Rural Transformation and Poverty Reduction in Rural Area

Ahmad Saifullah Kamaludin[1*]

[1]Universitas Indonesia, Kampus Salemba, Jalan Salemba Raya IV Nomor 4, RW.4, Kenari, Kecamatan Senen, Kota Jakarta Pusat, Daerah Khusus Ibukota Jakarta; [*]Corresponding author. *e-mail*: ipung.kamaludin@gmail.com

ABSTRACT

Rural Development is a major concern of the Indonesian government and has grown rapidly in the last decade. However, the pattern of development and its correlation to poverty remains a question mark. Using the Difference in Difference estimation model we analyzed whether the economic transformation in the rural area that occurred in the period 2014 to 2018 correlated with a decline in rural poverty. This study utilized secondary data from the micro dataset referring to the smallest administrative level named Village Potential from the Central Bureau of Statistics in Indonesia. Disaggregated by the transformed sectors, this study shows that the strongest correlation to the decline in the number of rural poor occurs when agricultural dominant-based villages have been complemented by adequate or have transformed as well to the service sector and other sectors. While the transformation to the trade sector shows the right direction of the correlation that reflects the decline in the number of poor people, the effect is still not significant. Atypical result in the transportation sector and industrial sector has not reduced poverty.

Keywords: development, poverty, rural, transformation

INTRODUCTION

Background Study

Rural development is a major concern of the Indonesian government (Arifin et al., 2020), and increased rural economic activities in the last decade. Around the years 2008-2014, the Government of Indonesia (GoI) issued a community-based development policy entitled the National Program for Community Empowerment (PNPM Mandiri Perdesaan) for the scope of rural communities. Since 2014, GoI showed a higher commitment to developing the villages and launched the village fund (VF) program (Arifin et al., 2020). GoI made progressive changes by giving the village a higher role to manage their development, no longer a development object by the higher level of government. The VF program provided a reasonably large budget compared to the rural

PNMP Mandiri Perdesaan program. As noted, that from 2015 to 2021, the Village Fund has budgeted at Rp. 400.96 trillion, with a total realization from 2015 to 2020 of Rp. 315.25 trillion (Aji, 2021). A large portion of the Village Fund was deemed too large to be accepted by the village (Hans Antlöv, Anna Wetterberg, 2016).

The government programs and variations of economic activities changed in the rural economy. Large allocation for public infrastructure development reached 67.4% of the total VF (The World Bank, 2019). The expansion of public infrastructure may drive the evolution of the agricultural sector for the village communities. Adequate infrastructure provides benefits such as lower transaction costs (Renkow et al., 2004), which leads to higher agricultural productivity. Good infrastructure can also help expand the market (Bakht, 2000), boost the growth of small and medium-sized

businesses (Lokshin & Yemtsov, 2005), and ultimately speed up the process of transforming the village economy (Nakamura et al., 2020, United Nations, 2021).

As an agricultural country, the agricultural sector is still the most dominant in the rural area in Indonesia's context. We explore the data from PODES (Potensi Desa – Village Potentials), a typical three-year census conducted by CBS (Central Bureau of Statistics). From PODES data, we identified that in 2011, the highest source of income for rural communities was in the agricultural sector, reaching 94.21% of the total 69,742 villages (*desa*)/urban villages (*kelurahan*). In PODES 2014 the domination of agriculture reached 93.86% of the total 73,709 villages/urban villages. In 2017, the agriculture domination was 92.89% of the total 75,436 villages/urban villages. With the dominance of the agricultural sector in the village, understanding this agriculture-based village development is essential. But the data also shows a decrease in the percentage of agricultural dominance in each period.

Moreover, in the 2014 to 2018 period, the decline was higher by -0.97% compared to the 2011 to 2014 period of -0.35%. This decline is an indication of the economic transformation of rural communities. Kamaludin & Qibthiyyah, (forthcoming 2022) find that increasing road infrastructure accessibility affects the possibility of rural economic transformation. Excluding the urban village's government type, this study identifies about 2,404 villages transformed from the agricultural sector to the non-agricultural from 2010 until 2017. Nevertheless, in the case of Indonesia's village society, the impact of the transformation remains a question.

