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Economic growth and poverty reduction: the role of the agricultural sector in rural Indonesia

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ABSTRACT

Agricultural sector has emerged as the engine of economic growth in Indonesia. The sector is expected to contribute to poverty reduction in rural areas which is the largest contributor to poverty in Indonesia. Growth in the agricultural sector can induce the growth of the non-agricultural sector through linkages between the two sectors. Thus, the growth of the agricultural sector is not only a positive impact on poverty reduction through the rising of incomes in the sector, but it can also encourage non-agricultural activities in rural areas. This study aims to determine how much the growth of the agricultural sector impacts on the non-agricultural sector in rural areas and how much the growth of these two sectors impacts on poverty reduction in rural areas. Data used in this research is panel data from 2002 to 2008. Data are analyzed using simultaneous equations model estimation and the estimation of panel data regression model. The results of simultaneous equations model analysis show that growth in the rural agricultural sector by 1 percent will induce the growth of the rural non-agricultural sector at 1.35 percent. Meanwhile, the results of estimation of panel data regression model reveal that productivity growth in both the agricultural and the non-agricultural sectors in rural areas by 1 percent will reduce the rural poverty rate by 3.91 percent and 3.97 percent, respectively. Both these findings affirm that the agricultural sector is still the driving force of economic growth and is critical to the success of poverty alleviation in rural areas. In addition, the government also needs to develop the non-agricultural sector to support poverty alleviation efforts.

Keywords: sectoral linkages, growth multiplier, panel data regression

PAPER

1. Introduction

During the last five decades, Indonesia has experienced a massive economics structural transformation from a country that mostly relied on the agricultural sector to a country whose economy is dominated by industry and service sectors. Over the period, the share of the agricultural sector to the total Gross Domestic Product (GDP) has declined dramatically from 45 percent in 1970 to 14 percent in 2016. This change, in turn, triggers a question: Is the sector still important for Indonesia's economic development?

Although the structural transformation has reduced the role of the agricultural sector in the country's economy, the sector clearly still plays a very important role in terms of its contribution to the output of Indonesia's economy as measured by GDP. In 2015, the sector accounted for 13.52 percent of the country's GDP, the second largest after manufacturing sector. The agricultural sector also has a significant contribution to labor absorption, especially in rural areas. BPS estimated that approximately 32.88 percent of the total labor force in August 2015 work in the sector. With these important roles, the agricultural sector is expected to be the engine of economic growth, especially in rural areas.

Until recently, poverty was still one of the main development challenges that must be addressed by the government. Although the number of poor people generally has decreased during last five decades, the number of Indonesians living below the poverty line is relatively high. In March 2016, for instance, the BPS estimated that the number of poor people was 28.01 million or approximately 10.86 percent of the total number of population.

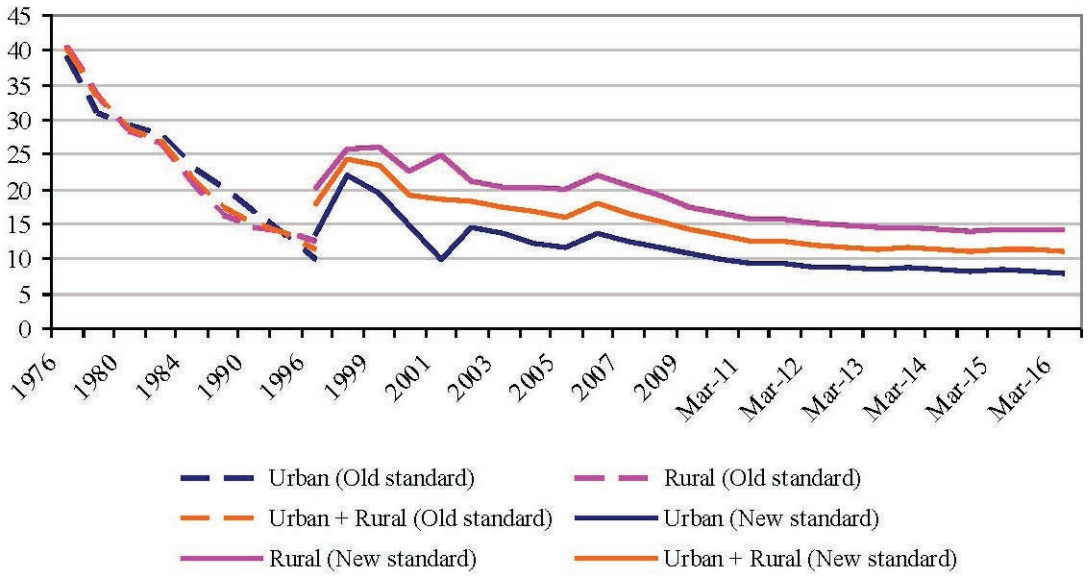
As such, it is clear that poverty is basically a rural-agricultural phenomenon because around 63 percent of the poor people live in rural areas, and most of them rely on the agricultural sector as their livelihood. BPS estimated that in 2014 approximately 67.26 percent of poor households in rural areas were agricultural households. Therefore, the success of poverty reduction measures in Indonesia has a strong connection with the performance of the agricultural sector. In other words, the agricultural sector is the key factor in reducing the number of poor people in the country, especially in rural areas. The growth of the sector definitely gives impacts on poverty reduction not only by increasing the income level of rural people working in it, but also by stimulating the growth of the non-agricultural sector in rural areas.

