et al. 2013). The

lower education attainment among cassava farmers indicates that higher formal education attainment may not be a necessary condition for smallholder households' decision to increase investment in the cassava value chain, rather hands-on (on-farm) experience may be more crucial (Adepoju et al. 2019; Awotide et al. 2012; Huffman 2001). The less than 2.00 ha mean farm size reveals that most of the cassava farmers in the study area are smallholder farmers cultivating less than 5.00-hectare farmland. These findings are in line by with works of Ikuemonisan et al.(2020);Otekunrin & Otekunrin (2021b); Otekunrin & Sawicka (2019); Rapsomanikis (2015); and Sebatta et al.(2014). The results (Table 3) also reveal that cassava farmers were found to be far from the closest market centres, indicating that the farther the farmers are to the market, the lower the possibility of the farmers' market participation, which may result in reduced household income (Otekunrin et al., 2019b; Renkkow et al., 2004).

Based on the level of agricultural commercialization of cassava farmers (Table 3), it is shown that the mean crop commercialization index was 53.64% while maximum CCI was 95.45%. The results are similar to that of Hussayn et al. (2020) and Kolapo et al. (2020) who reported higher level of market participation by cassava farmers and processors in South-West Nigeria.

The challenges faced by cassava farmers in rural Oyo state are as shown in Table 4, indicating that lack of high cost of agrochemicals, deplorable road condition, destruction of growing cassava by rodents, lack of funds and continued cassava cyclical gluts are among the important challenges for the smallholder cassava farmers in the study area. Furthermore, studies have reported that availability of rural infrastructure such as good road networks play a vital role in increasing commercialization (Key et al., 2000; Okoye et al., 2016; Otekunrin & Sawicka 2019; Renkkow et al., 2004). Other studies have also identified continuous cassava cyclical gluts as one of the production and marketing challenges of cassava in Nigeria (Ezedinma et al., 2007; FGN, 2011; Otekunrin & Sawicka 2019). Empirical evidences have shown that this situation is common in the northern part of Nigeria but the southern states have also started experiencing this menace by the Fulani herdsmen (Bello, 2013; Ikhuoso e al., 2020; Kazzah, 2018; Salihu, 2018). This finding is supported by Obaniyi et al. (2020) who identified damages done to crop farmers in Osun State by the Fulani herdsmen attacks.

The factors influencing the cassava commercialization of smallholder farmers in rural Oyo state as indicated in Table 5 reveal that the younger the farmer, the higher the productivity and the probability of increasing commercialization level while the older the farmer, the lower the probability of participating in the marketing of farm produce. The findings agree with previous studies that the older the farmers become, the less likely they participate in the market and the more unlikely they increase their commercialization level (Matey et al., 2012; Olwande & Mathenge 2011; Okoye et al., 2016).But, this finding is contrary to the one by Enete & Igbokwe (2009) who reported that older farmers are more likely to increase the extent of cassava sales. The distance from farm to market indicates that farmers may not participate in very high level of commercialization if they are at far distance to available market centers, usually because of higher transaction costs that will be incurred by the farmers. This is corroborated by the findings of Agwu (2012), Gebremedhin and Jaleta (2010), Omiti et al. (2009), and Opondo et al. (2017) who found that distance to market centers inhibits market access by the farmers. However, it is a common knowledge that, it is only when farmers have more farming experience that such experience can be translated to better marketing experience (through sales of the cassava roots in the output market). This is expected because farmers with increased marketing experience tend to have good bargain power (for prices of farm produce) at the market than those with little or no experience. This is in line with Okoye et al. (2016) who posited that increased cassava farming experience of farmers has significant influence on the likelihood of farmers participating in markets and attaining increased commercialization level than selling at the farm gate in Central Madagascar. It is also revealed in Table 5 that access to healthcare services promotes agricultural commercialization in the study area.

CONCLUSION AND SUGGESTION

Transformation of subsistence agriculture to commercial status is an important pathway that leads to the growth and development of many low and mediumincome countries especially those that depend mainly on agriculture. It is equally important to identify the challenges confronting smallholder crop farmers in

their quest to increasing market penetration especially with respect to marketing of output produce. In this study, we investigated the socioeconomic factors influencing agricultural commercialization of cassava farmers in Oyo State, Southwestern Nigeria. CCI was used to classify cassava farming households into levels while ordered logit regression model was employed to analyze the determinants of agricultural commercialization of cassava farmers in the study area. The CCI was computed for each farmer while we explored challenges confronting smallholder cassava farmers in the study area. The study found that about 84% of cassava farmers participated in the marketing of their cassava produce with mean CCI of 53.64%. Also, the study revealed that the number one problem confronting cassava farmers was the menace of Fulani herdsmen attack, limiting the possibility of increased commercialization and threatening food security of the farmers in the study area. The ordered logit regression analysis indicated that age, farm size, cassava marketing experience, distance to market and access to healthcare services were among the significant determinants of agricultural commercialization of cassava farmers in the study area. Therefore, the provision of rural infrastructure (such as good road network) will promote easier transportation of the farm produce (such as cassava) to the market centers. Additionally, stakeholders should intervene in formulating policies that will bring lasting peace between crop farmers and Fulani herdsmen in order to promote food security and peaceful co-existence in the farming communities.

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Typology and spatial distributions of rural poverty: Evidence from Trenggalek Regency, Indonesia

Ulul Hidayah[1], Anggelina Delviana Klau[2], and Suci Rahmawati Prima[1]

[1]Universitas Terbuka, Jakarta, Indonesia
[2]Universitas Timor, Kefamenanu, Indonesia

*Correspondence email: ulul-hidayah@ecampus.ut.ac.id

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ABSTRACT

Poverty is a condition associated with the inability to meet basic needs such as food, clothing, shelter, education, and health. Although Indonesia is currently experiencing a decline in poverty trend, data show that this extreme state of lack is consent in rural areas, such as Trenggalek Regency. Approximately 99.7% of this region is rural areas, with 10.98% poor populations. Therefore, this study aims to identify rural poverty's typology and distribution pattern in Trenggalek Regency using the spatial approach, which identifies the impact of distance and neighborhood of area towards villages' poverty. The results showed a positive spatial autocorrelation of 0.29232, which indicates the spatial relationship between the poverty in every village in Trenggalek Regency is clustered and divided into four categories. Approximately 25, 28, 5, and 9 villages were in the high-high, low-low, low-high, and low-low categories. Every cluster has similar characteristics, thereby, the villages are influenced by each other. The results further showed that villages with high poverty rates have low accessibility to various facilities and infrastructure. An important factor that makes it possible for a rural area to escape poverty even though the surrounding is experiencing it at a higher rate is activating the micro, small and medium enterprises.

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INTRODUCTION

Regional development can nationally be achieved by integrating harmonious, integrated, efficient, and effective developments in the lowest administrative area (rural area). According to Indonesia's Village Law No. 6 of 2014, rural development is a series of efforts used to improve the quality of life and provide excellent welfare to rural communities (Undang-Undang Republik Indonesia Nomor 6 Tahun 2014 Tentang Desa, 2014). Similarly, Muta'ali (2016) stated that rural development is all efforts made jointly by the government and the community to manage rural resources' potential to achieve sustainability, independence, justice, welfare, and equitable distribution. Development at the village level is needed to strengthen the foundation of the country's economy, reduce disparities between regions, and accelerate poverty alleviation.

Poverty is defined as a condition of inability to meet basic needs such as food, clothing, shelter, education, and health. It is caused by the scarcity of tools to fulfill these needs or difficulty accessing education and work. Poverty is a global problem and one of the objects of sustainable development goals

(SDGs). During the Covid-19 pandemic, new policies emerged, limiting the movement of human activities. These policies significantly affected economic growth, with an increase in unemployment, a decrease in the productivity level of individuals and companies, and a rise in the poverty rate (Suryahadi et al., 2020). People who previously depended on urban economic activities slowly returned to the village to survive.

Although poverty is experiencing a declining trend in Indonesia, data show that poor people are still concentrated in rural areas (Hermanto, 2018). Based on BPS data in 2020, the percentages of poor people in rural and urban areas were 12.82% and 7.38%. Ballard, Menchik, and Tan (2016) stated that the pattern of income distribution inequality between urban and rural communities is different. The inequality that occurs in rural communities is lower than that in urban areas. According to Rahajuni et al. (2017), income distribution in urban areas is relatively more even than in rural areas. The poor are generally weak in doing business and have limited access to various economic activities, leaving them behind other communities with higher potential.

Spatial and sectoral approaches are used to alleviate poverty in rural areas (Irawadi et al., 2020). According to Nashwari et al. (2017), using a spatial system to formulate poverty reduction policies leads to well-targeted and balanced policies capable of minimizing the program's failure. This spatial approach can provide an overview of different conditions of poverty and the influencing factors, such as education and income levels, finance, public services, access to health, and location. Furthermore, poverty in a village tends to be interconnected with its surrounding area because something close has more influence than something far away. The complexity of deprivation can lead to a domino effect capable of disrupting government work (Pajriah & Suryana, 2018).

The issue of poverty in Indonesia is still important and has not been resolved in various provinces, including East Java Province which has a relatively high rate above the overall national average. The national urban poor population in 2020 was 7.63%, while in East Java Province the number of urban poor was 8.13%. This figure is still lower when compared to rural poverty in East Java which reached 14.96%, an increase from 2019 which was 14.29%. The development of poor people in East Java from 2017 to 2020 was above the poverty level in Indonesia, which has had a downward trend over the last four years. The decrease in the poor population indicates the declining number of people whose per capita expenditure are lower than the poverty line. One of the areas with a relatively high level of rural poverty and inequality in East Java Province is Trenggalek Regency.

This area is located in Development Area (WP) IV of East Java Province, with 99.7% of it is rural area. Development Area (WP) IV consists of Trenggalek, Tulungagung, Nganjuk, Kediri Regency, and Kediri regencies. Compared to other regencies/cities in WP IV in East Java Province, Trenggalek Regency occupies the first position as an area with high poverty rate. The Theil Index of Trenggalek Regency is 0.23, and the community income inequality is 0.38. These figures are still above the average regional inequality of East Java Province, which has 0.18 for Theil index value and 0.37 for the Gini index value. Meanwhile, the percentage of poverty is 10.97, which is slightly higher than the provincial average.

The high poverty rate in rural areas is an important issue that requires special attention because the varying characteristics can cause complex social and economic problems in the community. Therefore, it is interesting to analyse them spatially because the social and economic aspects of the community are related to spatial characteristics. This research further aims to determine the rural poverty's typology and distribution pattern in the Trenggalek Regency with limitations to time and the Covid-19 pandemic.

RESEARCH METHOD

The scope of this research is to analyze the spatial pattern of rural poverty in the Trenggalek Regency. The border area in Trenggalek Regency consists of 152 villages. This research was quantitative research with secondary data obtained. The data used were the percentage of the number of poor people in each village in Trenggalek Regency, obtained from comparing the number of poor people and the total population of each city. These data were sourced from the Trenggalek Regency Social Service, and a literature study was carried out from scientific articles and books. The research used to measure how spatially related the conditions of rural poverty is with the Moran Index Analysis, both locally and globally. The global index explains the spatial autocorrelation in a region, while the local moran index shows spatial autocorrelation in each village. This analysis uses

ArcGis 10.5 software. The analysis method is as follows.

Global Moran Index

Spatial autocorrelation is an estimate between observed values related to the spatial location of the same variable. One method to determine the spatial relationship is to use the Moran Index. The Moran test determines the spatial dependencies or autocorrelation between observations or locations. In other words, the characteristics of a village will affect (or be influenced) by the features of the nearest town. This technique was created to describe and visualize the spatial distribution, identifying the concentration and the location of outliers. A positive autocorrelation indicates the similarity of values from areas that are close together and tend to be clustered. Negative autocorrelation means that adjacent locations have different values and tend to be different. For the formula of calculating spatial autocorrelation, the Moran Index was used (Anselin, 1995),

$$I = \frac{n\sum_{i-1}^{n}\sum_{j=1}^{n} Wij(X_i-\bar{X})(X_j-\bar{X})}{\sum_{i-1}^{n}(X_i-\bar{X})^2} \quad (1)$$

in which I is Moran's Poverty Index, n is the number of villages observed, xi is observation value in village i, xj is observation value in village j (neighboring to i), $\bar{x}$ is the mean value of all observed variables, Wij is matrix elements between villages i and j.

At this stage, the hypotheses used were the occurrence of autocorrelation between locations: (i) H0: I=0, there is no spatial autocorrelation of poverty between rural the Moran Index areas; (ii) H1: I≠0, there is a spatial autocorrelation of poverty between rural areas in the Trenggalek Regency.

Meanwhile, the expected value of Moran's test is in equation 2.

$$E(I) = I_0 = \frac{-1}{N-1} \quad (2)$$

The autocorrelation between locations was calculated by:

$$Z_{count} = \frac{I-I_0}{\sqrt{Var(I)}} \sim N(0,1) \quad (3)$$

where I is the coefficient of Moran's I, Io is the expected value of Moran's I, and var (I) is the variance of Moran's I. The value or pattern formed in this Moran Index consists of clustering, random patterns, and spreading patterns. Decision-making H0 is rejected if |Zhitung|>Zα/2. The value of I is in the range between -1 and 1. If I>Io, the autocorrelation value is positive, representing the clustered data pattern. If I<Io, then the autocorrelation value is negative, which indicates the data pattern is spread out.

Local Moran Index

In identifying and classifying village areas that have a fundamental similarity to the poverty level or spatial pattern locally, the Local Indicator of Spatial Autocorrelation (LISA) analysis was carried out. The higher the local value, the more the adjacent locations have a similar value or form a clustered distribution. The LISA formula is

$$I_i = Z_i \sum_{i=1}^{n} WijZ_j \quad (4)$$

where I_i is LISA coefficient, Z_iZ_j is standardized data, Wij is the weighting between village i and village j, j is the village located around i

The test hypotheses for the LISA parameters are as follows: (i) H0: I=0 means no autocorrelation between villages; (ii) H1: I≠0 meaning there is an autocorrelation between villages.

If not all observed villages had a spatial effect, the LISA test was required for each studied village. The dependency test also uses a spatial weighting matrix. The weighting code is binary coded, where Wij is 1 for adjacent I and I and Wij is 0 for the other.

The grouping of rural poverty was done by dividing it into four clusters based on the average value of the surrounding area and the observation value of each region. The characteristics of each group were (i) A high-high (HH) cluster is a grouping of villages with a high poverty rate surrounded by villages with a high poverty rate. Cluster I is called Hot-Spot because it consists of villages with high characteristics with positive spatial autocorrelation; (ii) High-low (HL) outliers are villages with high poverty surround villages with low poverty. It is a spatial outlier because it consists of regions with different characteristics. If the area tends to cluster in spatial outliers, it is said to have a negative spatial relationship; (iii) Low-low (LL) clusters are villages with low poverty rates and are surrounded by low poverty levels. Cluster III is the Cold-Spot because it has common characteristics with positive spatial autocorrelation; (iv) Low-high (LH) outliers are villages with low poverty surrounded by high poverty. Cluster IV is said to have a negative spatial relationship.

RESULT AND DISCUSSION

Rural Poverty in Trenggalek Regency

Poverty is still a global problem with yearly increases, with a rise in the community's growing needs. Numerous poverty alleviation programs have been issued by the government, such as Raskin (Rice for low-income families), Direct Cash Assistance (BLT), Family Hope and others. However, these programs are associated with inconsistencies and have not solved or reduced poverty rates, especially in rural areas such as in Trenggalek Regency, East Java Province.

Table 1. Categorization of Village Poverty Levels Based on Normal Distribution

Poverty level	Number of Villages	Proportion
		%
High	52	34
Medium	47	31
Low	53	35

High level if poverty rate more than average poverty rate plus 0.5 standard deviation. Low level if poverty rate less than average poverty rate minus 0.5 standard deviation. Medium level is poverty rate in between high and low level

.

Approximately 99.7% of this area is rural, with 14 sub-districts and 152 villages. Based on 2021 data from the Department of Social Affairs, Women's Empowerment and Child Protection of Trenggalek Regency, 42% of people living in this area were poor. The highest and lowest rate of poor people were found in Sengon (85%) and Dompyong (5%) villages, as many as 2,011 and 36,640 people, respectively. The proportion of rural poverty levels in this regency is in accordance with the standard distribution theory categorized into three classes, namely high, medium, and low, as shown in Table 1.

Villages with high poverty rates are located in hilly and mountainous areas. The higher the average village elevation, the greater the constraints on accessibility and infrastructure development, increasing the incidence of rural poverty. The distribution of poor areas is influenced by topographic factors, such as slope and elevation (Luo et al., 2021). This complex topography further impacts agricultural production by influencing local climate, hydrology, biology and others. Additionally, the problematic terrain also has a significant impact on infrastructure and socio-economic development (Li et al., 2020). This condition occurs in Indonesia and several other countries such as Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. According to Hunzai et al. (2011), poverty is higher in the mountain areas than in other geographic regions due to various causes. The spatial distribution of rural poverty levels in the Trenggalek Regency in 2021 is shown in Figure 1.