This study analyzes rural transformation and its impact on rural poverty reduction. Rural poverty has been a major concern globally (United Nations, 2021) and in Indonesia (Arham & Hatu, 2020). In 2018, four out of five people living below the international poverty line resided in rural areas, according to the World Bank (https://www.worldbank.org). According to data from the Central Bureau of Statistics in

Indonesia from 2012 to 2019, the number of poor people in villages was always more than 60% of Indonesia's number of poor people. It is also necessary to see whether an economic transformation can play a role in overcoming this problem.

To be noted, we specify that rural development refers to the applied study of change in rural societies and the practice of changing such societies. The policy analysts' or practitioners' point of view typically includes economic growth, social inclusion, political democratization, and environmental sustainability (Berdegué et al., 2013). From that broad definition of rural development, this study focuses on the rural transformation economy. The rural economic transformation is defined as a process of complete societal change whereby rural societies diversify their economies and reduce their reliance on agriculture (Berdegué et al., 2013; United Nations, 2021).

The "Lewis Two Sector Model," a classical theory of rural development, divided rural into two sectors which are the traditional sector in rural areas and the industrial sector in urban areas (Todaro & Smith, 2012). This model emphasizes urbanization, which implies a mass migration of rural residents to megacities (United Nations, 2021). In this case, urbanization will drive the transformation process (Imai et al., 2017).

However, rural transformation not only evolved solely by urbanization but also by increased agricultural productivity (and the two are connected) (Asher & Novosad, 2017; Belton & Filipski, 2019; Fan & Zhang, 2004; Hwang et al., 2018; Imai et al., 2017; Shamdasani, 2021; Timmer, c, 2009; United Nations, 2021). Since there are two pathways, the best pattern to accelerate economic development and reduce poverty has to be drawn. According to empirical research (Christiaensen & Todo, 2014; Imai et al., 2017), agricultural-based development is more likely to reduce poverty than urbanization.

Furthermore, the context of transformation has to be clearly defined as a stage of economic development based on increased agricultural production rather than the

agricultural sector's inability to provide a decent standard of living (Jayne et al., 2011; World Bank, 2020). Raising agricultural productivity is the first step in successful rural transformation (World Bank, 2020), which will trigger an increase in the purchasing power of millions of farmers (Jayne et al., 2011).

Farmers' increased purchasing power will increase the economy, increase demand for industrial product that will lead to create new business opportunities in non-agricultural sectors (United Nations, 2021). As the non-agricultural business sector grows, so does the demand for non-agricultural labor, which leads to the higher wage. In short, the rural transformation will allow rural areas to accelerate rural development while also reducing poverty (Christiaensen & Todo, 2014).

Nevertheless, never a single policy fit all. Each country must identify and formulate specific policies that target the context-specific barriers to agricultural productivity growth and the factors that can accelerate growth in non-farm activities (United Nations, 2021). Based on the experiences of several countries, the development outcomes may vary depending on the process that followed. The transformation that began with increased agricultural productivity is producing more sustainable results (Timmer, c, 2009; Timmer, 2015; United Nations, 2021).

Inclusive agricultural development in green revolution Asia was crucial to structural transformation and poverty reduction (Jayne et al., 2011). Furthermore, countries such as the Republic of Korea with the Saemaul Undong Movement (Asian Development Bank, 2012), Vietnam with the New Rural Development (NRD) program (Do et al., 2016), and China (Deininger et al., 2014) have had success stories in building sustainable rural transformation and poverty reduction.

However, some cases of rural transformation do not always involve development (Majumdar, 2020). Rural transformation in India does not reflect a form of development. Its transformation is represented by the declining growth rate of the rural population, various forms of agrarian distress and a considerable number of farmer suicides, increasing rural to urban migration, and the declining growth rate of agricultural output (Majumdar, 2020). Massive migration from rural to urban areas impacts counter-productive to people's welfare (Asher & Novosad, 2015, 2017). As a result, 10% of the agricultural labor force in India declined. India is experiencing de-agrarianization and suffering from declining agricultural productivity (Majumdar, 2020).