The focus of our study is to examine the role of the agricultural sector growth as the main driving machine in rural economy, notably in stimulating the growth of the non-agricultural sector in rural Indonesia. In addition, the study aims to assess the role of the rural agricultural growth in reducing poverty in rural Indonesia.

2. Poverty and Agricultural Sector in Indonesia

Indonesia has an impressive experience in curtailing the poverty rates. The success story of the country in poverty alleviation asserts the crucial role of the economic growths in eradicating poverty. It can be traced from 1976 to 1996 when the country experienced a high economic growth period before hit by the Asian Financial Crisis (AFC) in 1997-1998.

Figure 1 - Poverty Rate Trend in Indonesia (%), 1976 - 2016



Source: BPS (various years)
Note: In 1998 BPS revised the method of setting the poverty line. The new method resulted in an increase in the poverty threshold, and the poverty rate in 1996 was adjusted accordingly from 11.3 percent to 17.3 percent

Over the two decades period, through an impressive economic growth performance, reaching around 7 percent per annum on average, Indonesia succeeded in lowering the incidence of poverty from 40.1 percent in 1976 to only 11.3 percent in 1996. Timmer (2008) argued that over the period, there were some main sources of the economic growth in Indonesia, including the growth in the agricultural sector. The dominant contribution of the sector ended up in the 1980s when its role began to be replaced by manufacture industry sector. Although the trend of poverty has been declining after the AFC, its velocity has been relatively slower than the period before the crisis. Even the poverty reduction has experienced a plateau since 2009 due to the low performance of the agricultural sector that has grown below 4 percent on average in recent years.

In fact, from 1976 to 1996, poverty reduction in rural area was faster than that in urban areas. Over the period, the number of poor people in rural areas had plunged approximately 20 million. This impressive trend basically affirms the decisive role of the agricultural sector as the leading sector in the rural economy. The growth of the sector clearly gives a significant contribution to this remarkable poverty reduction because over the period the agricultural sector growth was able to push the level of income and jobs creation in rural areas, not only in the agricultural sector itself but also in the non-agricultural one. This is because the agricultural growth also had stimulated other non-agricultural activities in rural areas that had vigorous connection with agriculture such as trade, agro-industry, transportation and services.

At the same time, the structure of Indonesia's economy experienced a substantial change. Economic structural transformation over the last five decades has eroded the role of the agricultural sector gradually. It was marked by a decrease in the share of the sector on GDP from around 45 percent in 1971 to only 14 percent in 2015.

Unfortunately, although the contribution of the agricultural sector to GDP has been declining, until recently most of the workforce still rely on the agricultural sector as their livelihood. The share of the sector on labor absorption remains the highest compared to other sectors in the economy. It happens because the expansion of the industry sector has failed to absorb more workforce. In other

words, the shifting of the labor force from agriculture to industry has not happened in an ideal way. As a result, productivity of the agricultural sector has been declining consistently. For Indonesia, it is a critical problem in the context of pro-poor development because poverty in the country basically a rural agriculture phenomenon.

3. Sectoral Linkages and Poverty Reduction in Rural Areas

The agricultural sector has strong linkages to the non-agricultural sector in rural areas. Through the linkages, the growth of the agricultural sector not only pushes the increase of income in the agricultural activities but also stimulates the growth of the non-agricultural sector in rural areas. Therefore, the agricultural sector has a significant growth multiplier in the areas. The growth multiplier of the sector in an economy dominated by agricultural activities always more than one percent (Hazell and Haggblade in Timmer 2008). Hazell, Haggblade, and Brown (1989) estimated that the growth multiplier of the agricultural sector in Asia was 1.80 percent. Moreover, Suryahadi, Sumarto, and Molyneux (2006) estimated that from 1989 to 2002 one percent growth in the rural agricultural sector in Indonesia would induce the growth of the rural non-agricultural sector by 1.20 percent on average.