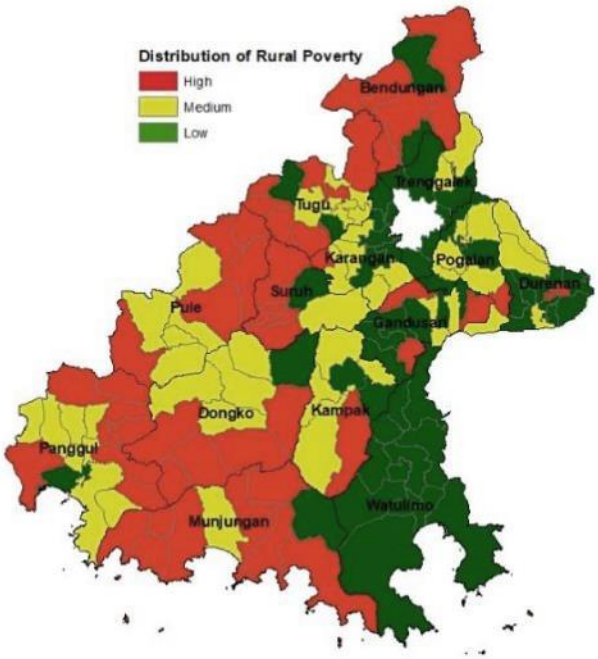

Figure 1. Distribution of rural poverty in Trenggalek Regency

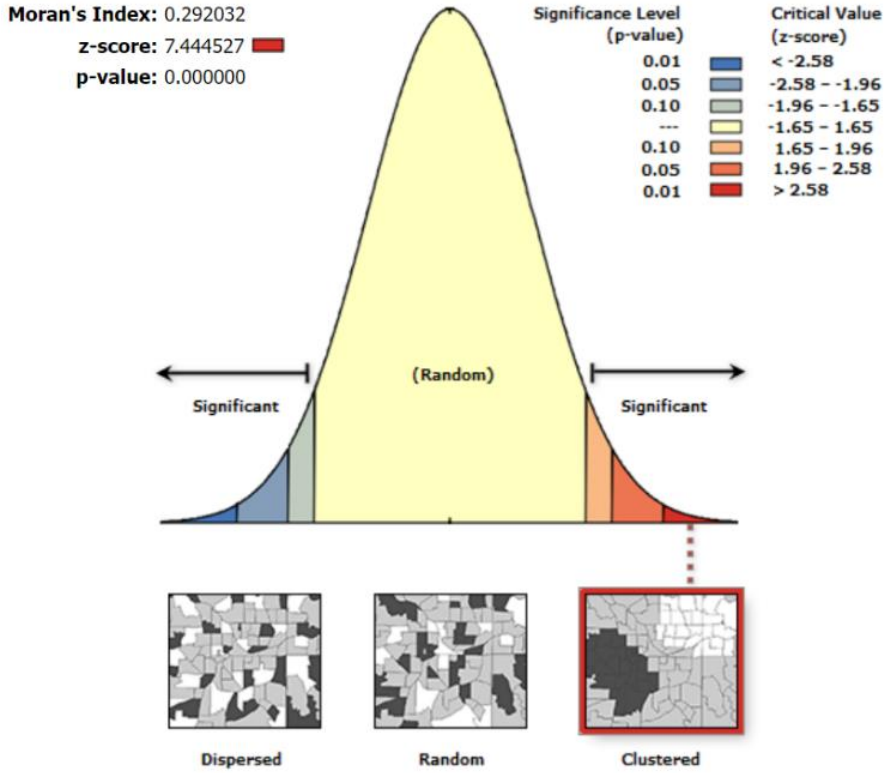

Figure 2. General spatial patterns of poverty in Trenggalek District

Typology of Rural Poverty

Spatial autocorrelation is an analysis process used to determine the pattern of relationships or correlations between observed locations. It is also used to describe the distribution pattern characteristics of an area and the interrelationships between locations. Anselin and Rey (2010) stated that a relationship between areas closer to each other has greater influence than those far away. Most times, the observations at one location are dependent on words in neighbouring sites. The Moran index analysis, which ranges from -1<I<1, was used to show the significant relationship of the region and its surrounding areas. The poverty pattern resulting from using this tool is shown in Figure 2.

Data were collected from a percentage of poor people in 152 villages in Trenggalek Regency using the spatial poverty analysis, and the result show that there was a positive spatial autocorrelation. This means that the poverty pattern in each rural area in Trenggalek Regency is clustered, as indicated in Figure 3. Furthermore, the results show that the value of Moran's Index (I) was 0.29232 and more significant than the Expected Index (I0) value of -0.006623. This indicates that each village in Trenggalek Regency has a tremendous spatial influence capable of affecting the level of poverty, as shown in Table 2. Therefore, areas with low poverty levels can be affected by neighbouring regions with low poverty levels and vice versa.

Table 2. Moran Index analysis results

Indikator	Index
Moran's Index	0.292032
Expected Index	-0.006623
Variance	0.001609
z-score	7.444527
p-value	0.000000

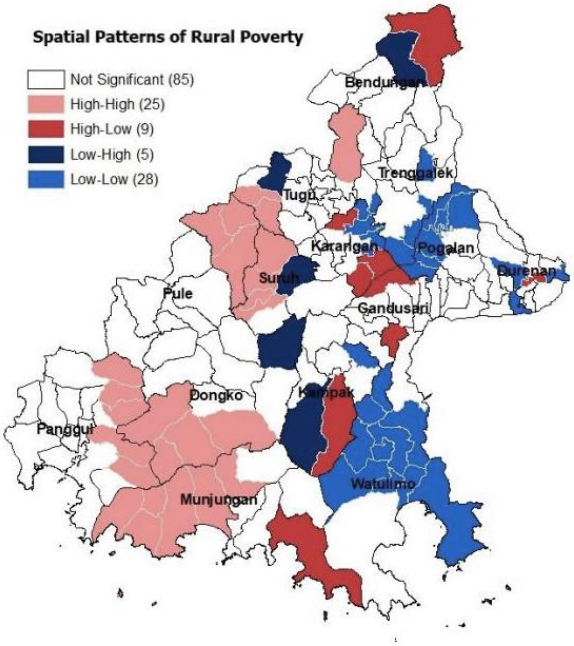

Figure 3. Map of regional clusters indicating local spatial autocorrelation

Table 3. Clustering of Villages Indicating Local Spatial Autocorrelation

Low-high (LH)	High-high (HH)
Bendungan District: Dompyong Dongko district: Pringapus Kampak District: Ngadimulyo Suruh District: Suruh Tugu District: Pucanganak	Dongko District: Cakul, Pandean, Salamwates, Watuagung Munjungan District: Craken, Karangturi, Masaran, Ngulungkulon, Ngulungwetan, Sobo Panggul District: Manggis, Ngrambingan, Ngrencak, Sawahan, Tangkil Pule District: Jombok, Karanganyar, Sukokidul Suruh District: Gamping, Nglebo, Puru, Wonokerto Tugu District: Duren, Nglinggis, Prambon
Low-low (LL)	**High-low (HL)**
Durenan District: Durenan, Karanganom, Pakis Kampak District: Sugihan Karangan District: Buluagung, Salamrejo, Sumber Pogalan District: Ngadirenggo, Ngetal, Ngulankulon, Ngulanwetan, Pogalan, Wonocoyo Trenggalek District: Karangsoko, Rejowinangun, Sambirejo, Sukosari, Sumbergedong Watulimo District: Dukuh, Gemaharjo, Margomulyo, Ngembel, Pakel, Prigi, Sawahan, Slawe, Tasikmadu, Watulimo	Bendungan District: Botoputih Durenan District: Sumbergayam Gandungsari District: Jajar, Wonoanti Kampak District: Karangrejo Karangan District: Jatiprahu, Kerjo, Sukowetan Munjungan District: Bendoroto

Spatial Patterns of Rural Poverty

The next step was to cluster villages included in the poverty criteria based on Moran's Scatterplot quadrant. Of the 152 villages in Trenggalek Regency, only 67 had local spatial autocorrelation, while the remaining 85 were insignificant. Therefore, the spatial grouping analysis based on the poverty level in Trenggalek Regency consisted of 4 groups. The first group was villages with high poverty and surrounded by villages with high poverty rates (high-high). The second group was villages with low poverty surrounded by low poverty (low-low). The third group was villages with low poverty surrounded by high poverty (Low-High) and the fourth was villages with High poverty surrounded by low poverty (high-low).

The analysis results of the poverty pattern in the Trenggalek Regency are shown in Figure 3 and Table 3. The figure shows that 25, 28, 5, and 9 villages in this regency were included in the High-high, low-low, low-high, and low-low categories, respectively. Each cluster formed had relatively the same characteristics to influence each other.

The existence of this poverty cluster shows that each village has a strong spatial influence in influencing its insufficiency level. Villages with high poverty will affect their neighbours, and vice versa. One of the causes of the high level of village poverty is a decrease in accessibility, inadequate educational and health facilities, and poor access to information technology, the central government, and the market. This is in line with Liu et al. (2020) research that rural poverty is significantly correlated with county-level, water resource, and town-level accessibilities. The accessibility conditions of minimum service facilities in rural areas in Trenggalek Regency based on poverty clusters are as follows.

Access to education

The high correlation between poverty levels and educational facilities has the ability to improve human resources (Fajriwati, 2016). This is because the higher the level of education, the lower the poverty level (Parwa & Yasa, 2019; Susanto & Pangesti, 2019). Facilities' availability and distance determine access to educational facilities. Figure 4 shows that villages in the HH (high-high) category had the most extended average length of 6.5 km because most are located in the mountains and are quite far from the urban centre. Meanwhile, those in the LH (low-high), HL, and LL categories had average distances of 5.7 km, 5.7 km, and 4 km to Senior High School location.

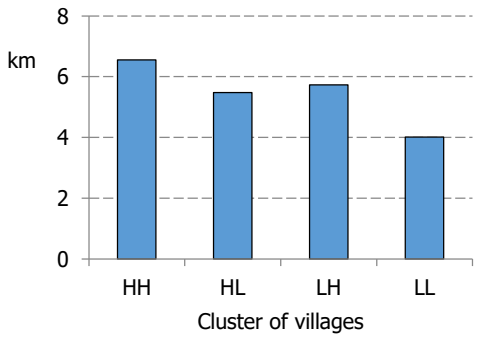

Figure 4. Distance of villages to Senior High School in Trenggalek Regency

Access to health

The overall functional, physiological, psychological, and sociocultural dimensions of people is determined by their health. Health is an investment to support economic development, and it is essential in poverty reduction efforts. Liu et al. (2020) stated that the village government's ability to spend in the health sector significantly reduces poverty. Villages in the HH category had the furthest distance to the hospital and public health centres by approximately 34 km and 5.5 km (Figure 5). Villages in the LH category had access to the hospital, which is 20.6 km, and the public health centre is 4.8 km. Meanwhile, those in the HL category had an average of 15 km and 4.8 km to access the hospital and public health centre. Finally, the villages in the LL category had the closest access compared to others, which was 10 km and 3 km to the hospital and public health center.

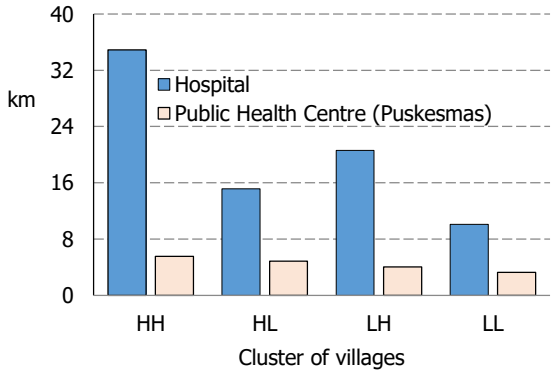

Figure 5. Distance of villages to the medical facility in Trenggalek Regency.

Access to communication

Poverty is not only an economic disability but also an inability to use technology to access information. Therefore, the easier it is for a community to access communication, the greater its ability to reduce the poverty rate (Widiyastuti, 2015). Villages in the LL category had higher communication facilities, namely 2 Base Transceiver Station (BTS) and 4 telephone operator facilities, than other types (Figure 6). Then, for the LH category, there were 2 BTS facilities and 3 telephone operator facilities. The HL category also had 1 BTS and 3 telephone operator facilities. The HH category had the lowest availability of communication facilities, i.e. 1 BTS with only one telephone operator.

Access to the center of government

Villages in the HH category had the farthest distance from the government center. The average

length from the villages to the sub-district and regent's offices is 8 km, respectively. In the LH category, the distances from the village to the sub-district and regent offices are 4.4 km and 22 km (Figure 7). Meanwhile, in the HL category, the distances from the village to the sub-district city and the regent's offices are 4.4 km and 18 km. In the LL category, the distances from the village to the sub-district and regent offices are 4.8 km and 16 km, respectively. The farther from the government center, the more complex and slower it will be in managing population administration activities.

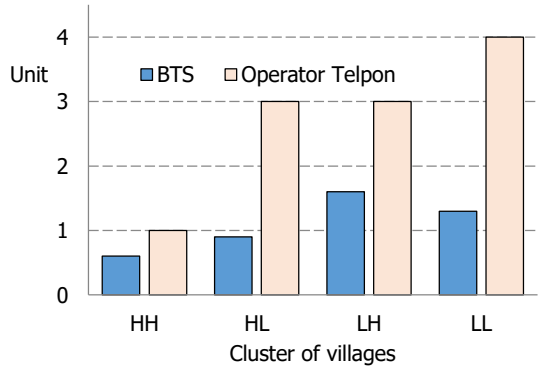

Figure 6. Rural communication access in Trenggalek Regency

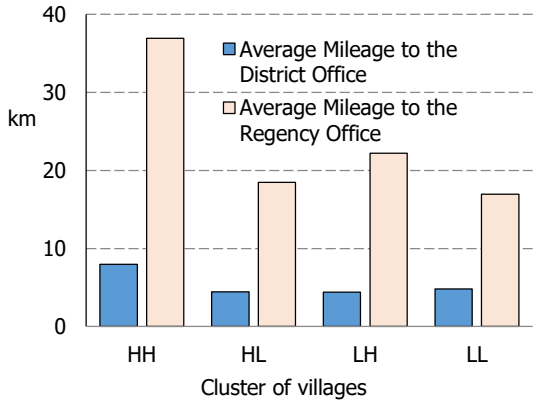

Figure 7. Distance of villages to the central government in Trenggalek Regency

Economic activities

Economic activities are the production, distribution, and consumption of activities carried out by economic actors to meet the needs of life. The activities include agriculture, services, industry, and trade. In this study, rural economic activities are seen from the number of stalls in each village, which describes the fulfillment of daily needs.

Figure 8 shows that villages in the LH category had the highest number of stalls per village (87). This is followed by villages in the LL category, with an average number of 55 stalls per village (Figure 8). The average length of villages in the HH and HL categories from the villages to the sub-district and regent's offices is 8 km, with 45 and 42 stalls per village, respectively. The graph explains that rural poverty can decrease, supposing the village has many trading points. These stalls and grocery stores show that economic activity is developing well because much money is circulating. According to Hidayah et al. (2020), increasing the rural economy by improving and synergizing micro, small and medium enterprises is necessary. The increasing number of MSMEs in an area indicates the development of economic potential in the region.

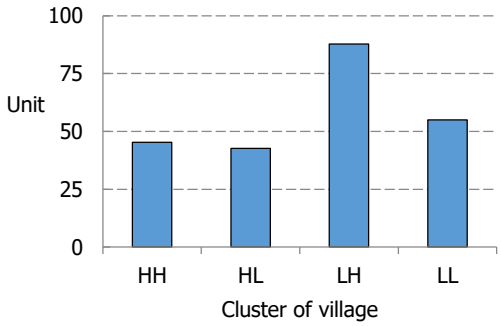

Figure 8. Average number of stalls per village in Trenggalek Regency

Research Implication

Spatial autocorrelation is a method used to understand the relationship of neighboring areas that influence each other. The use of this method can be adopted to describe the neighboring relationship between regions and their poverty levels. The research described poverty in the Trenggalek Regency divided into four clusters of poverty with varying forming factors. These results are expected to be taken into consideration by the government in making decisions and determining the right steps to reduce knowledge. The pattern of poverty distribution in space is helpful in planning and informing policy formulation for its eradication (Majid et al., 2016). Policy formulation needs to be prioritized for villages with high-high and high-low characteristics because they have the highest rates. Poverty alleviation policies should focus on poor village clusters with social infrastructure development (Ari et al., 2021).

The existence of grouping and concentration of spatial patterns in the Trenggalek Regency is expected to be the basis for formulating poverty reduction policies. The areas with high poverty should prioritize the reduction policy. High poverty must be seen based on the condition of its neighbors, which enables the target locus to be closer in each village (Harmes et al., 2017). Uniform policy-making without identifying spatial poverty patterns leads to unsuitable policies, which can negatively impact causes poverty and increased inequality. On the other hand, spatial mapping of poverty is both an opportunity and a challenge to encourage policies, plans and programs to reduce poverty that is right on target.

Areas with high-high clusters need to be prioritized to receive special attention. This cluster requires various programs to support minimum service facilities in education, health, and the economy. Meanwhile, villages included in the high-low and low-high areas need a policy. This is in accordance with Indonesia's Village Law No. 6 of 2014, article 91, which explains that villages can cooperate with third parties. Cooperation between villages in one sub-district can increase public services and development effectiveness and efficiency. Cooperation can be carried out by developing the economic potential and resources of the Region, strengthening the capacity of economic institutions and Village Owned Enterprises (BUMDes), and improvement of basic infrastructure and village economy. Hakim (2016) stated that the rural area development policy includes five aspects. The first is participatory spatial planning which tends to accommodate all thoughts, ideas, and interests from various parties regarding the desired space design. The second is inter-village growth centers, which are associated with developing the community's economy. The third is strengthening community capacity to promote regional development. The fourth is institutional aspects and economic partnerships, which are important in development areas because with good institutional management the villages will be independent, without relying on the government and the private sector. The fifth is the aspects of infrastructure development, which need to open access between villages and accelerate the regional economy.

The results of this study are undoubtedly positive and can be used as primary data for a strategic regional project for the next five years. They are also helpful for the government to channel various poverty alleviation programs to the right target and become a policy evaluation tool that has been carried out by analyzing the program's success implemented in the pockets of poverty. Furthermore, this research also has implications in revealing the economic status of the village. Previously it was difficult for the government to determine the community's economic position in various village areas. In that case, this study describes each village's economic status based on the classification to improve their economic position of rich, middle, or poor villages. Apart from being an information material because the data is clustered, this research can also contribute to those willing to deepen their studies on poverty. Therefore, the recommendation is to increase the quantity and quality of minimum service facilities, such as health centers and secondary schools in poor areas. It also aims to encourage the economic improvement of rural communities through empowerment activities to ensure the people are productive. Village funds in community empowerment need to be increased to encourage development, especially in remote areas, by exploring local resources (Aji, 2020). According to Luo et al. (2021), rural public expenditure has a significant spatial spillover effect on poverty reduction, greater than the direct effect. This is in accordance with the research by Liu et al. (2020), stating that rural public expenditures in the education, health care, social security, and infrastructure sector can reduce poverty significantly. Those are some of the statements that confirm and support the implications of this research. This is expected to help policy makers determine priorities in poverty alleviation.

CONCLUSION AND SUGGESTION

Based on the analysis results, it can be concluded that the distribution of rural poverty in the Trenggalek Regency is categorized into three levels, i.e. high (34%), medium (31%), and low (35%) with 52, 47, and 53 villages, respectively. Meanwhile, the poverty typology is clustered into four regional categories, namely high-high, low-low, low-high, and high-low with 25, 28, 5, and 9 villages. Each cluster formed has relatively the same characteristics to influence. Villages belonging to the high-high and low-high groups tend to be far from the government center and have low accessibility, compared to those in the high-low. However, low-high villages have better infrastucture condition because the region has many

developing economic activities; therefore, poverty is relatively lower. The government is expected to consider these results while making decisions. Subsequently, this study suggests the need to increase access to education, health, communication, government services, and economic infrastructure.