As a result of this contradictory result, research for the Indonesian context is required. To the best of our knowledge, the study of the correlation between rural transformation and poverty reduction in Indonesia is limited.

First, economic transformation and poverty reduction in Indonesia have always been viewed as national issues. Many kinds of research are conducted at the country level (Jacob, 2005; Kyunghoon et al., 2020) or at the provincial/regional level (Erwidodo et al., 2021). In this study, we sharpen the research to the village level referring to the smallest administrative level. This approach is based on the fact that rural areas are diverse (United Nations, 2021). Expanding the observations up to the smallest level governments are expected to eliminate bias from the generalizing data at the aggregate level.

Second, rural development studies in Indonesia are dominated by a qualitative approach (Hulu et al., 2018; Jamaluddin et al., 2018; Nasution et al., 2017; Ramly et al., 2018; Sulila, 2019). This quantitative approach may enrich the prior studies that have been done.

To the best of our knowledge, this study is the first empirical study in Indonesia that addresses rural transformation and connects it to poverty reduction. Furthermore, we create longitudinal micro-level data, which refers to the smallest administrative level and be referred to as village-level data. PODES data from three different periods are combined: 2011, 2014, and 2018.

The paper questions

As mentioned above, the rural development in Indonesia brings changes to the dominance of the business field in the village. About 2,404 villages transformed from the agricultural sector to the non-agricultural sector. Our study aims to answer the correlation between this transformation and poverty reduction in rural areas. We hope this paper will be useful to stakeholders and contribute to the literature on rural development in Indonesia.

Logical Framework

Rural development has been viewed to be in parallel to an increase in agricultural productivity, and adequate infrastructure is viewed to create benefits of lower transaction costs and thus lead to a productive economy (Renkow et al., 2004). Increasing agricultural productivity is a prerequisite for economic transformation and will accelerate the transformation of the village economy (Nakamura et al., 2020, United Nations, 2021). The economic transformation process was characterized by changes in the agricultural sector, which is no longer dominant in the village's business sector. It refers to the number of people employed in that particular primary sector. The transformation will increase the welfare of the rural community, as well as decrease the number of rural poor people. This study proposes that the transformation process is negatively correlated with the number of poor people in rural areas.

METHODOLOGY

The Data

This study uses the micro dataset Village Potential (PODES) years 2011, 2014, and 2018, issued by the Central Bureau of Statistics in Indonesia. PODES data represents the condition of the smallest unit of village-level government. PODES 2011 represents the data from 2010, PODES 2014 taken from 2013 data, and PODES 2018 represents 2017 data unless otherwise stated in the survey. The initial PODES compiled panel data are 244,083 observation units (villages). In this study, we make some adjustments to make the sample more robust. After that, we only used 181,050 or 74.18% of the overall villages available in PODES data. The 181,050 villages as a sample come from after the following adjustment: 1) dropped out the villages that have changed sub-districts (*kecamatan*); 2) excluded villages if those villages are new or have expanded/separated; 3) dropped the villages due to a change in the village code without a clear explanation; 4) dropped out the villages where there is a change the type of government to urban villages (kelurahan) or vice versa; 5) excluded urban villages, and also; 6) excluded the villages with the dominance of the mining sector, since the study only focuses on the transformation from the agriculture sector.

Variables of Study

Transformation on this study represents the changes in the domination of agriculture sector at the rural–village level to the non-agriculture sector. We set dummy (binary value) variables on the change (denotes 1 if transformation occurred and 0 if not). The reason to use this binary value is that the process of rural transformation is marked by a change in the dominant working sector from the agricultural sector to non-agricultural goods and services (Berdegué et al., 2013; Jayne et al., 2011). The agriculture sector in this study represents business fields which include food crops, horticulture, plantations, animal husbandry, forestry's, fisheries, and agricultural services.

Since that poverty reduction in rural areas is one of the most critical rural development objectives, we set the dependent variable in this study as the number of poor people in the respective village. However, we encountered problems obtaining data on the number of poor people at the village level. Surveys are mainly presented at the district/city at the aggregate level. We use the number of poverty certificates (*Surat Keterangan Tidak Mampu*-SKTM)

issued by the village government as a proxy to represent the number of poor people in the villages. To check the accuracy of this data source collected from PODES, we compare the data on the issuance of SKTM with poverty headcount (*jumlah penduduk miskin/JPM*) based on CBS dynamic data at the district/city aggregate level where the *JPM* is available.

We view the data of poor people based on SKTM as still relevant to represent the poor for the following reasons:
a. The SKTM is the best data we can get for the village level
b. The issuance of the SKTM is only intended for the poor with the same criteria by the Central Bureau of Statistics in Indonesia.
c. The number of SKTM issuances has never been higher than the number of poor people based on *JPM* data. The data from *SKTM* can still reflect data of the poor population, referring to the primary structural poverty levels.

However, given the character of the data, we note that the issuance of the SKTM is potentially biased. Controlling the factors that affect the issuance of SKTM, for example, indicators of the government's performance may solve this issue (Ratnasari, 2020; Siwu, 2016). Therefore, we use the village government apparatus component as a control variable to reflect rural administrative capacity. Referring to the previously existing literature on rural development and the context of poverty reduction, other explanatory variables which also affect the number of poor people is a substantial investment in basic infrastructure and public service, such as investment in roads and electrification (Nakamura et al., 2020; Rammelt & Leung, 2017; United Nations, 2021).

Estimation Model

It is difficult to assess the impact of rural development (Asher & Novosad, 2017). Since infrastructure policies typically involve multiple levels of government administration. Furthermore, it is difficult to track data

aggregation and the consistency of villager groups. We use the DID estimation model to solve this technical problem. Because we do not specifically evaluate one type of program, the issue of interconnected government policies is not relevant in our study.

We use the Difference in Difference (DID) method to examine the association between rural transformation and rural poverty. The idea is to determine whether the rural transformation process correlates with the number of poor people in the village. It is better to use the DID method than just comparing the conditions before and after the transformation that may be contaminated with a temporal trend bias (Abadie, 2005). To note, the proportion of village groups that have transformed is relatively small at 3.98% (2,404 per 60,350 of the total villages in the observation). However, as the overall sample of villages is large, referring to 60,350 villages, there is still much variation in the treatment despite the small proportion of the transformed villages.

As shown in the estimation model (equation 1) below, we classify the dummy transformed village group as the treatment group and the non-transformed village group as a control group. In this case, the treatment variable equals one for the transformed villages and equals zero otherwise. The time dummy variable was set by determining the cutoff period of transformation changes in 2014. We include two periods, namely the year 2014 before the transformation and 2018 after the transformation. Two periods before and after the transformation is a minimum requirement for the use of DID (Abadie, 2005; Mora & Reggio, 2013).

Furthermore, in addition to the overall sample estimation model, we also provide a sub-sample estimation model by differentiating the observations referring to the treatment group based on the type of the new-dominant sector in that respective villages. The idea of this analysis is to find out which sector transformation has been effective in reducing poverty. We divide these villages' observations based on sectors, which are the industrial sectors, trade sectors,

transportation sectors, service sectors, and other sectors. For analysis, we conduct an estimation as follows:

$$
\begin{aligned}
poverty_{it} = \ & \beta_0 + \beta_1 time + \\
& \beta_2 transform_t + \beta_3 time * \\
& transform + \\
& \sum_{n=1}^{k-1} \beta_k \, surface_{it} + \\
& \beta_5 wheels_{it} + \beta_6 elect_{it} + \\
& \beta_7 kades_{it} + \beta_8 sekdes_{it} + \\
& u_i + \varepsilon_{it} \qquad\qquad (1)
\end{aligned}
$$

The dependent variable or outcome variable is poverty, measured by the number of poor people. The observations are made in both the pre-treatment (time=0) and treatment (time=1) periods. The variable transform equals zero indicates the villages that have not experienced transformation. In contrast, the variable transform will equal one, which means the villages have transformed into the non-agricultural sector(s). We included an interaction dummy between the time dummy variable and treatment variable and denoted it as a coefficient variable of DID.