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Global value chains participation to enhance export: Evidence from Indonesian apparel SMEs

Muhammad Ilham Nugroho*

[1]Institute of International Studies, University of Gadjah Mada, Indonesia

*Correspondence email: nugroho.muhilham@gmail.com

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ABSTRACT

After recording remarkable growth and gaining more prominence within the domestic economy, Indonesian small and medium enterprises (SMEs) are now being pushed by the government to go beyond the domestic market. Indonesian government has introduced global value chains (GVCs) to SMEs to boost their export in the last recent years. Apparel SMEs normally can join GVCs through backward or forward participation. But in this case, the GVCs' impact on apparel SMEs export remains sluggish because they are highly concentrated in forward participation. This research, therefore, provides empirical cases on how Indonesian apparel SMEs can engage in backward participation to raise their competitiveness in global market using the evidence of apparel SMEs. Utilizing three dimensions of GVCs analysis: governance, upgrading, and local policy network, this research finds that SMEs can easily engage in backward participation to obtain foreign inputs by using the internet. Moreover, the decision to venture into GVCs and global market is heavily influenced by e-commerce. Findings of this research can provide guidance for Indonesian policymakers about the importance of GVCs on SMEs' export performance, creating a better environment for manufacturing and cross-border e-commerce that can be exploited by SMEs as the largest economic driver.

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INTRODUCTION

Indonesia is currently witnessing the rapid ascent of SMEs (Small and Medium Enterprises). In 2018, they contributed 61% to Indonesia's Gross Domestic Product (GDP) and accounted for 97% of the employment rate (Abe & Proksch, 2017; OECD, 2021). In recent years, they are gaining more prominence as the digital companies have expanded their access within domestic market, which put SMEs as the undisputed main actor in the Indonesian economy (Ministry of Cooperatives and SMEs, 2020; Beschorner, 2021). As things stand, the SMEs' progress within domestic market will likely remain positive, considering the high demand from domestic consumers and stakeholders' intention to keep SMEs having such a strong footing within domestic market (Ministry of Cooperatives and SMEs, 2020).

However, SMEs will face a big challenge from now onwards. The government, through The National Medium Term Development Plan 2020-2024 (RJPMN), is pushing SMEs to sell product beyond domestic market, which may put them in a delicate situation. This is because Indonesian SMEs are the least exposed to global markets with only recorded export value of US$20 billion in 2018, a number that is relatively small compared to their ASEAN peers. To illustrate, Thailand

recorded an export value of US$72 billion, while Malaysia managed to generate US$42 billion during the same period (OECD, 2021). As for export in apparel sector, only 14% of Indonesian SMEs were participating in export, while the proportion of Thailand and Vietnam SMEs were 28% and 26% respectively (Abe & Proksch, 2017; Chaldun et al., 2020; Tambunan, 2021; González, 2017). It implies that Indonesia SMEs is lacking ideal formulas to flourish in global market.

There are various methods to boost export and one of them is to engage in global value chains (GVCs) (Bas & Strauss-Kahn, 2014; Ndubuisi & Owusu, 2021; Revindo et al., 2019; Tolstoy et al., 2022). As a framework, GVCs provide an understanding of how global productions are governed by analysing the hierarchy and interplay of various actors involved in a certain industry (Gereffi, 1999; Gereffi & Fernandez-Stark, 2018). To developing countries, GVCs has had offered them plenty of opportunities and challenges, and Indonesia is no exception (Gereffi & Luo, 2018). For example, the performance of Indonesian textile and apparel industry in the 1990s was similar to China's in the last recent years because their products such as yarn, fabric, and apparel were subject to the global production networks of global brands. Unfortunately, Indonesia failed to maintain its competitiveness, specifically for yarn and fabric due to the outdated machinery and the emergence of free trade agreements (FTAs) that highly favoured the apparel industry (Gereffi & Frederick, 2010; Li et al., 2019a).

Similar to large firms, apparel SMEs can also engage and benefit through GVCs insertion. Before GVCs, apparel SMEs always faced some challenges such as logistics, high fixed costs, and economic scale in relation to exporting goods (OECD, 2021). But GVCs, specifically through indirect export, can be a turning point for SMEs because those challenges will soon be managed by the buyer (forward participation). This is the typical case of developing countries, where the predominant apparel SMEs generally have advanced technology and know-how shortcomings to produce sophisticated products (González, 2017; Lanz et al., 2018). Similarly, Indonesian SMEs have also been facing uphill struggles for tapping higher benefits from GVCs participation as they continue to generate low value-added activities (Stöllinger, 2021; Tijaja & Faisal, 2014). Thus, their overall share of participation in GVCs is the smallest among ASEAN members (6.3%) as Malaysia's SMEs lead at 40% (Ministry of Cooperatives and SMEs, 2020).

Therefore, additional support from stakeholders is essential because they must be treated as such. Some scholars viewed e-commerce adoption can play a significant role to help SMEs thrive in GVCs (Lanz et al., 2018; Chen, 2019; Cusolito et al., 2016). Chen (2019) provided a useful example that e-commerce adoption has given Taiwanese textile SMEs more flexibility to supply various foreign apparel brands. Meanwhile, Lanz et al. (2018) found that SMEs with a website tend to source a larger share of foreign inputs in a bid to reduce technological barriers. Unfortunately, this study does not further explain the correlation between having a website and sourcing a large share of foreign inputs.

Likewise, Lendle et al. (2016) and Li et al. (2019b) viewed e-commerce as a powerful means to enable SMEs to go through global market directly. E-commerce allows them to focus on the highest value-added activity that is often associated with research and development (R&D) and marketing. Given this condition, developing digital infrastructure immediately is imperative to enable SMEs into GVCs and global market. Lanz et al. (2018) noted that simple digital infrastructure is sufficient enough to facilitate SMEs securing a spot at the global level. Then, Jin & Hurd (2018) and Li et al. (2019a) put high emphasis on institutional cooperation and reform to enable cross-border e-commerce sales on a wider level. Still, the importance of delivering sophisticated products is noteworthy since SMEs will face larger firms in global market, and in light of this, competing in niche markets must be taken into consideration (Ganne & Lundquist, 2019; Khan & Lew, 2018; Tambunan, 2008).

In Indonesia, the government has persistently introduced GVCs to SMEs since many years ago but, unfortunately, the progress remains sluggish. In theory, SMEs can engage in GVCs through two channels: forward and backward participation (Cusolito et al., 2016). While in the case of Indonesian apparel SMEs, the share of participation between the two channels is uneven. Only 8% of apparel and textile SMEs participate in backward participation GVCs, while forward participation accounts for higher proportion (28%), which is notably driven by textile SMEs (upstream), where they appear to supply intermediate

inputs to multinational enterprises (MNEs) (Epede & Wang, 2022; González, 2017; Hing et al., 2020)

As a framework, GVCs would normally suggest small and medium-sized firms–notably from developing countries–to import in order to obtain more advanced specifications kind of input. A country that upholds this view can have a higher export value, and vice-versa (Bas & Strauss-Kahn, 2014; Feng et al., 2016). As shown in Figure 1, textile and apparel SMEs in Thailand and Vietnam managed to record 20% and 38% participation respectively. Indonesian SMEs accounted for lower participation as the textile and apparel SMEs only had 8% of backward participation. As a consequence, their export proportion could only reach 14%, which was two times smaller compared to that of Thailand and Vietnam (González, 2017).

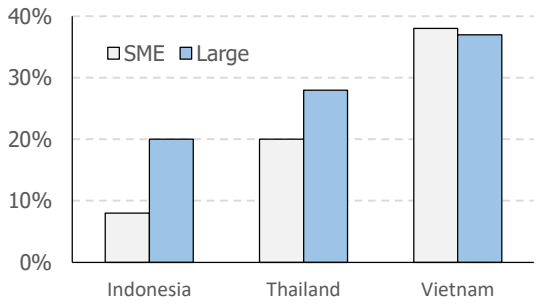

Figure 1. Percentage of backward participation of textile and apparel by country, 2017 (González, 2017)

Against this backdrop, the success of increasing the export of apparel SMEs through GVCs will likely depend on how the state, SMEs, and other stakeholders unlock and capitalize on all GVCs' channels. By unlocking their potential through backward participation, apparel SMEs will have a higher chance to be competitive in global market. This research aims to elucidate empirical analysis on how Indonesian apparel SMEs can participate in GVCs through backward participation in order to raise their competitiveness in global market using GVCs framework. It focuses on apparel because it is a labour-intensive manufacturing sector. It is also the third-largest contributor to Indonesian SMEs sales and at the same time the fifth-largest contributor to Indonesian export (Ministry of Cooperatives and SMEs, 2020).

RESEARCH METHOD

This study on GVCs' participation to enhance export is qualitative research with an empirical case approach. Qualitative research seeks to grasp the attitude and behaviour of SMEs in participating GVCs to favour their export performance (Gerring, 2004). The empirical case approach was chosen to give an understanding that backward participation is obviously viable to be accessed by the other Indonesian SMEs focusing on retail trade and assembly activity. The cases were analysed using three dimensions of GVCs analysis – governance, upgrading, and local institutional context. The first dimension, governance, provided the production structure of SMEs. The upgrading would be an illustration of how SMEs upgrade certain aspects of their business to enter the global market. Whereas, local institutional context offered latitudes by examining local policy settings (Gereffi & Fernandez-Stark, 2018).

Theoretically, firms can engage in backward participation through two channels: direct and indirect participation. However, this research only focuses on direct participation where SMEs are importing input from foreign suppliers without being further processed by domestic textile industry. There were several export-oriented apparel SMEs that engaged in indirect backward participation, and they normally source foreign input from domestic textile industry. They generally produce t-shirts with standout graphic designs. However, after briefly examining their production trajectories, this kind of SMEs did not come under the provision of this research because their success in entering global market is rather defined by their graphic design instead of the inputs they utilized.

Empirical cases were drawn from the experience of two Indonesian apparel SMEs based in Jakarta and Bandung, Indonesia, who have been performing export. The research was conducted through desk research and in-depth interview. Desk research was conducted beforehand to find Indonesian apparel SMEs that fall into the category of this research. It is an important phase because it was quite difficult to find an appropriate database regarding the business activity of apparel SMEs in detail. Nevertheless, those kinds of SMEs could still be identified through digital platforms such as Instagram and official website. They normally put international payment systems to ease the foreign consumer in a transaction.

Table 1. Governance Structures in Global Value Chains

Governance structure	Leading industries and timing	Main drivers	Forms	Pioneers
Producer-driven chain	•Natural resources: late 19th and early 20th centuries •Capital goods & consumer durables: 1950s &1960s	Transnational manufacturers	Vertical integration (ownership and control)	• Oil companies • Mining industries • Agribusiness • Ford and Japanese automobile
Buyer-driven chain	Consumer non-durables: 1970-1990s	Retailers and marketers	Network integration (logistics and trust)	• Mexico, Taiwan, South Korea, etc. • Nike, Reebok, Adidas, UNIQLO, etc.
Consumer-feedback chain	Apparel industry in China: 2010s	Online consumers	Online marketplace	• Handu • Garment industry clusters in Humen town, China

Adapted from Gereffi (2001) and Li et al. (2019b)

Table 2. The definitions of SMEs in Indonesia

Criteria	Definition
Assets[1]	Assets valued at Rp 50 million-Rp 10 billion, equal to approximately US$3.476-695.255.
Annual Turnover[1]	Annual turnover of RP 300 million-Rp 50 billion, equal to US$20.857-3.476.277.
Employees[2]	Enterprises with 5-99 employees

[1]Ministry of Cooperatives and SMEs of Indonesia
[2]Indonesian Statistics Agency/BPS
Adapted from Revindo et al. (2019)

On the other hand, an in-depth interview was conducted to verify that SMEs resulting from desk research process were as per SMEs' definitions set by the Indonesian government (Table 2). Here, the two Indonesian apparel SMEs were in accordance with existing definitions in terms of annual turnover and number of employees. The interview was also intended to confirm that SMEs were never been associated with foreign capital. It was to ensure this research would generate policy recommendations that are inclusive and feasible for all Indonesian SMEs focusing on downstream activity since Indonesian SMEs are predominantly self-reliant in terms of financing (Esquivias & Harianto, 2020; Kergroach, 2019). In addition, it was to derive more detailed information regarding the governance of the value chain and what are their approaches toward GVCs participation. The world of textile and apparel is normally built upon buyer-driven chains governance (Table 1). It is governance in which the key parameters – what is to be produced, and how it is to be produced – are set by retailers or firms which focus on R&D and marketing, and thereby it is not compulsory for them to build any production facilities (Humphrey & Schmitz, 2001; Nadvi, 2008; Neilson et al., 2014).

At this rate, identifying the type of governance is crucial to this research for two reasons. First, it provides an insight into what kind of role is played by SMEs at the various stages of value chain. Second, by recognizing the role of SMEs we can understand Indonesian SMEs apparel's approaches to participate in GVCs through backward participation. On the other hand, the interview is also targeted to determine the variables that enable SMEs to go through global market by providing examples. In other words, it reveals the upgrading strategies of SMEs to reach global market. In the end, research implications will be drawn from the interview finding combined with analysis results using the dimension of local institutional context.

RESULT AND DISCUSSION

GVCs Participation of SME

This part of the research will attempt to elucidate the approach used by Indonesian apparel SMEs to engage in backward participation GVCs. Therefore, for a better understanding of the approach, this part provides the illustration of the value chain structure of two Indonesian apparel SMEs which are drawn from the empirical experience of Orbit Gear and NBDN Denim (Figure 3). The two SMEs are appropriate examples for this research for some reasons. To begin with, the majority of their products are sold to foreign consumers as they have been targeting foreign markets since the beginning. Additionally, they also have been highly reliant on foreign inputs to meet their production standards. Moreover, both SMEs have never been injected by a foreign entity or capital in order to enter a foreign market or utilize certain foreign inputs from a certain country.

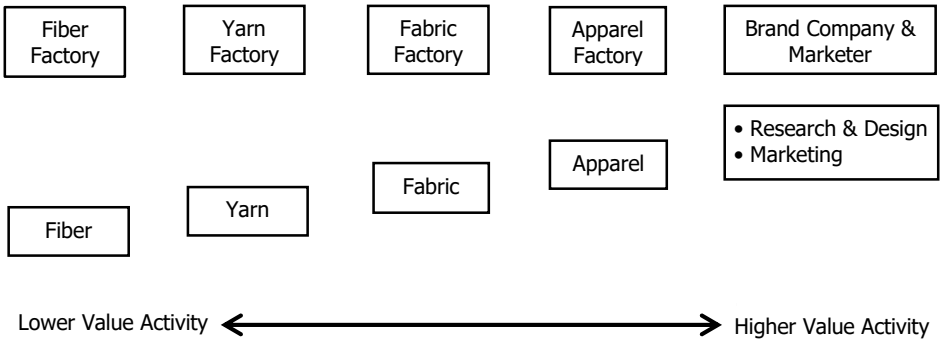

Figure 2. Value chain activities of the apparel industry (adapted from Gereffi and Frederick (2010))

Established in 2008, Orbit Gear is a Jakarta-based apparel brand primarily selling pants, jackets, and bags. By the end of 2019, the coverage of their sales has managed to reach countries like the United States, Canada, Russia, Germany, Japan, Hongkong, Taiwan, and some other countries in Asia recently. In 2018, their total sales were more than US$350 thousand, and 90% of it came from overseas sales. Meanwhile, NBDN Denim is a Bandung origin apparel brand primarily selling denim jeans and jackets. Established in 2012, they began to export in 2015 as the demand from several ASEAN countries emerged. Later, they managed to go through Japan market, followed by several other European countries and North America by the end of 2018. By 2019, their total sales have reached US$300 thousand, and 60% of it have resulted from export activity (Table 2).

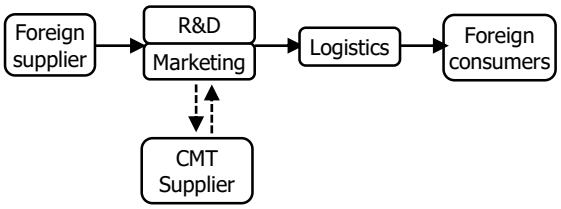

Figure 3. Value chain structure of Orbit Gear and NBDN Denim (based on the interview with the founders of SMEs)

Among all specializations along the chains, both SMEs are mastering the highest activity with added value – R&D and marketing (Figure 2). This resembles the roles of the lead firm in a buyer-driven chain, where the responsibilities of SMEs are divided into two important roles (Gereffi et al., 2005; Neilson et al., 2014). Here, they are not only responsible for developing products and setting marketing objectives, but also to source suppliers who are capable to translate their production standards (Figures 3 and 4). Therefore, it raises the question of how such a small firm organizes the production networks and the demand of end-user at the same time.

For Orbit Gear and NBDN Denim, fabric is a crucial input as it determines the significance of their products. As illustrated in Figures 5, both SMEs obtain fabrics from countries that are distant from Indonesia. In the past, this could lead SMEs to a significant hurdle. However, the distance between countries has been diminished by adopting internet which enables them to perform electronic commercial activities (e-commerce). Internet, at this rate, has a major role as an intermediary to enable Indonesian SMEs obtaining foreign inputs through backward participation (Figure 4). It becomes viable because all of their foreign suppliers have long been incorporating internet into their business. They normally have a website as a means to interact, exhibit the directory of products, as well as span their sales destination (Oliveira et al., 2021; Strange & Zucchella, 2017; Wang et al., 2017). The experience of both SMEs is similar to the finding from Chen (2019), which shows that Taiwanese textile SMEs can easily supply various foreign brands in Europe following the e-commerce adoption. Internet allows textile manufacturers to perform Business to Business (B2B) e-commerce as a way to shift from the traditional methods in order to reach overseas buyers (Chen, 2019).

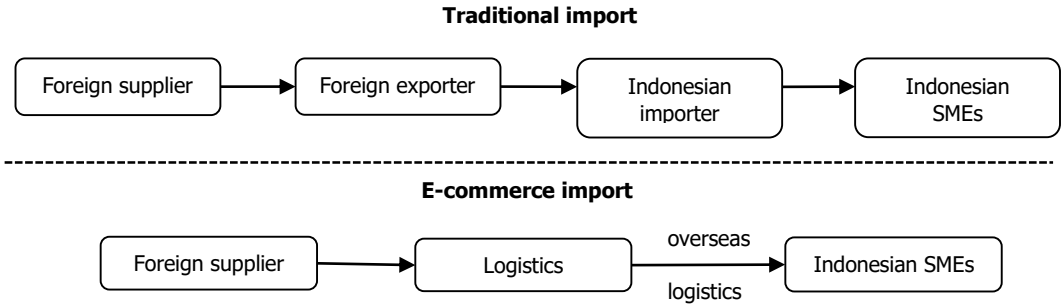

Figure 4. Backward participation in the age of internet by Indonesian apparel SMEs (adapted from Wang et al. (2017) and the interview with the founders of SMEs)

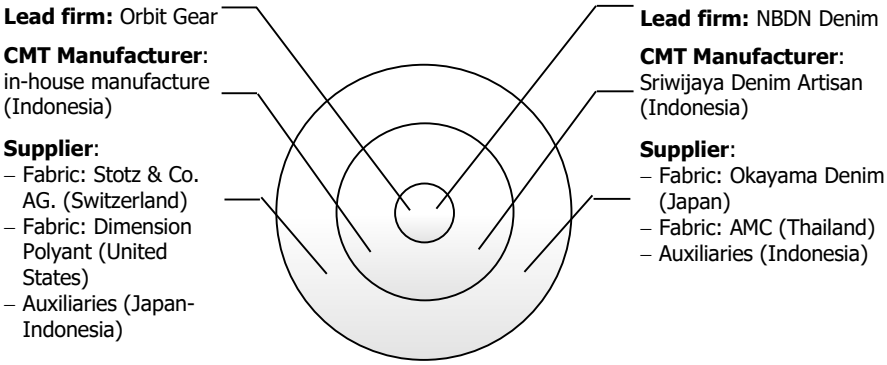

Figure 5. The production governance of Orbit Gear and NBDN Denim (based on the interview with the founders of SMEs)

Nevertheless, despite being able to participate in backward participation through internet, this research found that both SMEs can only reach a certain degree in terms of relationships with suppliers, i.e. through market. Their linkages with suppliers cannot go beyond the market relationship as internet does not allow them to function in this way (Antràs, 2020). Unlike SMEs, large firms are not highly dependent on the internet. Before the internet era, there is no constraint for large firms to engage in GVCs because they generally have abundant resources to establish various means of communication with overseas consumers and suppliers: analogue telephones, in-person travelling, or even building an overseas subsidiary (Ganne & Lundquist, 2019; Gereffi & Frederick, 2010). For this reason, both SMEs cannot easily develop modular, relational, or even hierarchy relationships, which allow them to obtain specific or customized products that suppliers do not necessarily produce for others (Gereffi & Fernandez-Stark, 2018; Gereffi & Luo, 2018).

Determinant to Export

Small enterprises typically face more barriers to export than large firms. They are generally impeded by two problems to compete in global market. First, SMEs cannot produce competitively priced products on large scale due to low labour productivity (Lopez-Gonzalez, 2016; OECD, 2021). Second, they only have relatively small resources to make their product visible in global market. For example, it is difficult for them to open physical stores overseas or use celebrities to promote the brand. However, Li et al. (2019b) argued that the opportunity to go through global market is immensely wide despite only having small resources.

Li et al. (2019b) showed that a growing number of Chinese apparel SMEs have taken a greater stride by utilizing e-commerce to enter some overseas markets. In 2015, their total export successfully generated millions hundreds of dollars through e-commerce selling. But in this case, the most credit should be given to some largest online marketplaces in China (e.g., Globalegrow, JD, Tmall, and Taobao) that have been providing proper cross-border e-commerce platforms. Meanwhile, In Indonesia, there is Erigo. an apparel brand that was once SME in 2012. Erigo is recently known as the champion of apparel in domestic market in terms of total sales. They gradually become a large firm following a series of funding they participated in, and as a result, they recently began to sell products to overseas individuals after investing a huge amount of money on top celebrities in order to promote their brand (Ningsih & Putri, 2020).

Nevertheless, the cases of SMEs above are not common for Indonesian because it does not correspond to the difficulties faced by the predominant Indonesian SMEs. In practice, Indonesia have not yet built dedicated cross-border e-commerce platforms like China. Besides, SMEs do not need to progress and transform to be a large firms, like Erigo, in order to export (Lanz et al., 2018). For that reason, Indonesian SMEs must look into any available options. This part of the research attempts to unravel the strategies of SMEs in order to be visible and competitive in global market within the context of Indonesia.

Identify and respond to the niche market demand. It is true that backward participation GVCs can boost the competitiveness of SMEs to a certain degree. Yet, in the case of Orbit Gear and NBDN Denim, using foreign inputs alone would not help them secure a spot in global market. Apart from suggesting utilizing sophisticated foreign inputs, almost all literature also cite the importance of niche markets (Nemati & Khajeheian, 2018; Tambunan, 2008). Theoretically, the impetus to enter niche market can be rooted from several reasons, for instance to explore the segments that offer lower or higher prices, to produce high-quality products or designs, or even to offer products with technical advantages, etc. (Nemati & Khajeheian, 2018). Orbit Gear and NBDN Denim have also taken this approach to prevent direct competition with larger firms that excel in producing a mass-market type of product. At this rate, identifying what kind of niche market they can go in is important, but how they respond to the challenges and demands from niche markets is instrumental.

The R&D department of Orbit Gear focused on the segment of technical gear from the outset. Technical gear normally appears to have many pockets and breathable yet water repellent fabric, and for this reason is suitable for commuting in all seasons since it offers high functionality to its user (Sabir, 2017). On the other hand, NBDN Denim is an SME with the area of specialization of selvedge denim jeans. It is a kind of jeans that takes the form of classic jeans, which are made from 100% of cotton and undergone a dyeing process using natural substances. In addition, what sets it apart is the sophisticated-looked finishing stitches inside of the jeans called "selvedge", which cannot be found in regular or modern jeans (Abrego, 2019). By focusing on this market, NBDN Denim strove for the gap left by the likes of Wrangler Jeans, Lois, Lee Cooper, etc., which tend to focus on the segment of modern jeans. Whereas, Orbit Gear tended to prevent direct competition with the likes of The North Face, Columbia, etc.

Table 3. Price Comparison between Indonesian Apparel SMEs and Their Competitors

Competitors (origin, product's price range)	Fabric's origin
Orbit Gear (US$185-320)	
– Enfinleve (Germany, US$700-1000)	Switzerland
– Guerilla Group (China, US$350-500)	Switzerland
– Acronym (Germany, US$1000-1600)	Germany
– Vollebak (United Kingdom, US$500-1200)	United States
– Cloudburst (Russia, US$600-1200)	Japan
– Krakatau (Russia, US$200-400)	United States
– Riot Division (Russia, US$180-380)	Austria
NBDN Denim (US$145-170)	
– Oldblue Co. (Indonesia, US$130-250)	United States
– Pure Blue (Japan, US$215-470)	Japan
– Iron Heart (United Kingdom, US$300-350)	Japan
– Naked and Famous Denim (Canada, US$170-400)	Japan
– Soso Brothers (Sweden, US$160-190)	Japan
– Nudie Jeans (Sweden, US$200-398)	Japan
– Studio D'Artisan (Japan, US$280-315)	Japan

Author's calculation

The competition among SMEs that share the same niche market specialization is also inevitable. In general, Orbit Gear and NBDN Denim competed with other SMEs, the majority of which come from various developed countries, mainly from Europe (Table 3). However, in order to thrive within niche market, Orbit Gear and NDBN Denim embarked on the same strategies as the requisites to enter are relatively simple. It is imperative to follow this pattern because

each niche market has similar characteristics (Fouji & Hoque, 2021).

Selection of the right fabric is at the heart of strategy for SMEs targeting the niche market of technical gear and selvedge denim jeans. Many SMEs specializing in these niche markets tend to source fabric from the same region, if not the same countries. In fact, in many cases, they sourced from the same suppliers (Table 3). To illustrate, many selvedge denim jeans labels around the world opted to use Japanese input–notably from Okayama Denim supplier –in order to be recognized by the international selvedge denim community (Table 3). It is because there is a general consensus among this community that excellent quality of denim jeans can be achieved by using a shuttle loom machine, which generally can be found in Japanese denim manufacturers (Abrego, 2019). Different from denim, the product quality of the technical gear is rather defined by the raw material itself, which is extra-staple-long cotton. Known as the finest cotton, this material is not common for mass-market products, and thereby only several country countries with high-tech manufacturing capability are able to process it (Braja & Gemzik-Salwach, 2019; Sabir, 2017).

Table 4. The Impact of Inputs on Market Diversification

Input used (fabric)	Market entry (year)
Orbit Gear	
ElecorSHIELD (China)	Indonesia (2017)
	Singapore (2017)
Stotz & Co. AG. (Switzerland)	South Korea (2018)
Dimension Polyant (United States)	Taiwan (2018)
	Hongkong (2018)
	Philippines (2018)
	Germany (2018)
	East Europe (2018)
	Russia (2019)
	United States (2019)
	Canada (2019)
	Poland (2019)
NBDN Denim	
Domestic input	Indonesia (2012)
Atlantic Mills (Thailand)	Thailand (2015)
	Malaysia (2015)
	Singapore (2016)
Okayama Denim (Japan)	Japan (2016)
	United States (2017)
	Canada (2017)
	Switzerland (2017)
	Germany (2018)
	Netherland (2019)
	New Zealand (2019)

Adapted from the interview with the founders of SMEs

On the other hand, the selection of fabric has also facilitated both SMEs in tapping market diversification to some extent. For example, in the early days both SMEs encountered similar struggles in venturing international market because they used domestic input which at that time was considered less sophisticated for the niche market (Table 4). Market coverage was limited. But as the process of R&D developed, sophisticated foreign inputs were significantly added in order to reinforce the competitiveness of products (Gereffi & Fernandez-Stark, 2018; Gereffi & Luo, 2018; Ndubuisi & Owusu, 2021). New sales destination was opening gradually as the fabric that originated from Switzerland, the United States, and Japan continued to entice the niche markets (Table 4). However, domestic inputs remained essential to accommodate the local consumers who demanded the cheaper sort (Table 4).

Regardless of how impactful the foreign inputs, the role of design activities cannot be undermined either because both SMEs have successfully managed to deliver high-quality products. But on top of that, price settings have also been important in providing entry into niche market (Nemati & Khajeheian, 2018). As shown in Figures 5 and 6, both SMEs prefer to carry out assembly activities in their home country. Here, both SMEs have been backed by Indonesia's industrial settings, because for more than a decade, Indonesia has continued to maintain its comparative advantage in low-technology sectors. This condition has benefited the upstream sectors, including apparel industry, to continue gaining competitive advantages in global market in terms of the price of the products. Subsequently, it presents Orbit Gear and NBDN Denim with an additional advantage on the global stage because they can produce lower-priced products without any tradeoffs (Goldberg et al., 2010; Hollweg, 2019; OECD, 2021) (Table 3).

The role of domestic textile industry. Indonesia is among countries to have a complete configuration of textile industries, from textile to apparel. But why did Orbit Gear and NBDN Denim choose to source fabrics from foreign suppliers instead of local ones? There are some reasons that caused this issue. To begin with, the products of both SMEs require extra-long-staple cotton, which is the highest quality of its kind (Abrego, 2019; Sabir, 2017). Unfortunately, this input cannot be found in domestic textile industry because Indonesia is not a cotton producer country (Soumya & Yeledhalli, 2021).

Instead, the majority of domestic textile industry is specialized in man-made fibre products (MMF) and has been widely known as the second strongest MMF producer behind China (Gereffi & Frederick, 2010). A country can build a competitive advantage in an intensive-capital sector despite not having a comparative advantage in it (Porter, 1990; Zhu & Pickles, 2014).

However, domestic textile industry seems reluctant to embark on this path. For example, in 2010, the government approved a large amount of budget to update the textile machinery in order to meet Japan's high standards. But the program was then ruled out due to a lack of interest and applicants (Gereffi & Frederick, 2010). At the same time, domestic textile industry was gradually losing the competitiveness on global stage with the emergence of several free trade agreements (FTAs) that highly favour the apparel industry (Gereffi & Frederick, 2010). For instance, ASEAN-China FTA, which was ratified in 2010, is the one that mostly exacerbates the downfall of domestic textile industry on global stage. At that time, China was the biggest hub of global textile trade, thereby enabling them to produce lower-priced inputs than the other countries (Frederick & Gereffi, 2011; Li et al., 2019a). Thereby, it will be hard to see domestic textile industry produce high-quality inputs in the near future as their machinery is only capable produce a normal quality of inputs (Kadarusman & Nadvi, 2013). Thus, it is normal if Orbit Gear and NBDN Denim opted to source the fabric from foreign manufacturers.

E-Commerce and market diversification. Determinants of export of Orbit Gear and NBDN Denim are not only defined by the activity in the upstream side, where both SMEs quest for a higher share of foreign inputs in order to succeed within the niche market. Instead, the key factor to export occurs throughout the value chain activities, including in the back end of value chains, which normally consist of marketing-related activities (Agarwal et al., 2021; Rahayu & Day, 2017; Sinkovics et al., 2013). To be linked with the foreign consumers, both SMEs used the same formula as the one they were using to source the foreign suppliers. With the internet, both SMEs have conducted a Business-to-Consumer (B2C) e-commerce manifested in their official website, which was meant as the main channel to sell their products.

Many scholars have cited the importance of e-commerce adoption in providing a different path of market entry for SMEs (Al-Khalidi Al-Maliki, 2021; Jin & Hurd, 2018; Li et al., 2019b; Rahayu & Day, 2017; Tan et al., 2009; Tolstoy et al., 2021; Wang et al., 2017). On the one hand, e-commerce can be exploited by SMEs to evade the conventional export model, in which firms are considered necessary to make big investments in order to sell their product overseas (e.g., opening physical stores, using local celebrities to promote) (Li et al., 2019b; Qi et al., 2020). On the other hand, it also helps SMEs to reduce the barriers to logistics in terms of quantity of the product and organization of the shipment (Jean & Kim, 2020; Kinda, 2019; van Asch et al., 2020).

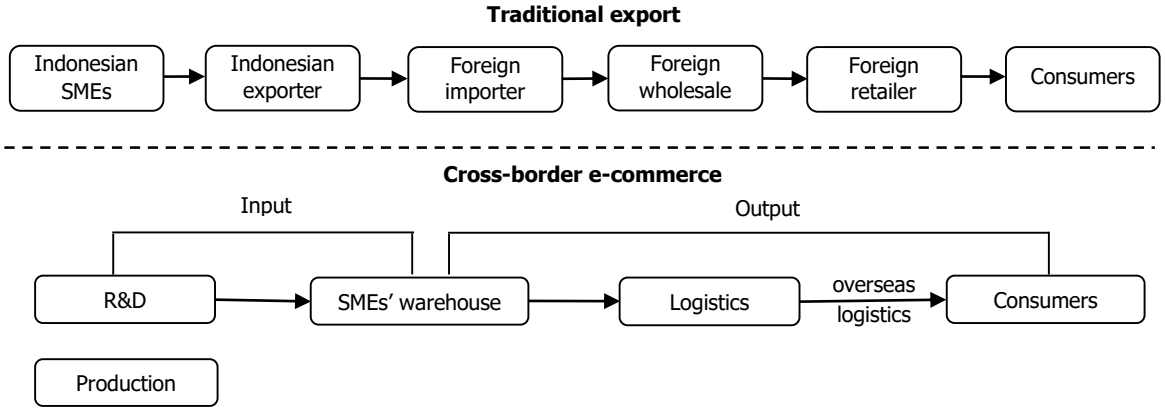

Figure 6. Cross-border e-commerce model of SME end-market upgrading (adapted from the interview with the founders of SMEs)

By adopting B2C e-commerce from the outset, Orbit Gear and NBDN Denim have successfully performed end-market upgrading by selling the product to individuals overseas without having a physical store as well as leasing the containers for shipment, and at the same time has accelerated the whole process of logistics. As seen in Figure 6, both SMEs have cut back the large part of trade intermediary actors that normally partake in the traditional export, which is then replaced by only one actor: logistics. In addition to lessening the export process, this also means that by using e-commerce, both SMEs will not be subject to the high fare of traditional export (Figure 6).

Besides the advantages of using B2C e-commerce on export, deploying a website as the main channel of selling is proven to be instrumental in settling both SMEs into the niche market. It is true that websites have facilitated both SMEs to be visible and recognized by their consumers that are geographically dispersed (Table 4). However, from an e-commerce point of view, there is a key factor that propels both SMEs to be accepted by the international market that is worth highlighting. As shown in Figure 7, it was the ability of both SMEs to monitor the dynamics of their market and execute their available resources based on the market preferences (Sinkovics et al., 2013; Stoian et al., 2018).

Figure 7. Cross-border e-commerce strategy of Orbit Gear and NBDN Denim (based on the interview with the founders of SMEs)

Through e-commerce, Orbit Gear and NBDN Denim are not merely selling product to foreign consumers. Instead, e-commerce platforms have been purposefully used to observe the trends and changes in a targeted market. This strategy was useful when both SMEs reached a deadlock in entering foreign markets during the early years of their business (Table 4). To this end, research was conducted by both SMEs using data of business transactions, including consumers' feedback, which has entirely been derived from their e-commerce platforms (e.g., website, and Instagram). Both SMEs were then presented with a clear mapping of the state of their targeted markets (e.g., what input should be used, how to properly assemble the inputs, how to export, etc.). One of the outputs of this research was the decision to participate in the backward participation GVCs, which in the end led Orbit Gear and NBDN Denim to obtain the best fabric according to their niche market consensus (Table 4). In the end, their decent international performance was underpinned by a skillset to grasp market dynamics, which involves online selling capabilities both on the input and output side (Nakos et al., 2019; Tolstoy et al., 2022).

What has been accomplished by Orbit Gear and NBDN Denim can affirm the discovery by Lanz et al. (2018), which argued that SMEs with website tend to source a larger share of foreign inputs. As previously mentioned above, this study did not provide a further explanation as to whether the website and a large share of foreign inputs are positively correlated. Therefore, this research attempts to offer an explanation stemming from the experience of Orbit Gear and NBDN Denim. Here, building and having a website can be the catalyst as to whether SMEs possess profound know-how about internet and e-commerce. This is also in line with research from Ganne & Lundquist (2019) which stated that SMEs – particularly from developing countries – can thrive in GVCs and international trade if they are proficient in internet and e-commerce.

Meanwhile, from a political viewpoint, international performance can be partially associated with the regulatory settings of a country. Chinese apparel SMEs, for example, have a strong basis within global markets because the government designed some well-rounded policies on e-commerce many years ago (Li et al., 2019b). In the meantime, Indonesia's position on this issue is still in the early stages of development. However, despite the lack of comprehensive regulations on e-commerce, the success of both SMEs in building websites to enter global market can be attributed to the decent broadband internet connectivity in Indonesia (UNCTAD, 2018). In the end, this finding also confirms the research from Lanz et al. (2018) that simple internet infrastructure is sufficient to bring SMEs into global market.

Research Implication

This research argues that Indonesia can survive the challenges given all the resources they have. Therefore, this part explores the latitudes of policy settings that can possibly raise the export performance of Indonesian SMEs through GVCs, particularly direct backward participation. It covers two main aspects. First, the input side consists of a recommendation on a policy that can be reinforced by the Indonesian government to attract more SMEs to engage in backward participation. Second, it explores the output side concerning through what channel Indonesian SMEs can enter the global market.

If Indonesian SMEs are being pushed to have more export share, the government must show its commitment towards a more outward-looking policy. This assumption is grounded in what the Indonesian government has done to raise the export performance of export-oriented sectors decades ago. From the 1980s until today, the competitiveness of exporting sector has been backed by the ease of import for export purposes facility (KITE). A policy that is consistent with the fundamental of global value chains, where in order to export a country could delegate its competitive disadvantages to its counterparts whose more proficient in a certain activity (Bown et al., 2021; Gibbon et al., 2008; Porter, 1990). Indonesian shortcoming on the intensive-capital sector has been looming over the years and, for this reason, the government continually enforces KITE in the downstream sector as a way to cope (Gereffi & Frederick, 2010).