Other explanatory variables include road infrastructure, electricity coverage, the head of the village, and the village secretaries. Village road infrastructure, in several studies, has been empirically proven to have an effect on reducing poverty (Aggarwal, 2018; Nakamura et al., 2020; Rammelt & Leung, 2017; United Nations, 2021). As a proxy for road infrastructure, we include the type of road surface and all seasonal accessibility for 4-wheeled vehicles. The first proxy is the type of road surface. This variable is divided into three categories: paved/concrete, gravel/hardening stone, and earth/others such as wood/board. The use of the type of road surfaces is based on Aggarwal (2018) who investigated the association between paved roads and poverty in India and found evidence that it has a positive effect on the village economy.

The second proxy is the affordability of the road for 4-wheeled vehicles throughout the season. We use this proxy based on Calderon & Serven (2010), which measures the accessibility of transportation by looking at the affordability of citizens to access transportation, whether it can be accessed all-season or not. In this context, we view that access to four-wheeled vehicles throughout the year is important to increase the benefits of using roads for economic activities.

Electrification is one of the basic infrastructures that must be provided (United Nations, 2021). Investment in electricities will be required to eradicate extreme poverty (United Nations, 2021). Gibson & Olivia (2010) found that quality of both roads and electricity affect income from non-farm enterprises. Furthermore, electricity has been linked to lower transportation costs (Asher & Novosad, 2017) which will benefit farmer efficiency.

Furthermore, the quality of village government uses to control over the issuance of SKTM (Ratnasari, 2020; Siwu, 2016). This study uses the presence of the village head and village secretary. Some villages may have a vacancy in the position of village heads or village secretaries due to the end of their working period or dismissal (Pemerintah Republik Indonesia, 2014). This vacancy period potentially affects village government services such as the issuance of SKTM. Other variables that affect poverty, such as education, and government poverty eradication programs are unfortunately not available in the PODES dataset, that is one of the study's limitations.

RESULTS AND DISCUSSION

Association of Transformation on the Reduction of the Poors in the villages

In this study, the summary of the data we use is divided into transformed and non-transformed village groups as follows:

Table 1. Summary descriptive

	Transform		Not Transform	
Variables	*mean*	*sd*	*mean*	*Sd*
Number of poor	134.1	234.8	80.12	197.8
Road Surface	2.887	0.383	2.626	0.659
4-wheels access	0.993	0.0813	0.936	0.245
Electricity	98.73	6.846	91.80	20.53
Head of the village	0.967	0.179	0.960	0.196
Secretaries	0.895	0.306	0.899	0.302
Observations	4,808		115,892	
Number of villages	2,404		57,946	

Source: Author (2022)

Based on Table 1, the number of poor people in the transformed village is higher than in the non-transformed village [see Figure 1 the red line above the blue one]. However, in the period 2014 to 2018, the transformed villages experienced more decrease in the number of poor than the non-transformed.

On the other hand, Table 1 showed the infrastructures in the transformed village are better in terms of the roads and electricities while the presence of village officials looked similar.
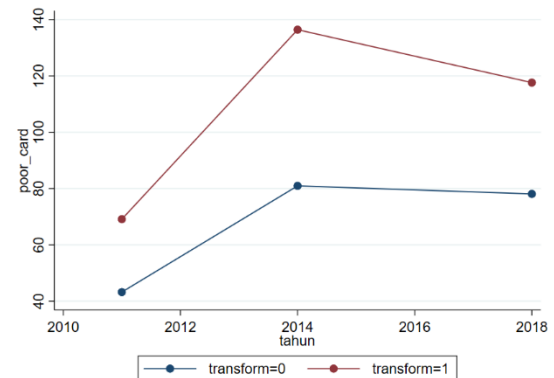

Figure 1. The decline in the number of poor people based on PODES 2011, 2014, 2018
Source: Author (2022)

Table 2. Estimation result

	Dependent variable: the number of poor people					
	Dif		DID1		DID2	
Time			-3.029**	(1.084)	-2.905*	(1.376)
Transform	-17.448**	(5.457)	62.735***	(5.693)	0.000	(.)
time#transform			-17.465**	(6.018)	-17.590**	(6.056)
Road surface:						
Soils/others					0.000	(.)
Gravels					-5.820	(5.720)
Paved/concrete					-5.569	(7.654)
Road access to 4-wheels					-12.957	(9.130)
Access of electricity					0.091*	(0.038)
Head of the village					-0.239	(2.561)
Village secretary					0.116	(2.107)
Constant	-3.003**	(1.090)	81.628***	(0.743)	93.142***	(13.103)
Observations	60,273		120,623		120,623	

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| | Dependent variable: the number of poor people | | |
	Dif	DID1	DID2
R^2	0.0002	0.0030	0.0084

Standard errors in parentheses
$^*\,p < 0.05$, $^{**}\,p < 0.01$, $^{***}\,p < 0.001$
Source: Author (2022)

The Dif column represents a simple difference estimate between the years 2014 and 2018. In this estimation, the observation is only for 60,273 units. DID1 is the estimated DID in 2013 as a condition pre-transformation and 2017 post-transformation, without controlling variables. DID2 is DID with control variables such as changes in the village road surface, 4-wheeled vehicle accessibility, and electricity coverage. These three variables are used to control the omitted variable bias, which directly impacts the number of poor people (Nakamura et al., 2020; Rammelt & Leung, 2017; United Nations, 2021). We also employ a control variable, such as the presence of village government officials suspected of influencing the SKTM issuance service (Ratnasari, 2020; Siwu, 2016). We combined the DID with the fixed model since the proportion of transformed villages is much smaller than that of the untransformed.

We test the goodness of fit and find that Prob > F is 0.000, indicating a significant effect. The R2 value in model DID2 is 0.0168, indicating that the model could explain 0.84 percent of the correlation. In model 3, the statistical t value has a significance of 1%.

The time#transform variable is the interaction variable referring to the difference-in-difference coefficient, as shown in estimation model 1. The coefficient reflects how much the number of poor people has changed due to rural transformation. The coefficient of -17.590 indicates that the transformation significantly reduces the number of poor people at the 1% level. The second estimate's standard error value is 6.065, which is more precise. It should be notice that this interaction association is only valid from 2014 to 2018. As a result, this study discovers a signal that the rural transformation from 2014 to 2018 strongly correlates with reducing the number of poor people in the village. This outcome is consistent. This result is consistent with the assertion that structural transformation influences economic growth and the rate at which poverty is reduced (Christiaensen & Todo, 2014; Jayne et al., 2011; Timmer, c, 2009; Timmer, 2015). Christiaensen & Todo (2014) discovered that patterns of urbanization play a role when striving for faster poverty reduction. Timmer, c (2009) emphasizes the transformation process that is able to reduce poverty must begin with increased agricultural productivity. Substantial gains in agricultural productivity can create new economic opportunities to provide farm and non-farm goods and services (Jayne et al., 2011; United Nations, 2021).

Rural Transformation and the Number of Poors by Sectors

To get a better picture, we desire a more detailed view of economic transformation by sectors, such as industry, trade, services, transportation, and the other sector. In general, 39 percent of the transformations occurred in the industrial sector, followed by 30 percent in the trade sector, 19 percent in the services sector, 12 percent in other sectors, and 0.5 percent in the transportation sector the total transformed 2,404 villages. We replicate the DID model's estimation and divide it into six sectors.