The implementation of KITE for SMEs can be a turning point for all stakeholders who are concerned about SMEs' low participation in GVCs and export. For SMEs, KITE would be useful for three reasons. First, it will make imports more attractive as KITE allows SMEs to avoid import duties and consequently, lowering the price of the SMEs' products. Second, this policy will ensure SMEs export after processing raw or intermediate foreign inputs. Third, in general, it can be means to boost the export performance and backward participation GVCs of Indonesian SMEs at the same time (Bas & Strauss-Kahn, 2014). However, this policy might need several adjustments before bringing it into force because it is still only accessible to large firms (Tijaja & Faisal, 2014). For example, the recipient of KITE should be a limited company (PT), while many SMEs have a limited partnership scheme (CV). In addition, Orbit Gear and NBDN Denim have shown that participating in GVCs is feasible using digital means and more SMEs are likely to continue down this path in the near future. Therefore, adjusting KITE to keep up with digital development must also be taken into consideration by the government (UNCTAD, 2018).

As for the output, e-commerce can be the main alternative to Indonesian SMEs' export growth that remains sluggish (Vu et al., 2022). However, it will be unwise to force the existing marketplaces to create cross-border e-commerce immediately. The government along with the marketplaces seem to uphold this view. They prefer to improve the readiness of SMEs in producing sophisticated products as they become more discerning as to which SMEs can go to the global market (Fahmi et al., 2017; Markusen et al., 2008). However, the following snippet of President Joko Widodo's statement indicates that Indonesian apparel SMEs have started to evolve.

> *I just came in (an expo of SMEs export in Jakarta), and my colleagues showed me the SMEs' products, and apparel surprises me a lot. I saw the design is no longer outdated. They are now very fashionable (Sekpres, 2019).*

This statement implies that the predominant Indonesian apparel SMEs was producing less sophisticated products, but several SMEs have started to produce more sophisticated products. In 2019, the government made an open invitation for local apparel SMEs to participate in an international apparel expo abroad. The total applicants were 121, but only five were selected and four of them are specialized in the niche market of technical gear and selvedge denim jeans. Moreover, they even engaged in backward participation GVCs (Ministry of Tourism and Creative Economy, 2019). The issue of competitiveness is also recognized by Indonesian marketplaces. Almost all Indonesian marketplaces have launched at least a program to address this issue. For example, Shopee Indonesia has created Shopee Export Campus to facilitate Indonesian SMEs in identifying their competitiveness as well as navigating into global market (Suyanto et al., 2021). Against this backdrop, building cross-border e-commerce for Indonesian SMEs must be done on an incremental basis, and should come along with the readiness of Indonesian SMEs (Lendle et al., 2016; Rahayu & Day, 2017).

CONCLUSION AND SUGGESTION

As a country with low-tech manufacturing capability, Indonesian apparel export has long been

championed by the mass-product category, which its success is mainly driven by Indonesian comparative advantage – a huge labour force. For Indonesian apparel SMEs, it might be arduous to embark on the mass-product category considering discrepancies in resources compared to that of large firms (Khan & Lew, 2018). For this reason, Indonesia apparel SMEs are presented with twofold approaches in order to prosper on the global stage. They can either produce apparel with excellent graphic design or deliver product lines utilizing high-grade materials.

Orbit Gear and NBDN Denim that plunge into the latter option have decided to import in order to obtain advanced specifications of fabric. This article concludes that their decision toward backward participation GVCs has been prompted by two events at the domestic and international levels. At the domestic level, the dismissive attitude by the Indonesian government and businesses towards the agenda of modernizing outdated machinery and fabricating the competitiveness of the textile industry on derivative cotton products has brought hesitancy among both SMEs to engage in indirect backward participation GVCs. Meanwhile, the international event, which has been shaped by the consensus of their niche market community, guides both SMEs to obtain inputs with advanced specifications that are only found in several countries with high-tech manufacturing capability.

With regards to SMEs' participation in backward participation GVCs, Orbit Gear and NBDN Denim have been benefited from the development of the internet in the last recent years. The quest for foreign suppliers can be easily performed by both SMEs since many of their suppliers have engaged in B2B e-commerce. Despite being able to search for foreign suppliers through the internet, this article concludes that it is the internet proficiency of both SMEs that has led them to the right inputs. Because, in order to find the input that matches their niche market demand, both SMEs have to conduct comprehensive online research to identify which supplier is fall under their category. Furthermore, this proficiency is also advantageous for expanding their market destination. It is not only useful for building the website as the main channel of selling but also crucial for mapping their niche market dynamics in order to deliver products that fit the market demand.

To further progress the development of Indonesian SMEs into backward participation GVCs and export, Indonesian government can exercise the KITE policy to SMEs to make the import more attractive. As for e-commerce export, the government does not need to create a dedicated cross-border e-commerce platform imminently. Instead, improving the digital literacy among Indonesian SMEs must be taken into account. In the end, Indonesian SMEs can provide many valuable lessons as more scholars have come up with issues that are still unexplored within the context of Indonesia. For example, although the production activities of Orbit Gear and NBDN Denim are underpinned by e-commerce, this research does not address how the latest governance of GVCs – consumer-feedback chain – emerges. This kind of governance has been anticipated by Gereffi (2001) back in 2001, but the emergence just raised in 2019 as Li et al. (2019b) captured this governance shifting through the experience of Chinese SMEs, where their sales growth was robust since they engaged in the Chinese cross-border e-commerce giants.

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Towards feasibility and sustainability of chrysanthemum cut flowers farming: Evidence from Pasuruan Regency, Indonesia

Silvi Purnama Sari, Iwan Nugroho*, Rita Hanafie, and Suwarta

Widyagama University of Malang, Indonesia

*Correspondence email: iwanuwg@widyagama.ac.id

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ABSTRACT

The chrysanthemum commodity has shown a marked increase in the demand for decorations, ornaments and ceremonies service business in urban areas. This has raised attention to the feasibility and implications of sustainable production at the farm level. This study aims to measure the economic feasibility and sustainability of the chrysanthemum farm business. The study was carried out by surveying 24 chrysanthemum farmers in the village of Tutur, Tutur District, Pasuruan Regency. The analysis method used farming feasibility and multidimensional scaling (MDS) approach of Rapfish. The results of the study found the criteria for chrysanthemum cultivation of R/C ratio and ROI of 2.58 and 1.58, with profit equivalent to 126.66 million rupiahs per month per hectare. The study also found that the sustainability index in the dimensions of the social, economic, institutional, and environment was 62.74, 57.76, 57.48 and 51.66; all of which are categorized as fairly sustainable. In those dimensions, it was found that the most important attributes influencing sustainability were land conversion, farmers' network in chrysanthemum cultivation, access to business capital and changes in market trends. Further research suggests strengthening farmer group institutions, implementing innovation and developing sustainable tourism areas.

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INTRODUCTION

Horticulture as an agricultural product is seen as a potential source of growth to be developed in the agribusiness system because it has high linkages both to the upstream and downstream sides. It covers all activities in the agricultural sector, from providing production inputs to product processing and marketing.

Floriculture plants are one of the horticultural commodities that have great potential to be developed as an effort to grow the regional and national economy. Flower plants have become a global agricultural business venture, relying on innovative trends and niches to help increase product sales (Darras, 2021) such as roses, carnations, gerberas, and chrysanthemums. Of the various types of floriculture plants that exist, chrysanthemum has good agribusiness prospects and provides high economic opportunities.

The progress of development in various fields encourages the decoration and ceremony service industry to develop rapidly in various regions in Indonesia. According to Darras (2021) the cut flower industry is able to meet the challenges of demand for innovation and new products through dynamic

marketing campaigns. The chrysanthemum business is highly dependent on market demand and prices (Putra et al., 2019). Wijayani et al. (2017) found that the largest consumer of cut flowers came from office workers and loyal customers. Events such as weddings, new year, Eid, or certain ceremonies request decoration services from flower material, cut leaves or a series of pot plants (Lintang et al., 2020). In addition, public awareness of the need for green open space, especially in urban areas, is a great opportunity for the development of nurseries in various areas to provide potted plants and landscapes.

The prospect of rising demand for ornamental plant commodities will have an impact on market opportunities for business people. The increase in the flower business will spur the economy of rural communities, improve the standard of living of farmers, increase the country's foreign exchange, and open up job opportunities. The number of cut flower producers is increasing every time, indicating that the market share is still relatively open. In addition, the increasing public knowledge about the benefits and uses of cut flowers in big cities triggers the development of the cut flower industry.

Considering that the demand for ornamental plants, including chrysanthemum, continues to grow both for domestic and export needs, ornamental plants can be positioned as important trading commodities in the country and in the global market (Darras, 2021). Meanwhile, during the last few years, floriculture business actors have grown from small to medium scale. Floriculture production centers need to be nurtured through an efficient, sustainable and competitive scale of garden management.

In 2020, chrysanthemum production reached 383,466 million stalks with a harvested area of 836.96 hectares. Provinces with the largest production of chrysanthemum were West Java, East Java, and Central Java, with the contribution of production of 140.06 million stalks (36.52%), 121.18 million stalks (31.60%) and 111.38 million stalks (29.05%). The chrysanthemum harvested areas of the three provinces were 166.37, 495.31 and 165.06 hectares, respectively. The export value of chrysanthemum reached US$733 thousand, with the main export destination of Japan with 43 tons worth US$732,064. Meanwhile, the import value of chrysanthemum reached US$19,000, especially from China which reached US$18,917 (3 tons) (BPS, 2020).

In East Java, chrysanthemum production in 2020 was contributed mainly by Pasuruan and Malang Regencies, with 93,783 and 4,683 million stalks, respectively (BPS Malang Regency, 2021; BPS Pasuruan Regency, 2021b). This makes Pasuruan Regency a center for chrysanthemum development in East Java, in which the potential to meet increasing market demand is very open for development.

Tutur Village in Pasuruan Regency is one of the main production centers of chrysanthemum plants. The village has optimal ecology for chrysanthemum farming, especially fertile soil, altitude, and cool air temperature. Chrysanthemum farming in Tutur village grows rapidly, gaining support from institutional, social, and economic factors. The chrysanthemum cultivation atmosphere in Tutur village is supported by cultivation experience, innovation, market access, and infrastructure support.

However, the chrysanthemum cultivation business in Tutur village also has numerous problems. Field conditions show that chrysanthemum cultivation faces several obstacles, including small business scale, limited capital, limited quality seeds, and weak production and marketing management. This indicates the uncertainty of business sustainability. Many studies on chrysanthemum have been carried out, including in terms of the supply chain (Putra et al., 2019), business feasibility and risk (Chrisdiyanti & Yuliawati, 2019; Fadlilah et al., 2020), description and business strategy (Fadlil et al., 2020; Helmiatin & Susanty, 2019), technology implementation (Hayusman et al., 2019; Lintang et al., 2020), market perception (Wijayani et al., 2017), and global trade (Darras, 2021). The studies provide important findings regarding the optimistic prospects of chrysanthemum, the importance of technology and access to capital. However, they do not focus on the sustainability of the chrysanthemum business.

A more comprehensive study on sustainability seen from the institutional, social, economic and environmental aspects will be able to describe in more detail the chrysanthemum business in Tutur village. A comprehensive approach needs to be taken to map the scope of agribusiness (Chengappa, 2018) to detect the extent to which farmers receive benefits or costs, the constraint factors, and what needs to empower them. An integrated approach involving the government, farmer associations and other concerned parties so that the floriculture business or business is

efficient, competitive, and provides farmer welfare (Putra et al., 2019).

This study aims to analyze the economic feasibility and evaluate the sustainability of chrysanthemum farming in Tutur village in Tutur district, Pasuruan regency.

RESEARCH METHOD

The research was conducted in Tutur Village, Tutur District, Pasuruan Regency. The location selection was done deliberately with the consideration that the area is a production center area, and that the cut chrysanthemum is one of the leading ornamental plants in Pasuruan Regency.

The research was carried out through interviews with chrysanthemum farmers using a closed-ended question questionnaire. A total of 24 respondents were selected randomly to obtain variables and attribute concerning institution, social, economic and ecological characteristics of the chrysanthemum farming (Table 1). Secondary data were obtained from documents from the Pasuruan Regency Agriculture Office and relevant agencies.

The research objective was operationalized through the feasibility method of farming and the multidimensional scaling (MDS) approach. The economic feasibility analysis method of farming used the criteria of cost and revenue analysis, Revenue Cost Ratio (R/C Ratio), and Return on Investment (ROI). The variable costs and revenues were obtained from farmer respondents.

Table 1. Research Variable and Attribute

	Variable and attribute	Criteria	
		Good	Bad
	Institutional		
O6	Government policies to support flowers farming	4	1
O9	Tourism policy boosts domestic demand for cut flowers	4	1
T2	High competition with imported products in the free market era	1	4
T3	Changes in economic and political conditions affect price stability	1	4
T4	Market trends are changing rapidly affecting production	1	4
T1	The free market will suppress the domestic market	1	4
T8	Government support for floriculture business is relatively low	1	4
	Social		
O2	Not many farmers have developed chrysanthemums	4	1
S8	Lot of resources to support the chrysanthemum cultivation	4	1
T5	Many farmers cultivate ornamental plants	1	4
TK3	Labor costs of chrysanthemum cultivation	1	4
S4	A lot of farmers are engaged in chrysanthemum cultivation	4	1
W8	Marketing of chrysanthemum is done individually by farmer	1	4
P3	Area size of chrysanthemum cultivation	4	1
	Economy		
S1	Farmers' skill in chrysanthemum cultivation technology	4	1
P7	Production quantity of chrysanthemum	4	1
P6	Seeds cost of chrysanthemum cultivation	1	4
O3	Improved technology in cultivation and postharvest	4	1
T7	Obstacles for a business capital access	1	4
P4	Greenhouse cost	1	4
W9	The price of chrysanthemums tends to be low during the main harvest	1	4
O1	The demand for chrysanthemums is increasing in outside city	4	1
O8	The demand for chrysanthemums is increasing in big cities	4	1
W6	Cultivation technology depends on import product	1	4
	Environment		
S2	The period for cultivation is relatively short and throughout the year	4	1
O7	Local varieties are available in abundance and quality	4	1
P5	Pesticides cost of chrysanthemum cultivation	1	4
P1	The water irrigation cost of chrysanthemum cultivation	1	4
P2	Electricity costs of chrysanthemum cultivation	1	4
T6	Land conversion from agricultural to non-agriculture land	1	4
S3	Cultivation technology produces very bright chrysanthemum colors	4	1
O5	Expansion of chrysanthemum cut flower business in other locations	4	1
W5	Seed degeneration of chrysanthemum cultivation	1	4
S5	Chrysanthemum cultivation technology is relatively simple to do	4	1

The MDS analysis method used the Rapfish software application to calculate the sustainability index of each variable (Table 1) to find sustainable farming adjusted for the sustainability category (Table 2). Furthermore, the MDS method also measured the leverage index to identify which indicators (Table 1) were levers or critical, to determine sustainability farming. Indicators were obtained from farmer respondents, who gave close-ended answers on an ordinal scale of 1 to 4 (Likert scale).

Table 2. Sustainability Level Category

Index Value	Category	Sustainability Level
00.00 - 24.99	Bad	Not Sustainable
25.00 - 49.99	Less	Less Sustainable
50.00 - 74.99	Enough	Fairly Sustainable
75.00 - 100.00	Good	Sustainable

Source: (Pitcher & Preikshot, 2001)

RESULT AND DISCUSSION

Overview of Research Area

Tutur is one of the 24 districts in Pasuruan Regency, sitting at the geographical position of 7.30° - 8.30° South and 112°30° - 113°30° East latitude. Tutur District occupies an altitude of 300-1,600 m above sea level couple with wavy and hilly physiography, with 3,448 mm of rainfall and 129 rainy days in a year. With climatic and ecological conditions suitable for floriculture planting, Tutur District is the center for cut chrysanthemums production in East Java (BPS Pasuruan Regency, 2020).

Chrysanthemum production in 2019 reached 93,753 million stalks, up from 86,247 million stalks in 2016 (BPS Pasuruan Regency, 2021a). Chrysanthemum production in Pasuruan regency is only found in Tutur district. More than 7 groups of farmers work on 30 hectares of land area, where each group consists of 10-25 farmers spread over the villages of Blarang, Tlogosari, Gendro, Andonosari, Kayukebek, Ngadirejo and Tutur villages.

Chrysanthemum cultivation has developed in 20 years. This builds farmers' experience in mastering cultivation technology and number of skilled workers. The experience shapes people's competence and innovation to make Tutur District a center for chrysanthemum production, producing standard and spray types of chrysanthemums. Chrysanthemum plant growth until harvest is 8-12 weeks depending on the variety and season. In the dry season, chrysanthemum flowers are harvested at 8-11 weeks, while in the rainy season the harvest is 12 weeks.

Tutur Village is one of 12 villages in Tutur sub-district. It has an area of 3.42 sq. km, inhabited by 5,477 residents (BPS Pasuruan Regency, 2020). As the capital of the sub-district, the availability of infrastructure, market access, and production factors are very adequate so that the chrysanthemum farming business in Tutur Village is more advanced than in other villages. The increase in chrysanthemum production is due to the application of drip irrigation cultivation technology, the use of superior seeds and balanced fertilization, the development of chrysanthemum gardens, and the support of the government budget. The marketing of chrysanthemum reaches various areas such as Surabaya, Malang, Bali, Jakarta, and Makassar.

Characteristics of Respondents

The age of most farmer respondents ranges in the 41-50 years' group, i.e. as many as 54.2% of the total 24 respondents. Meanwhile, the most experience in farming chrysanthemum was found in the group of 5-10 years or 66.60% of all respondents. Respondents with work experience of 10-15 years and 15-20 years were 4 people or 16.70%. The distribution of farmers' education level was found to be highest at the high school level (66.70%), followed by university (25%) and junior high school (8.30%) (Table 3).

Characteristics of age, work experience and education can reflect the attitudes and behavior of farmers in running a farming business. Age level can affect farmers' physical and thinking abilities at work. According to Soekartawi (1990), young age reflects the spirit to recognize new things and adopt innovations and develop farming business.

The farming experience reflects expertise, skill, and innovation. Farmers with experience are also able to analyze problems and find solutions for their business ventures. Time will shape the maturity to face problems and find the skills to innovate in a fast-changing business venture.

The influence of education is it strengthens management and enables farmers to recognize the scope of business ventures. The chrysanthemum business must deal with dynamic market conditions. It is not surprising that university graduates are involved in the chrysanthemum business, because they can identify input innovations to marketing that require complex analysis. The chrysanthemum business deals

with modern services, which generate high added value because it requires service management that emphasizes speed and customer satisfaction.

Table 3. Characteristics of Respondents

Variable	People	Proportion %
Age		
31-40 years	4	16.70
41-50 years	13	54.20
>50 years	7	29.10
Education level		
Junior High School	2	8.30
Senior High School	16	66.70
University	6	25.00
Working experience		
5-10 years	16	66.60
10-15 years	4	16.70
15-20 years	4	16.70
Land size		
<500 m^2	9	37.50
500-2,000 m^2	11	45.83
2,000-4,000 m^2	2	8.33
>4,000	2	8.33
Production		
<25,000 stalks	9	37.50
25,000-100,000 stalks	11	45.83
100,000-500,000 stalks	3	12.50
>500,000 stalks	1	4.17

Furthermore, the average land area for chrysanthemum cultivation is 1,579 m2 per respondent. The highest land distribution was found in the area of 500-2,000 m2, as many as 45.8% of respondents. As many as 83.3% of respondents have a land area of fewer than 2,000 m2, which indicates a relatively small land area. This also has an impact on the low average production of 85.873 stalks per respondent, with productivity rate of 54.38 stalks per m2.

The cultivation of chrysanthemums in the village of Tutur characterizes modern agriculture. The scope or supply chain of production to the market affects the lives of farmers (Putra et al., 2019). Characteristics of respondents indicate a change in life towards modern society, especially with regard to technology and social organization (Rifkian et al., 2017). Changes in 20 years have shaped the attitudes and behavior of farmers to quickly adapt to market demands and needs and accumulate chrysanthemum farming competencies.

Feasibility of Farming Business

The cost and income analysis calculations are presented in Table 4. Production costs in chrysanthemum cultivation include variable costs (seeds, fertilizers, pesticides, equipment depreciation, and labor costs) and fixed costs (depreciation, electricity and water). The average cost per season incurred by each respondent was 31,635,789 rupiah. Meanwhile, the average production per respondent was 2,060,950 flower stalks, and with a unit price of 950 rupiah per stalk, the revenue was 81,579,271 rupiah and profit was 49,943,482 rupiah. This study found the R/C ratio and ROI of 2.58 and 1.58, respectively.

Table 4. Chrysanthemum Farming Costs and Revenue

Variable[1]	Value
Average fixed cost (rupiah)	
Depreciation of materials	4,156,875
Electrical installation	372,708
Water installation	677,708
Average variable cost (rupiah)	
Seed	20,920,313
Fertilizer	2,566,935
Pesticide	1,995,833
Labor	945,417
Average total cost (C)	31,635,789
Number of respondents	24
Total production (stalk)	2,060,950
Average production (stalk)	85,872
Price (rupiah/stalk)	950
Total revenue (rupiah)	1,957,902,500
Average revenue (rupiah) (R)	81,579,271
Average profit (rupiah) (π)	49,943,482
R/C Ratio (R/C)	2,58
ROI (π/C)	1.58

[1]Calculation on the average of each respondent

These results indicate that chrysanthemum farming is very profitable. This research shows that with an average land area of 1579 m2, it can generate a profit of almost 50 million rupiah (rounded off) within 10 weeks (average harvest age), or equivalent to 20 million rupiah per month. If it is converted in a matter of one hectare, then farmers will get a profit equivalent to 126.66 million rupiah per month.

This study is alike as the findings (Chrisdiyanti & Yuliawati, 2019) in Badungan, Ungaran, Central Java, which found a profit of 133.40 million rupiah and an R/C ratio of 1.71. Meanwhile Fadlilah et al. (2020) discovered an R/C ratio of 1.90 in Batu City, where production is significantly affected by seeds, chemical fertilizers and labor. Cost is a focus in the chrysanthemum business supply chain. Chrysanthemum farmers in Bandungan, Semarang, generally accept the burden of transportation costs to retail traders in direct marketing (Putra et al., 2019). The conspicuous problem faced by farmers is the high cost although this study found a relatively high ROI

(1.58). They had to expense costs through various efforts to manage their business. Therefore, the experience of farmers is vital to anticipate access to costs, cultivation management, market access and to reduce the high business risk due to these high costs.

Sustainability of Farming Business

The sustainability index of the variables of Institution (I), Social (S), Economic (Ec), and Environment (Ev) was categorized into a fairly sustainable level (Table 5), or as displayed in the form of radar (Figure 1). Meanwhile, the Monte Carlo test results show no significant difference compared to the sustainability index. This result shows that the sustainability index meets reliability and is stable.

Table 5. Sustainability Index of Variable

Variable	Value[1]	Sustainability Level[2]
Institution	51,66	Fairly Sustainable
Social	57,76	Fairly Sustainable
Economic	57,48	Fairly Sustainable
Environment	62,74	Fairly Sustainable

[1]Reliability test using the Monte Carlo method on each variable shows a difference of no more than 1 unit
[2]0 - 24.99: Not Sustainable; 25 - 49.99: Less Sustainable; 50 - 74.99: Fairly Sustainable and 75 - 100.00: Sustainable (Pitcher & Preikshot, 2001)

This research shows that the environmental dimension indicated the highest sustainability (62.74), while the institutional aspect indicated the lowest sustainability (51.66). This signifies that the management of chrysanthemum farming in the environmental dimension ran most optimally. The involved attributes worked well in support of sustainability. On the other hand, the management of chrysanthemum farming in the institutional dimension worked less than optimally. Institutional attribute performance did not function to produce sustainability. Meanwhile, the social and economic dimensions show performance in the range between the institutional and environmental dimensions. A study by Parmawati et al. (2021) showed fairly sustainable farming shallot on the institutional and social dimensions of 52.9 and 60.47. Meanwhile, another study (Suryana et al., 2012) found 34.53 to 44.40 for the similar dimension in the red snapper fishery.

The sustainability index reflects the ability of resource attributes to support the extent to which resource functions work. Jowsey & Kellett (1995) stated that resource sustainability is contributed by ecological attributes that characterize recyclability/ depletability, longevity and environmental impact. It can also be adapted to the sustainability of the social, institutional and economic dimensions, and of course the interactions between them. The ability to recycle can be seen as the degree of adaptation to the extent to support the function of a resource.

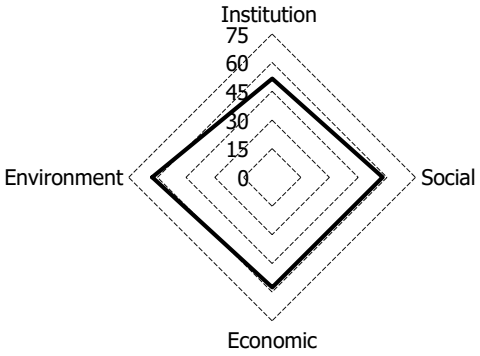

Figure 1. Sustainability index in the radar pattern

To complete the sustainability index, leverage measurement can further explain which attributes as leverage for the benefit of chrysanthemum business management sustainability. Attributes in a dimension are calculated from the leverage number, which is the percent change in Root Mean Square. Leverage shows the changes that occur when the attribute is released. The focus is to scrutinize at attributes that have the high leverage values. The higher the leverage indicates the more important or needed attribute to maintain sustainability.

The institutional dimension attribute leverage is presented in Figure 2. Three attributes with the highest leverage were found, i.e. the ever-rapidly changing market trends (4.52%), government support for floriculture businesses (3.93%), and tourism policies that encourage demand for chrysanthemums (3.87%). These attributes were an important requirement to support the chrysanthemum business. Cultivation of chrysanthemum is a new thing for the villagers. It has not been 20 years and there has been no local culture developed yet. Although it has provided benefits and welfare, in this study chrysanthemum cultivation is highly dependent on external institutions, especially demand and market prices (Putra et al., 2019). A study (Muryanti, 2020) indicated the need to establish local institutions to strengthen and buffer the implications of external influences. Helmiatin & Susanty (2019) argued that

the external factors of the chrysanthemum business are very dynamic, therefore farmers need organizational strengthening to manage the internal and external dynamics of their business.

Three attributes with the highest leverage on the social dimension (Figure 3) were the substantial number of farmers engaged in chrysanthemum cultivation (8.80%), the many farmers cultivating ornamental plants (8.69%), and the individual marketing (8.55%). The findings of this social dimension show an emphasis on competition and synergy. Chrysanthemum farmers have so far shown competition for the market, and therefore it is a positive thing to communicate with each other, filter information and improve the quality of cultivation and products. However, those have not been realized; instead, they worked individually and have not tried to build joint marketing, thus reflecting a weak bargaining position. Chrysanthemum agribusiness does not seem to reflect incentives for increasing cultivation quality and reasonable prices, as studies have shown (Irawan, 2016; Kahmir et al., 2008).

Owner farmers always cooperated with farm laborers because they both need each other. Farm workers needed agricultural land from the owner farmers, while the owner farmers need farm laborers to work on land that they cannot work on themselves. The more owner farmers give trust to farm workers to work on their land, the greater the expectations of farm workers to work and earn income (Rifkian et al., 2017).

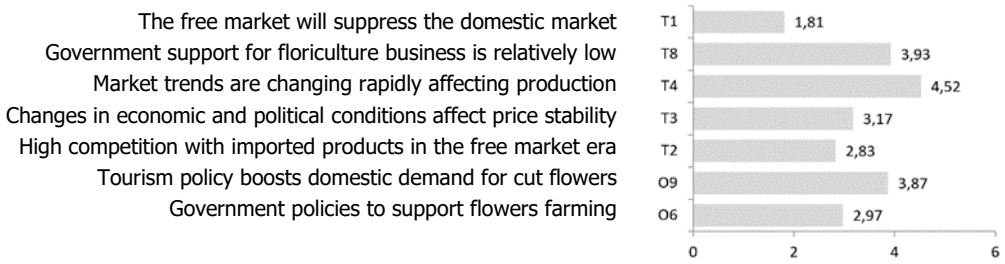

Figure 2. Leverage attribute for the institution dimension

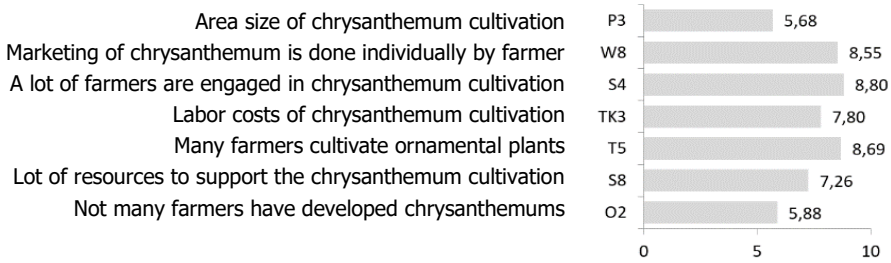

Figure 3. Leverage attribute for the social dimension

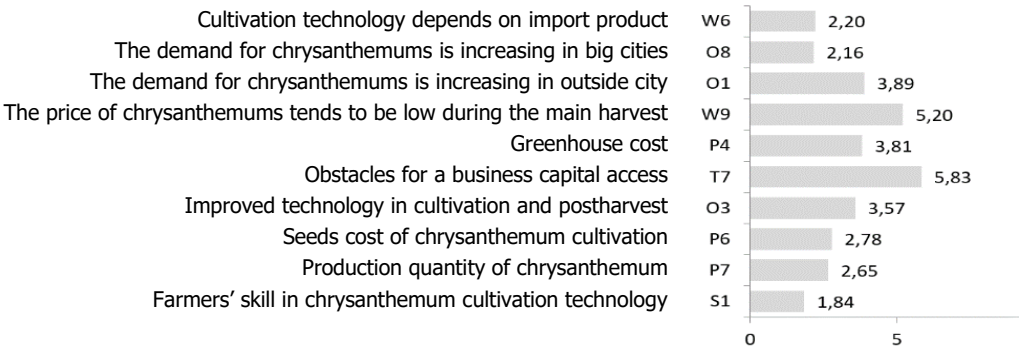

Figure 4. Leverage attribute for the economic dimension

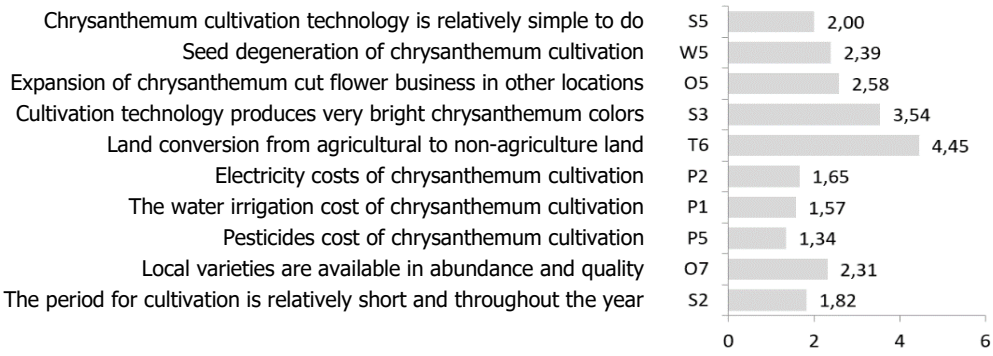

Figure 5. Leverage attribute for the environment dimension

The attribute leverage in economic dimension is presented in Figure 4. Two attributes with highest leverage were the application for business loans in agriculture (5.83%) and the price of chrysanthemum interest falls during the main harvest (5.20%). These two attributes were commonly found in horticultural agribusiness in Indonesia. Chrysanthemum cultivation requires high capital so that careful production management is vital to reduce the risk of loss, including the risk of harvest prices. Farmers should make the right decisions to prevent the risk of these losses (Irawan, 2016; Kahmir et al., 2008), especially since the influence of market demand and price is very robust on the chrysanthemum business, and farmers often receive relatively low prices in the supply chain (Putra et al., 2019).

Meanwhile, the attributes with the highest leverage on the environmental dimension (Figure 5) were the shift in the function of agricultural land to residential areas (4.45%) and the bright flower colors due to the altitude of the place (3.54%). These two attributes are the comparative advantages of the Tutur region as a center for chrysanthemum production in East Java. Meanwhile, the color of chrysanthemums and the appearance of freshness determine their economic value (Lintang et al., 2020), thus becoming the main factors in choosing the type of flower to be cultivated and post- harvest treatment. Thus, this comparative advantage becomes the focus to maintain its sustainability. According to Wijayani et al. (2017), yellow and white chrysanthemums are the flowers most chosen by consumers because they are believed to cause a sense of energy and social hope, as well as being able to stimulate mental and general activity.

The tourism service economy becomes a disincentive through changes in land use from agriculture to non-agriculture, and negatively influences ecosystem services (Stankov et al., 2016; Widaningrum et al., 2020). Saha & Paul (2021) stated that changes in land use in tourist areas induced in the entire landscape have been fragmented, vegetation cover degenerated, and the ecology of the plains has been destructed. The environmental dimension of sustainability requires attention due to tourism activities because it has the potential (Gössling, 2002) to change the land cover and land use, the use of energy and its associated impacts, as well as changes in the understanding of the environment.

Research Implication

The performance of farmers in chrysanthemum cultivation provides important findings, related to the feasibility of economic business and the challenges of business sustainability. However, it is crucially revealed that the chrysanthemum business involves a long chain, in which the farmers accept significant burdens and risks. This study reveals several needs that need to be done to help farmers and efforts to strengthen institutional performance in anticipating especially external factors that are the dominant factors in the chrysanthemum business.

Strengthen local institutions. A chrysanthemum farmer group has been formed in Tutur Village. So far, farmer groups have the function of coordinating activities to improve cultivation technology, market information, and other assistance, especially from the government. However, the function of the group is not yet fully binding and coercive as an organization, and on the contrary, farmers display more individual behavior when it

comes to efforts to improve efficiency, economies of scale, and market access. This puts farmers in a weak position and accepts high risks in running their businesses.

Strengthening farmer group organizations requires the commitment of farmers to work together and protect each other so that they have a strong position when facing the chrysanthemum supply chain (Putra et al., 2019). A strong internal management group will be able to face external challenges, especially market conditions (Helmiatin & Susanty, 2019). Internal strengthening of farmer organizations can strengthen social capital and capacity (Nugroho, Hanafie, Negara, et al., 2021), especially in addressing market influence, as is generally found for commodities that support tourism demand (Nugroho et al., 2020). It is time for farmer groups to formulate strategic needs for business development, for example, cooperation in the management of production factors to contract farming (Chengappa, 2018), as an effort to increase the value of the supply chain (Putra et al., 2019).

Innovation. Chrysanthemum farming requires a display of creativity and innovation to increase its economic value (Darras, 2021; Lintang et al., 2020). Production technology innovations are carried out by farmers corresponding to their abilities, skills and commitments to maintain flower quality in accordance with consumer needs. Special needs to produce chrysanthemum colors can use additional night lighting technology through electrical energy installations and greenhouses (Fadlil et al., 2020; Hayusman et al., 2019). Meanwhile, Lintang et al. (2020) suggested the post-harvest technology of pulsing and holding liquid during display for extending the chrysanthemum vase life.

Tutur Village should make innovations or breakthroughs to take advantage of the potential for tourist visits. This work requires government cooperation in local tourism planning (Nugroho et al., 2018), by allowing the establishment of storefronts or centralized tourist areas that promote chrysanthemum flowers along with other local agricultural products (Mardiana et al., 2019). Featured farmers or farmer groups can run this business using modern management, by providing introduction and education of chrysanthemums to attract more tourists. This can accelerate creating added value due to increased tourist visits in the surrounding area (Nugroho, Hanafie, Rahayu, et al., 2021).

Further, the innovation of the chrysanthemum business development can be directed towards medicinal or organic farming. Chrysanthemum plants are thought to contain natural bioactive compounds, which include flavonoids, phenolics, tannins, coumarins, luteolin, and apigenin. These compounds are useful for the treatment of anti-gout (Abu Bakar et al., 2018). Another benefit of chrysanthemum plants is as a compound in a natural insecticide. This type of insecticide may lead to organic farming, be more beneficial to biodiversity and the environment, and further reduce dietary exposure to pesticides. (Shahrajabian et al., 2020).

Access to capital. This study shows that access to capital is a significant constraint even though the study shows a relatively high ROI (1.58). There is a kind of tangled thread behind this problem so that the chrysanthemum business presents a disincentive for the entry of capital. This situation is probably due to the weak internal conditions of farmers, low economies of scale, and less functioning farmer groups. This situation creates a high level of business risk for formal financial institutions, which instead operate high-interest money lending at the expense of farmers. This should motivate farmers to work and collaborate by strengthening farmer groups in accessing capital or dealing with the external environment.

Land use policy. Pasuruan Regency greatly benefits from the natural resources and environment in Tutur Village, which provide the carrying capacity of agriculture, tourism, and especially horticultural commodities. This also creates a comparative advantage for the growth of chrysanthemums. This circumstance has a positive impact on the economic aspect, and indicating an impact on land use change. This change is a necessity, so the Pasuruan Government needs a land policy that is oriented towards sustainable tourism development for controlling the negative environmental consequences (Gössling, 2002; Saha & Paul, 2021).