According to the estimation results per sector [see Table 3], the service sector has the most significant effect on reducing the number of poor people, with a coefficient of -64,14 and a significance level of 5%. The service sector in this study refers to a service activity or the provision of services, including education, health, civic, and government and individuals.

The rural transformation to the trade sector and to the other sector seems to affect poverty reduction, but the significant level is low. In this study, the trade sector refers to all activities of selling goods (new/used), including the restaurant, food and beverage, catering, lounges, cafeterias, canteens, cafes, and so on. Whereas the other sector refers to business activities that are not classified in a specific sector, such as water, gas, electricity, construction, banking, and so on. In this case, the direction is more important than the level of significance. The direction indicates that the transformation to the trade sector and other sectors will be able to reduce poverty in the majority of the transformed villages. The low level of significance must be seen because the transformation's results in reducing poverty in several villages are still not evenly distributed.

Anomalies occur when the transformation into the transportation sector is associated with a significant increase in the number of poor people by 142.57. The transportation sector is defined as any business activity that provides transportation services for passengers or goods/livestock from one location to another using a scheduled system, whether by land, water, or air. Warehousing and communication activities in telecommunications, publication presentation, postal, and giro are all included in the transportation sector.

Likewise, the transformation of the industrial sector has not been proven to affect poverty reduction. The industrial sector refers to manufacturing including the activities that change the basic goods (raw materials) into semi-finished goods or finished goods, and or other items that have higher values.

Table 3. Estimation result for each sector

| | Dependent variable: the number of poor people | | | | | | |
	agri	mining	industry	trade	transport	service	other
Time	-1.571	-1.571	-1.562	-1.571	-1.571	-1.571	-1.575
	(1.410)	(1.410)	(1.409)	(1.410)	(1.410)	(1.410)	(1.410)
time#transform	0.000		2.002	-43.648	142.571***	-64.140*	-75.353
	(.)		(15.411)	(23.496)	(1.410)	(32.583)	(41.725)
road surface:							
soil/other	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
gravel	-5.834	-5.834	-5.819	-5.846	-5.834	-5.844	-5.804
	(5.871)	(5.871)	(5.869)	(5.870)	(5.871)	(5.870)	(5.868)
paved/concrete	-6.509	-6.509	-6.488	-6.526	-6.509	-6.517	-6.472
	(7.911)	(7.911)	(7.907)	(7.909)	(7.911)	(7.909)	(7.907)
4wheels vehicles	-13.401	-13.401	-13.407	-13.395	-13.401	-13.381	-13.406
	(9.276)	(9.276)	(9.276)	(9.276)	(9.276)	(9.273)	(9.276)
electricity	0.081*	0.081*	0.080*	0.081*	0.081*	0.081*	0.081*
	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)
Head of the villages	-0.105	-0.105	-0.332	0.080	-0.105	-0.168	-0.065

	agri	mining	industry	trade	transport	service	other
				Dependent variable: the number of poor people			
	(2.614)	(2.614)	(2.612)	(2.609)	(2.614)	(2.611)	(2.612)
Village secretary	-0.624	-0.624	-0.675	-0.638	-0.624	-0.612	-0.576
	(2.149)	(2.149)	(2.146)	(2.146)	(2.149)	(2.148)	(2.149)
Constant	89.410***	88.405***	89.429***	88.935***	88.401***	88.976***	88.646***
	(13.355)	(13.331)	(13.346)	(13.344)	(13.331)	(13.336)	(13.333)
Observations	112122	110378	111614	111276	110397	110937	110729

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: Author (2021)

We further explore what occurred in the industrial and transportation sectors. For the first discussion on transformation to the transportation sector, we discover that only 13 villages are transforming into the transportation sector. These numbers actually are too small to generalize the case. But we found four of the thirteen villages lack adequate water supply/irrigation. Given the scarcity of irrigation, it is likely that the transformation of the transportation sector is a result of a failure to survive in the agricultural sector rather than a failure to grow in the agricultural sector (United Nations, 2021). Agricultural productivity is difficult to increase due to limited irrigation availability (agro-ecological potential) (Davis et al., 2017). Furthermore, with the lack of agro-ecological potential, the transformation process may result from the inability to survive in the agricultural sector rather than growth. Agriculture's contribution to economic development is undeniable (Timmer, c, 2009). Historically, no country has been able to sustain a rapid transformation out of poverty without increasing agricultural productivity (Timmer, c, 2009; United Nations, 2021).