Enforcement for tourism development enables an appropriate capacity of ecosystems in order to sustain food production, maintain freshwater and forest resources, regulate climate and air quality, and provide biodiversity (Foley et al., 2005). This policy also provides an ecosystem that supports human life to maintain the strengthening of institutional, social and economic aspects of chrysanthemum, through the

ability to adapt and maintain sustainability (Jowsey & Kellett, 1995; Nugroho et al., 2020).

CONCLUSION AND SUGGESTION

This study shows that the measurement of economic feasibility and sustainability work well and complement each other to find the important aspects of chrysanthemum business prospects that are proven to provide welfare for farmers in a sustainable manner. Economic feasibility indicates a performance portrait in a given condition, while the measurement of the sustainability index captures a wider perspective on strategic and synergistic steps to find the sustainability of the chrysanthemum business.

The chrysanthemum business has succeeded in providing farmers with a profit equivalent to 20 million rupiah per month on an average land area of 1579 m2, equivalent to 126.66 million rupiah per month per hectare. This study found the R/C ratio and ROI of 2.58 and 1.58, respectively.

The sustainability of the chrysanthemum flower business in the environmental dimension found the highest index (62.74), followed by social (57.76), economic (57.48), and institutional dimension (51.66). This index shows that all dimensions are categorized as fairly sustainable, where the environmental aspect shows the highest sustainability, while the institutional aspect requires attention to maintain sustainability by considering which attribute management is better.

The attributes of the institutional dimension with the highest leverage reflect the important needs to support the sustainability of chrysanthemum cultivation, i.e. market trends that always change rapidly (4.52%), government support for floriculture businesses (3.93%), and tourism policies (3.87%). The attributes that mostly influence the sustainability of the economic dimension are access to business capital (5.83%) and the price of chrysanthemum flowers falls during the main harvest (5.20%). Meanwhile, the attribute with the highest leverage on the social dimension is the togetherness of farmers engaged in chrysanthemum cultivation (8.80%) and marketing (8.55%). Sustainability in the social dimension reveals the need for strategic synergy among farmers to improve bargaining positions. On the attribute of the ecological dimension, the highest leverage is found in efforts to defend against land use conversion efforts (4.45%) and the comparative advantage of the high altitude location resulting in the quality of bright chrysanthemum colors (3.54%).

The research suggests several important things as implications of the research findings. First, strengthening farmer group institutions to face the chrysanthemum supply chain and formulating strategic needs for business development. Second, the application of innovation to improve yield and post-harvest quality, as well as the integration of regional development, tourism promotion, and medicine use. Third, strengthening access to capital and reducing business risk for chrysanthemum cultivation through farmer group management and external collaboration. Fourth, planning for sustainable tourism development and controlling the negative environmental consequences.

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Community decision making based on social capital during COVID-19 pandemic: Evidence from Bangelan Village tourism, Indonesia

Gunawan Prayitno*, Dian Dinanti, Rahmawati, Lusyana Eka Wardhani, and Aidha Auliah

Brawijaya University, Malang, Indonesia

*Correspondence email: gunawan_p@ub.ac.id

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ABSTRACT

Bangelan is one of the villages which proclaim as a tourism village in Malang Regency. However, the COVID-19 pandemic has impacted tourist visits, causing considerable losses to tourism economic activityr. This study aims to determine the structure of community adaptation in the face of the COVID-19 pandemic, which is associated with social capital and collective actions to restore socioeconomic conditions. Assessment of social capital used three variables: trust, social norms, and social networks, each of which identifies its relationship with collective action. This study used descriptive analysis and Structural Equation Modeling (SEM) and the data were obtained from the questionnaire. The study results explain that the norm variable in social capital was the most influential for the community to make decisions in taking collective action to restore the socioeconomic conditions. The norms were based on compliance with applicable norms and social sanctions against those who violate. Social norms affected almost every aspect of people's lives and became development pillars. The success of development efforts depended on conforming to or contradicting the development with pre-existing norms. In addition, the role of the community as hosts was the most important element in tourism development where they lived. Furthermore, norms could prevent outsiders from taking the opportunities that often dominate the development of local tourism destinations.

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INTRODUCTION

Indonesia is a country with various tourism potentials and unique culture where the form of popular tourism is an alternative to improve the welfare of the community through the empowerment process. The tourism sector can spur economic growth by increasing job opportunities, increasing per capita income, and increasing people's welfare (Beridze et al., 2020). In 2019, the Ministry of Tourism targeted 20 million foreign tourists. A breakthrough in the tourism sector was made to accomplish this, one of which was village tourism as a form of alternative tourism. The development of tourist villages is highly recommended to apply the concept of Community-Based Tourism (CBT) as a fundamental development (Dangi & Jamal, 2016; Noorashid & Chin, 2021). With CBT implementation, many tourist villages are developing and starting to advance in their management, both individually and in groups. Based on the Ministry of Tourism and Creative Economic

data, in August 2021, 1,838 tourist villages already registered their business activities (Noviarita et al., 2021).

At the beginning of 2020, the world faced a catastrophic Corona Virus Disease 2019 (COVID-19) pandemic. The impact of this pandemic disaster is multidimensional and spread in almost all provinces. It is not limited to the health sector as the national disaster status has also been established in many fields especially economy and socio-culture, including the tourism sector (Hadi, 2020). Tourism is the sector that is most affected due to travel prohibition, thereby drastically reducing the number of visitors at tourist destinations, hotels' occupancy rate, and transactions with travel agents. This also happens to Community Based Tourism (CBT) or tourist villages that are very vulnerable to the COVID-19 pandemic (Noorashid & Chin, 2021). The decline in the tourism and travel business also impacts MSME (Micro, Small, Medium Enterprise) businesses and disrupts employment (Sugihamreta, 2020). In addition, the COVID-19 pandemic has caused local revenue (PAD) from tourist villages to decline due to the lack of tourist visits (Sari & Nabella, 2021).

One of the tourist villages affected by the COVID-19 pandemic is Bangelan Village, located in Wonosari District, Malang Regency. Bangelan village has various physical and non-physical potentials that support its existence as a tourist village. One of the tourist attractions in Bangelan Village is Tanaka Waterfall which can attract up to thousands of visitors on weekends before COVID-19. Apart from the tourism sector, Bangelan village's economy is also supported by agricultural and livestock activities, with the primary commodities being rice, coffee, and goats. COVID-19 pandemic has significantly impacted Bangelan Village life, including the tourism sector. During the COVID-19 pandemic, there was a decrease in tourist visits to Bangelan Village, which influenced the community's economy. As an agricultural village, Bangelan Village's agricultural and livestock activities are hampered in the marketing aspect due to mobility restrictions during the pandemic.

One of the keys to handling the impact of COVID-19 both in social and economic aspects is by strengthening community capacity, i.e. social capital (Prayitno et al., 2022). From the perspective of political science, sociology, and anthropology, social capital generally refers to the norms, networks, and organizations through which people gain access to power and various resources, which are tools that enable decision making and policymaking. The results of studies in multiple countries show that strong social capital will stimulate the growth of various economic sectors because of the high level of trust and closeness of relationships in a vast growing network of fellow economic actors. The culture of mutual assistance, helping each other, and mutual reminding among individuals in village community entities reflects the spirit of reciprocity, trust, and social networks (Haridison, 2021).

Social capital is the whole thing that arises to facilitate the actions of individuals in their social structure (Coleman, 1989). Social capital refers to social networks, relationships between individuals, reciprocal norms, and the emergence of trust between individuals (Putnam, 2000). Each group has potential social capital where its utilization is related to the radius of trust (Fukuyama, 2001). Social capital is related to the ability of a community in an entity or group to work together to build a network to achieve a common goal. This cooperation is characterized by reciprocal and mutually beneficial interrelationships built on trust, supported by positive and strong social norms and values. Coleman (1989) argued that the notion of social capital is determined by its function. There are many functions of social capital. However, there are two common elements: (i) social capital covers some aspects of the social structure, and; (ii) social capital makes it easy for people to do things within the framework of the structure of the social.

Social capital integrates social, environmental, and economic dimensions that play a positive role in the political dimension. The principle of social capital is under the sustainable, inclusive development paradigm that encourages participation and accessibility to society (Fathy, 2019). Social capital is rooted in the idea that norms, trust, and informal networks are valuable resources. The three elements of social capital are interconnected (Farisa et al., 2019). Research on the relationship among elements of social capital shows that there is a direct influence between social norms and trust on social networks that leads to community participation (Farisa et al., 2019).

Norms relate to concrete values that guide the behavior of each individual under regulations applicable in society (Fathy, 2019). For example, Fukuyama (2001) mentioned that norms and values can underlie trust formation.

Social networks are structural elements of social capital that refer to the reciprocal relationships and beliefs in those structures. Social networks can arise from norms and values that are held firmly together. Cooperation is what occurs with a moral exchange, repetition of interactions, and creation a shared identity (Fathy, 2019)

Trust is exchanged with the foundation of norms for the benefit of the people (Fukuyama, 2001). Trust becomes an important aspect in shaping social capital in a rural community. Social norms and values will not become social capital without being based on trust.

The concept of social capital is one of the crucial components to support the human development model. Humans are placed as subjects that determine the direction of development implementation. In various studies, social capital has been associated with village development. A study conducted by Rivera et al. (2019) regarding the role of social capital in agriculture and village development showed that the four dimensions of social capital, including cooperation, trust, culture and tradition, and sense of community, play an important role in agriculture and village development. These four dimensions influence how people organize themselves, relate to each other, and interact for development (Rivera et al., 2019). In term of sustainable village development, the social capital of rural communities will be considered from an inclusive perspective based on the norms of trust to generate profits in the development of the social, ecological, and economic sectors of the village (Podgorskaya & Schitov, 2021). Social capital is a significant issue that policymakers must consider in the village development process. Weak social capital can hamper the implementation of village development policies but can be a supporting factor when strong and well-rooted (Wiesinger, 2007). In the development of the Bangelan tourism village, social capital is shown through mutual assistance in the community. One form of social capital established is a public trust, both towards fellow community members and stakeholders. People do not hesitate to give each other assistance in materials and labor. The existence of community groups also forms a strong network in society.

Social capital can help overcome barriers to collective action (Aldrich, 2012; Nugraha et al., 2021). Social capital focuses on relationships between human beings that encourage social networks so that people are willing to take collective action based on solidarity, tolerance, and mutual trust. With social capital, the community has the instruments to deal with problems caused by the COVID-19 pandemic (Hadiwijoyo & Hergianasari, 2021). However, the community's collective action in solving problems does not just appear. Participation and cooperation are needed that arise from strong social capital conditions. This study aims to identify an appropriate model to describe the relationship between community social capital and the decision to take collective action for the Bangelan Village community.

RESEARCH METHOD

Research survey was conducted in Bangelan Village, Wonosari District, Malang Regency, Indonesia, using questionnaires instrument within October 2021 period under social distancing policy. Data collection aimed to obtain the characteristics of social capital and its relation to the collective actions of the people. The number of samples was determined based on the Krejcie-Morgan formula. Based on the calculations, with a population of 1,397 heads of family, the sample size was found to be of 300 heads of family, consisting of 100 respondents from Arjomulyo Hamlet, 100 respondents from Bangelan Hamlet, 50 respondents from Sidomulyo Hamlet, and 50 respondents from Kampung Baru Hamlet. In addition, observation and interviews were conducted to obtain information related to the condition of the community during COVID-19 pandemic.

Social capital variables (trust, norms, and networks) were composed using the mode of collective action, which in the next stage would encourage the development of adaptation models for rural communities in the face of the COVID-19 pandemic. Using Structural Equation Modeling (SEM), the relationship among social capital variables consisting of trust, norm, and social network could be found, so that the relationship with collective action could be determined.

Analysis techniques in this study were descriptive statistical and SEM analysis. Descriptive statistical analysis describes and interprets data in the form of statistical data to explain each research data (Gitleman et al., 2019). The data presentation from this analysis takes the form of graphs or tables of the average, percentage of data, standard deviation, and others.

Table 1. Research Variable and Indicator

Variable	Indicators	Source
Trust (K)	Trust in fellow people (K1) Trust in people of different cultural backgrounds (K2) Trust in the village apparatus or government (K3) Trust in local community leaders (K4) Trust in local religious leaders (K5) Trust in village institutions (K6) Confidence in information related to the development program to be implemented (K7)	(Farisa et al., 2019) (Hidayat et al., 2020) (Dewi et al., 2021)
Social Norms (N)	Adherence to applicable customary norms (N1) The presence of social sanctions (N2) Attendance level in participating in customary activities or events (N3)	(Farisa et al., 2019) (Hidayat et al., 2020) (Dewi et al., 2021)
Social Networking (J)	Willingness in building cooperation to achieve mutual success (J1) Participation in religious activities (J2) Participation in community social activities (J3) Activeness in expressing opinions (J4) Communication with others (J5) Participation in a group or community (J6)	(Farisa et al., 2019) (Hidayat et al., 2020) (Dewi et al., 2021)

Model (SEM) shows a causal relationship between measured and latent variables based on hypotheses. This analytical technique involves conceptualizing a model based on indicators or parameters of each variable (Holipah et al., 2019). SEM analysis uses data sample groups or usually refer to as multiple group analysis, which aims to determine whether there are structural model similarities between sample groups (Holipah et al., 2019). The SEM model determines which model is most suitable for relating which social capital variables have the greatest influence on decision making. Meanwhile, confirmatory factor analysis (CFA) was carried out before testing the overall model using SEM. CFA was used to see whether the measuring instrument is under the theory by looking at the correspondence between the indicators and their constructs.

Three fitting models represent the results that explain the relationship between social capital and decision making. Each model describes the dependent variable (Y) or endogenous form, namely the decision-making variable. The independent variable is (X) or exogenous, while the social capital variables are trust, norms, and social networks.

Model 1 has a path coefficient of the social network variable and the norm variable directly related to the trust variable. Furthermore, the trust variable is directly related to the decision-making variable.

Model 2 has the path coefficient of the social network variable and the trust variable directly related to the norm variable. Furthermore, the norm variable is directly related to the decision-making variable.

Model 3 has a path coefficient of the norm variable and the trust variable directly related to the social network variable. Furthermore, social network variables are directly related to decision-making variables.

Based on these three models, we compared and took the model that best describes the relationship between community social capital variables and decision-making in Bangelan Village.

RESULT AND DISCUSSION

Respondent Characteristic

This research was conducted in Bangelan Village, Wonosari District, Malang Regency. The area of Bangelan Village is estimated to be around 768.10 ha or 16.33% of the total area of Wonosari District (Figure 1).

About 96% or 289 of 300 respondents were of productive age, i.e. 15-65 years. This can be an opportunity to develop Bangelan tourism village because it has better human resources for physical, creativity, and knowledge. Tourist villages like Bangelan can be developed because people of productive age can work well and develop their creativity to innovate (Marysya & Amanah, 2018).

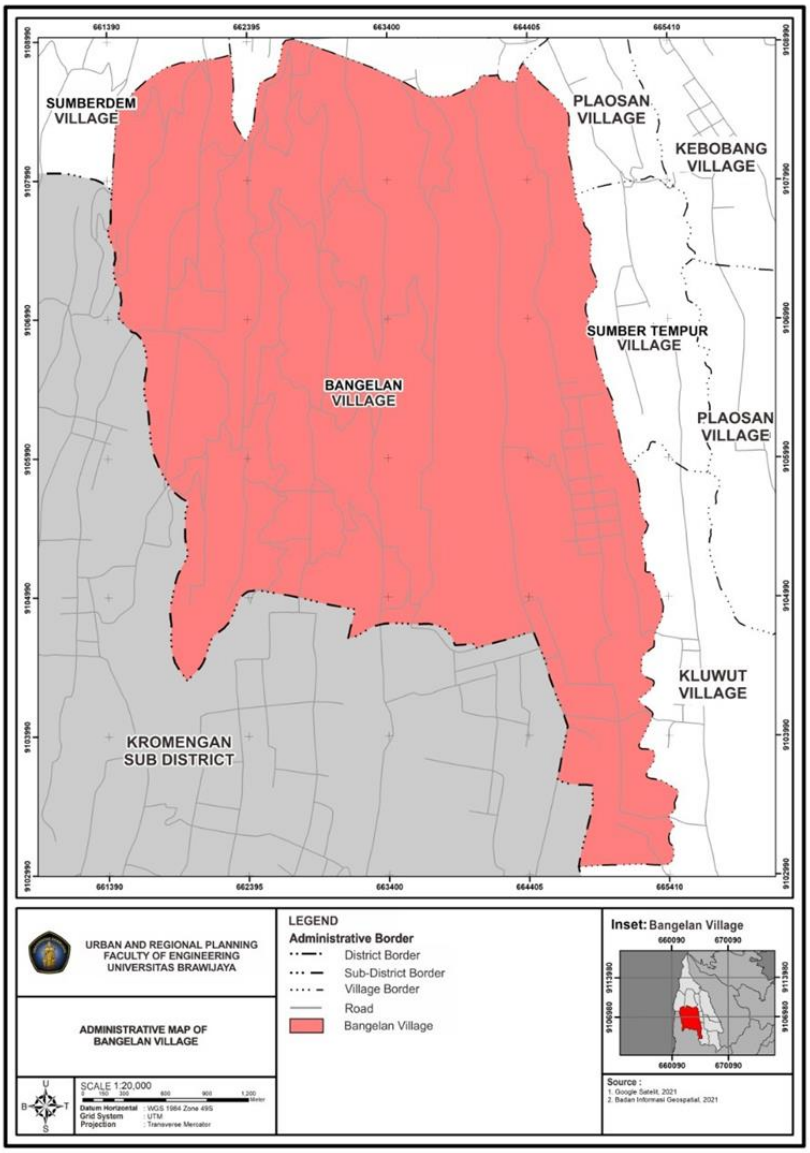

Figure. 1. Map of Bangelan village administration
Source: Google Satellite, 2021

Most of the respondents were male, with 197 people or 66% of the total respondents. The male dominance of the respondents indicated the development of tourist villages tend to require male workers. Meanwhile, the females generally joined the Women Farmers Group, where one of the activities is being shopkeeper at Umbulan Tanaka Tourism. Men as the head of the family are responsible for meeting the family's needs by working. In work, men tend to rely on physical strength for heavier activities than women (Amanah & Fatchiya, 2018).

About 59% or 177 respondents were elementary school graduates, 20% from junior high school, and 19% from high school. Meanwhile, the rest were associate program graduates and bachelors. This shows that the respondent's education level is still relatively low, affecting the human resource quality at Bangelan Village. In addition, the level of education

influences people's views on overcoming problems. The higher the education taken, the higher the ability to receive information, apply innovations, and find solutions to problems (Ancok, 2003).

Table 2. Respondent Characteristics

Variable Category	Frequency	Proportion %
Age		
15-65 years	289	96
> 65 years	11	4
Gender		
Male	197	66
Female	103	34
Education		
Elementary school	177	59
Junior high school	60	20
High school	56	19
Bachelor	5	2
Non-formal	2	1
Main job		
Unemployed	16	5
Farmer	131	44
Farm worker	57	19
Breeder	61	20
Entrepreneur	4	1
Private employee	13	4
Trader	11	4
Driver	3	1
Craftmen	2	1
Civil servant	2	1
Side job		
Not working in tourism	260	87
Tourism sector as main job	38	13
Tourism sector as side job	2	1
Income		
<3,068,275 rupiahs	253	84
3,068,275 rupiahs	36	12
>3,068,275 rupiahs	11	4

Sample size 300 respondents

Most respondents worked as farmers, as many as 131 people or 44% of respondents. Job as farmers and farm laborers are in line with the potential possessed by Bangelan Village, especially in term of agricultural coffee commodities. The second highest number of occupation was breeders, with 61 people or 20% of the total respondents. In addition, a small number of respondents worked as employees, civil servants, entrepreneurs, builders, and drivers. The majority of respondents worked in the agricultural sector, which is natural because agriculture is a sector that opens up many opportunities for rural areas. It does not require higher education graduates, just people who can work physically, to work on agricultural land (Kurniawan, 2021).

As many as 260 respondents did not work in the tourism sector (87% of respondents). Thirty-eight people, or 12% of respondents, worked in tourism as a side job apart from their main job, and some others made tourism their permanent job. The types of tourism job carried out by respondents included shopkeepers, traders, technicians, parking attendants, and tour managers. Not all villagers were members of tourist villages; this is because tourism is not the main economic sector in rural areas (Kurniawan, 2021).

As many as 253 people, or 84% of the total respondents, had income below the district minimum wage, i.e. less than 3,068,275 rupiahs. The respondent's occupation, in which farmers dominate, made the income obtained uncertain. The farmers' income depends on the harvest season especially during COVID-19 pandemic, with several respondents stating that it was challenging to market their agricultural products. The minimum income is due to education, where people with a lower education level generally have an average minimum wage income.

Confirmatory Factor Analysis

In this study, the use of CFA aims to determine valid and significant indicators on each dimension of social capital, including norms, trust, and social networks. Before the CFA was carried out, there were 16 indicators of social capital that needed to be tested for validity. CFA analysis was done in 2 stages, where the first stage showed that all social capital variables had the value of Critical Ratio (CR) and p level significantly. Meanwhile, indicators that showed low factor loading were then deleted. The indicators included trust in one's fellow community members (K1), trust in people from diverse cultural backgrounds (K2), confidence in local religious leaders (K5), confidence in tourism agencies such as Pokdarwis (K6), presence in following activities or custom events (N3), activity in expressing opinions (J4), and participation in religious activities (J2).

On the other hand, with the modified model, a measurement model of each variable was obtained. First, trust was influenced by three indicators: trust in village officials or government (K3), trust in local community leaders (K4), and communication with others (K7). Second, norm was influenced by two indicators: obedience to prevailing customary norms (N1) and the existence of social sanctions (N2). Third, network was influenced by three indicators: the willingness to build cooperation to achieve mutual success (J1), the participation in community social

activities (J3), and the participation in a group or community (J5).

The second stage was to determine indicators that can measure social capital variables using a feasibility test goodness of fit. The indicator was valid if it had a loading factor ≥0.5, CR≥1.96 and p≥0.05 (Figure 2 and Table 3).

Table 3 indicates that the ratio of the first and second stages is different, as shown by Chi-square, Probability, CMIN/DF, GFI, AGFI, TLI, CFI, and RMSEA. The Chi-square value declined from 26.690 to 250.533 in the first stage to 26.690 to 250.533 in the second stage. Also, CMIN/DF decreased from 2.880 to 1.570 in the second stage. Meanwhile, the chi-square value decreased, where p value 0.000 became 0.063 in the second stage. Likewise, GFI value of 0.877 became 0.979, AGFI value of 0.830 to 0955, TLI value of 0.871 to 0.986, and CFI value of 0.893 to 0.991. Overall, in the goodness of fit test, the model meets four to five goodness of fit criteria (Haryono, 2016).

Table 3. Goodness of Fit of CFA Model

Test	Cut of value	1st stage	2nd stage
Chi-square	<α.df (α=0.005)	<124.718 (df=87) 250.533	<35.718 (df=17) 26.690
Probability	≥0.05	0.000	0.063*
CMIN/DF	≤2.00	2.880	1.570*
GFI	≥0.90	0.877	0.979*
AGFI	≥0.90	0.830	0.955*
TLI	≥0.95	0.871	0.986*
CFI	≥0.95	0.893	0.991*
RMSEA	≤0.08	0.079*	0.044*

*denotes good fit criteria

Relationship between Social Capital and Collective Action

The relationship between social capital and Bangelan village collective action was analyzed using SEM. Three models were displayed to determine the best model for describing the relationship between social capital and collective action in Bangelan Village (Table 4).

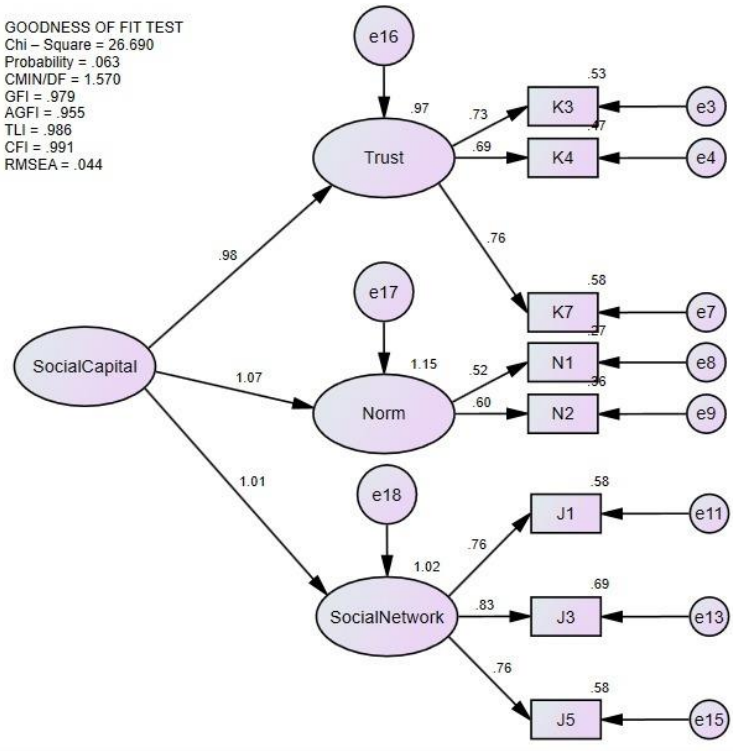

Figure 2. CFA analysis of the model

Table 4. Comparison of Models of Social Capital Relationship

Model	Variable relationship	CR	Sig. level
1	Trust <- Norm	0.518	0.605
	Trust <- social network	2.923	0.003
	Collective Action <- Trust	4.624	0.000*
	norm < -> social network	7.515	0.000*
2	Norm <- Trust	-0.171	0.864
	Norm <- Social Network	0.218	0.828
	Collective Action <- Norm	4.444	0.000*
	Trust <-> social network	9.029	0.000*
3	Social Network <- Trust	1.726	0.084
	Social Network <- Norm	-0.403	0.687
	Collective Action <- Social Network	4.620	0.000*
	Trust <-> norm	7.395	0.000*

*denotes significant level at p 0.05

Table 5 shows a comparison among three models, all of which display have six criteria goodness of fit index. GOFI showed appropriate result so that it is acceptable. There are two significant paths in each model, and the rest are insignificant paths. Models with a CR value of ≥1.96 and a p value of ≥0.05 are fit and acceptable. The higher the CR value, the better the model, and indicate a more significant model. Based on these considerations, it was concluded that Model 2 is the best model to describe the relationship between social capital and the collective actions of Bangelan Village (Figure 3).

Table 5. Goodness of Fit Index of Model

Test	Cut of value	Model 1	Model 2	Model 3
Chi-square	<α.df (α=0.005)	<55.002 (df=31) 56.696	<55.002 (df=31) 56.566	<55.002 (df=31) 56.565
Probability	≥0.05	0.003	0.003	0.003
CMIN/DF	≤2.00	1.829*	1.825*	1.825*
GFI	≥0.90	0.966*	0.966*	0.966*
AGFI	≥0.90	0.939*	0.940*	0.939*
TLI	≥0.95	0.971*	0.971*	0.971*
CFI	≥0.95	0.980*	0.980*	0.980*
RMSEA	≤0.08	0.053*	0.053*	0.053*

*denotes good fit criteria

Table 6. Path Coefficient Estimate Results

No	Variable relationship	CR	Sig. level	Loading factor
1	Norm <- Trust	-0.171	0.864	-3.822
2	Norm <- Social Network	0.218	0.828	4.865
3	Collective Action <- Norm	4.444	0.000*	0.381
4	Trust <-> social network	9.029	0.000*	0.996

*denotes significant level at p 0.05

The path coefficient can be said to be significant and interconnected when based on the results, Model 2 (Figure 3) showed two paths that worked significantly, i.e. norm to collective action and the trust associated with social networks. The path that did not have an insignificant path coefficient is trust towards norm and the path of social networking to the norm.

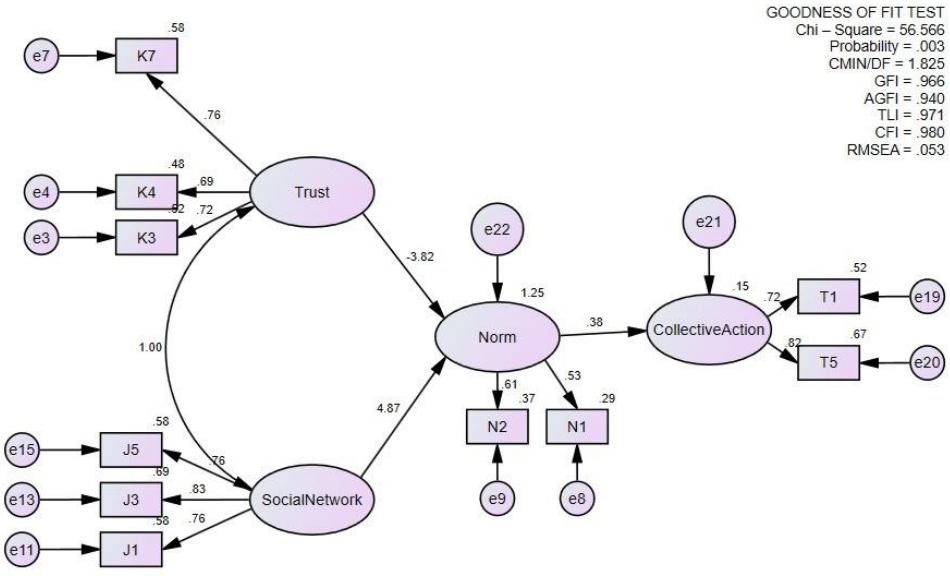

Figure 3. Model relationship among variables of SEM results

Based on these results, it can be concluded that the most significant model in describing the relationship between the variable dimensions of social capital and the collective actions of the people of Bangelan Village is Model 2. Variables that relate significantly in Model 2 include norms and collective action variables and significantly interconnected social networks and trust. Variables of trust and social networking are not significantly related to the norm variables. Norm is the variable that influences the Bangelan Village community the most in making decisions to take collective action.

People who adhere to norms will think first about what other people think of what they will do in a question, and will usually consult with others before making a decision. Norms will change the shape of the desire to behave well and solve the problem of collective action. Norms present order in society. Without norms it will be difficult to see how human can behave. Human needs norms to guide their behavior, provide balance in social relationships, and understand each other's actions. Norms influence people's decisions on how to treat, act, and speak people (Gram et al., 2021).

Norms affect almost every aspect of people's lives, and can be a pillars of development. Norms are important because they regulate and enforce behavior and address social inequalities. The success of a development effort often depends on whether the change fits or goes against pre-existing norms. Therefore, development must consider whether it influences the social norms themselves. Social policy must be increasingly aware of the importance of norms to achieve their goals. In the development of Tourism Villages, the community as the host has become the most important element in tourism development where they live in. These norms can prevent outsiders from taking opportunities that often dominate the development of local tourism destinations and prevent acts of corruption (Ostrom, 2014). Norms are mutually agreed upon values in society that can regulate individual behavior in a group or society. This value can encourage the community to take action together for the common good (Vipriyanti, 2011).

Decision Making Based on Social Capital

Social norms lead to cooperation between individuals and groups, related to honesty, commitment, responsibly carrying out tasks, and reciprocity. All forms of traditional socio-cultural groups such as tribes, clans, rural associations, or religious sects, are based on shared norms in cooperation to achieve common goals. Coordination for collective action can be found in society's informal norms.

According to Coleman and Putnam's concept, most research on social capital assume that social capital facilitates collective action. The entities of networks, norms, and trust enable collective action to solve problems (Putnam, 1993).

Social norms are a form of transfer of actions that can control rights from one actor to another and a set of rules that must be obeyed by the community in a certain area (Putnam, 2000). The norms and values in the community will become social capital only if they can facilitate an action. In addition, Hauberer (2011) also explained that the most important characteristic is a reciprocal process because individuals will help each other without expecting anything in return. Therefore, they can form social interactions that will later help solve problems in collective action. These theories are in line with the findings of the social capital conditions of the Bangelan Village community in making decisions to deal with the COVID-19 pandemic. The existence of social norms adopted by the Bangelan Village Community is manifested in obedience to applicable customary norms and sanctions. They adhere to the norms that apply both under normal conditions and during the COVID-19 pandemic.

Research Implication

Based on the results of SEM modeling, relationships social capital and decision making to take collective action are in line with Coleman and Putnam, who said that social capital facilitates collective action to solve problems (Putnam, 1993). Social capital is a form and spontaneous process developed in society to enable development (Thomas et al., 1966).

Social capital refers to the institutions, relationships, and norms that shape people's social interactions. Social capital is not only the number of institutions that support society but also the glue that holds them together. The social capital is the ability to work together as a group to achieve common goals. In contrast, simple social capital is the existence of a set of informal values or norms among group members that allow cooperation (Fukuyama, 1997).

For this reason, the existence of social capital makes life easier for the community.

Social capital variables are associated with collective action variables to produce Model 1, 2, and 3. Based on the findings, model 2 shows that norm is the most influential variable in making decisions to take collective action in the Bangelan Village community. The form of norms that influence the Bangelan Village community in making decisions to take collective action is community obedience to applicable customary norms and existing social sanctions.

This finding is consistent with the results of field observations to those directly involved in tourism activities, such as managers, parking attendants, and technicians. They were generally well prepared to assist in developing tourist communities. Tourism management standards were implemented effectively coupled with the expertise and experience of responsible operators.

The participation of tourism actors shows diverse behavior and performance in activities and efforts to develop tourism. This study shows that traders (66.7% of respondents) were very ready to serve visitors at tourist attractions. However, their involvement in meetings or discussions about the development of the tourism community was relatively low. Meanwhile, shopkeepers who are members of the Women's Farmer's Group showed higher activity. They always analyzed the tourism business at the end of each month and found more information about the viability of the tourism village. This women's farmer group was directly affected by tourism activities during the pandemic.

Efforts to develop collective actions of rural communities require the assistance of various parties. Governments can get involved to support technical or management guidance and assistance. Government and chain-managed tourism business implemented a number of initiatives and practices focused on health and hygiene, prudent marketing, domestic tourism, booking flexibility, cancellation policies, community support, vacations, and contracts (Noorashid & Chin, 2021; Salem et al., 2022). Dissemination of health protocols for tourism services is an important priority for preventing the transmission of virus transmission, and ensuring steps for implementing health standards - Cleanliness, Health, Safety and Environmental Sustainability (CHSE) (Illiyyina et al., 2021).

Hospitality training can be applied to managers, women farmers, parking attendants, and technicians to improve their service quality. They need to understand the concept of interpretation and sustainable tourism so that visitors experience a process of engagement and learning to produce a deep impression and revisit intention in the future (Li & Zhao, 2021; Nugroho et al., 2021).

Local government as well as village administration office should facilitate the needs of tourism management in the village. The establishment of collective action is not a simple process. It requires a long process and time to accumulate experiences to form social capital. Collective action processes and mechanisms require an enforcing norms and the extent to which people adhere to them. The village government needs to be involved in the process to follow, assist, and develop the potential of tourism villages. Existing social organizations are essential to enhance collective action of people. An implication for increased participation in tourism development is for community leaders to reach out and learn from people who are marginalized within community networks (Hwang & Stewart, 2017)

CONCLUSION AND SUGGESTION

This research proves that the construction of the social capital model works well to explain the relationship among variables, consisting of trust, norm and social network. The measurement results of the model produce the following relationship effects. Trust is influenced by indicators of trust in village officials or government, trust in local community leaders, and communication with others. Norms are influenced by indicators of obedience to prevailing customary norms and the existence of social sanctions. Network is influenced by indicators of the willingness to build cooperation to achieve mutual success, the participation in community social activities, and the participation in a group or community.

Furthermore, this research proves that social capital of rural communities has resulted in adaptive capacity for resource management and village development. The social capital model is implemented in the right decision-making mechanism during the pandemic to encourage the management of tourist villages with innovation and diversification to develop village potential. In other words, the social capital of the Bangelan Village community through decision

making in collective actions has succeeded in carrying out economic recovery efforts during the COVID-19 pandemic.

Furthermore, norms are the main variables in social capital that influence the Bangelan Village community in making decisions to take collective action. A series of norms or informal values, forms of social networks, and shared beliefs believed by the Bangelan village community allow the creation of collaboration that encourages collective action of all community potentials in effective economic recovery after the COVID-19 pandemic.

The research findings suggest efforts to develop collective actions through government and tourism business role in implementing health standards of CHSE, applying interpretation and sustainable tourism, and increasing leadership capacity to reach out all people within community networks.

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- **Introduction**. The introduction describes the arguments on why the article contains interesting research and why it is important to be conducted. It should use the most relevant and recent literature (in the last ten years). The Introduction ends with the formulation of research objectives to be achieved. The entire introduction should be presented with a portion of no more than 20 percent of the total pages.
- **Research Methods**. The method includes (i) specific time and place of research in the first part, (ii) describe the types and sources of data and information collection techniques, and (iii) explain data analysis methods, example: contains data retrieval techniques (sample) and analysis of the data used. The overall methods should be presented straightforwardly and concisely of no more than 20 percent of the total pages
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- **Conclusion and Suggestion**. The conclusion should be in the form of a response from the intended purpose and is not intended as a summary of the results. The conclusion should confirm that the research objectives are achieved or not. Suggestion placed after the conclusion contains a recommendation that can be used directly by society, industry, government. The conclusions and recommendations should approximately be 10 percent of the total pages.
- **Acknowledgments** (optional). It contains a thank you to those who deserve (donors/sponsors), materials contributor, and research facilities.
- **References**. The references is arranged in alphabetical order using the American Psychological Association (APA) 6th edition style. Check each reference against the original source (author name, volume, issue, year, DOI Number). Authors are required to use Mendeley Reference Manager.

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