The second precondition is the absence of a market or the distance to the nearest market, which slows economic development and opens up non-agriculture business sectors (United Nations, 2021). In villages that transformed to the transportation sector, we discover that 10 villages out of 13 do not have a market whereas increasing market access will eventually boost village economic growth (Bakht, 2000; Rammelt & Leung, 2017).

In the case of transformation to the industrial sector, we suspect several factors cause the anomaly. First, even though the transformation was toward the industrial sector, 57 villages had no village micro and small industries. This condition is possible if the majority of the residents work in the industrial sector in the nearby urban area (Majumdar, 2020), rather than developing micro and small industries in the village. According to (Imai et al., 2017), the transformation built through the urbanization process is not more effective in reducing poverty. Imai et al. (2017) argue that there is some possible reason (i) the rural non-agricultural sector is poverty reducing in some cases, but its magnitude is generally much smaller than that of the rural agricultural sector; and (ii) higher population in mega cities has no role in poverty reduction. Another reason, many workers who are not interested in agriculture move to the city, leaving agriculture to the elderly. As a result, agricultural productivity tends to decline and remain low return farming (Nguyen et al., 2020).

Second, similar to what occurred in the transportation sector, approximately 202 villages lacked adequate water/irrigation availability. It is difficult to grow the agricultural sector due to the lack of irrigation. When agro-climate conditions are unfavorable,

villages tend to see opportunities in the non-agricultural sector (Nguyen et al., 2020). Third, market expansion support is less than ideal. There are no marketplaces in 748 villages that have converted into industrial sectors. Expanding market access is one of the factors that can boost economic growth and promote long-term transformation (United Nations, 2021).

CONCLUSIONS AND RECOMMENDATIONS

In this study, we discovered a link between village transformation and rural poor people. From 2013 to 2017, the transformation process was associated with a significant decrease in rural poor people. This result is consistent with the assertion that structural transformation influences economic growth and the rate at which poverty reduction. This study found that the transformation of the service sector and the other sector has the strongest correlation to the decline in rural poor. While the transformation to the trade sector demonstrates the direction of the correlation, which reflects the decrease in the number of poor people, the effect is insignificant. Estimates for the transportation sector exceeded expectations as a result of the transformation. It demonstrates a significant increase in the number of poor people and an increase in the industrial sector, which has not reduced poverty. This atypical result could be attributed to unfulfilled preconditions for transformation due to insufficient irrigation sources that support agriculture and insufficient availability/access to the nearest market that allows the community's economic development.

Based on these findings, we recommend the government support rural development that can accelerate the village transformation process to reduce rural poverty. To support the transformation process, infrastructure development is still required (Nakamura et al., 2020; United Nations, 2021). As a side note, the context of transformation must be clearly defined as a stage of economic development based on increased agricultural production

(United Nations, 2021) rather than leaving the agricultural sector.

Furthermore, the government must first achieve established agricultural productivity before promoting other business sectors such as the service sector, industry, and other sectors. To avoid anomalies in the transformation process, the government must ensure adequate water supply/irrigation to increase agricultural productivity. The government should also promote market availability or shorten the distance to the nearest market. The village governments need to build a permanent market place, bring it closer to the people in accordance with its authority and budget (Renkow et al., 2004).

The village government can also construct more accessible roads to expand the market (Bakht, 2000; Nakamura et al., 2020; Rammelt & Leung, 2017). Moreover, if the developments exceed the capacity of the village government, it should be carried out in collaboration with other villages government, other government agencies, state-owned enterprises, or the private sector. Expanding market access is one of the factors that can boost economic growth and promote long-term transformation (United Nations, 2021).

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