The sectoral linkages between the agricultural and the non-agricultural sectors that usually happen in rural areas are in the form of demand linkages that cover both production and consumption linkages. From the production side, the growth of the agricultural sector needs inputs provided by the non-agricultural sector. In addition, the growth of the agricultural sector can also boost the development of economic activities using its outputs as the intermediate inputs. From consumption side, the rising of income in the agricultural sector can enhance agricultural households consumption that, at the end, will raise the demand for goods and services produced by the non-agricultural sector in rural areas (Harianto 2006).

A significant number of empirical studies show that the economic growth that relies on the agricultural sector expansion benefits the poor. The compilation of the empirical studies that affirm the impressive contributions of the agricultural sector growth on poverty reduction in developing countries can be found in Mellor (1999). In the context of Indonesia, many studies also confirm that the growth of the agricultural sector has noticeable impacts on poverty reduction, notably in rural areas. They include among others Sumarto and Suryahadi (2003), Suryahadi, Suryadarma, and Sumarto (2006), and Tambunan (2006).

Enriquez and Stamoulis (2007) argued that the channels through which the growth of the agricultural sector lowers poverty in rural areas consist of two ways. Firstly, the growth of the agricultural sector directly raises the income/consumption level of small farmers that are commonly poor farmers. Secondly, the growth of the sector can indirectly reduce poverty by lowering the price of unprocessed foods, pushing the level of income generated by the non-farm rural economy activities, and raising the jobs creation and the level of wages, particularly for unskilled labors.

4. Methodology

4.1. The Model

Most studies used in estimating the growth multiplier of the agricultural sector are roughly classified into three types: (1) studies using micro-econometrics approach; (2) studies using macro-econometrics; and (3) studies using input-output table, social accounting matrix, and computable general equilibrium model (Suryahadi, Suryadarma, Sumarto, and Mlyneaux 2006). In this study, we apply macro-econometrics approach to examine sectoral linkages in rural Indonesia.

Considering the interdependence relationship between the agricultural sector and the non-agricultural sector in rural areas, we use simultaneous equation model to examine the impacts of the agricultural sector growth on the non-agricultural sector growth in rural areas.We use double log-linear regression, so the estimation of regression coefficient can be interpreted as elasticity. The specification of system of equations that we estimate is presented below:

$$ln(ragdp)_{it} = \alpha_1 + \beta_{11}\, ln(rnagdp)_{it} + \beta_{12}\, ln(land)_{it} + \gamma \mathbf{z}'i + \varepsilon_{1it} \quad (1)$$

$$ln(rnagdp)_{it} = \alpha_2 + \beta_{21}\, ln(ragdp)_{it} + \beta_{22}\, ln(ugdp)_{it} + \gamma \mathbf{z}'i + \varepsilon_{2it} \quad (2)$$

$$ln(awage)_{it} = \alpha_3 + \beta_{31}\, ln(ragdp)_{it} + \beta_{32}\, ln(pmw)_{it} + \beta_{33}\, ln(rlf)_{it} + \gamma \mathbf{z}'i + \varepsilon_{3it} \quad (3)$$

$$ln(awork)_{it} = \alpha_4 + \beta_{41}\, ln(ragdp)_{it} + \beta_{42}\, ln(rnagdp)_{it} + \gamma \mathbf{z}'i + \varepsilon_{4it} \quad (4)$$

$$ln(nawage)_{it} = \alpha_5 + \beta_{51}\, ln(rnagdp)_{it} + \beta_{52}\, ln(pmw)_{it} + \beta_{53}\, ln(rlf)_{it} + \gamma \mathbf{z}'i + \varepsilon_{5it} \quad (5)$$

$$ln(nawork)_{it} = \alpha_6 + \beta_{61}\, ln(rnagdp)_{it} + \beta_{62}\, ln(pmw)_{it} + \gamma \mathbf{z}'i + \varepsilon_{6it} \quad (6)$$

The variables in the system consist of Gross Regional Domestic Product (GRDP) of the agricultural sector in rural areas (*ragdp*), non-agricultural GRDP in rural areas (*rnagdp*), urban sectors GRDP (*ugdp*), wages in the agricultural sector in rural areas (*awage*), agricultural labor—defined as the number of 15+ years old population working in the agricultural sector—in rural areas (*awork*), wages in the rural non-agricultural sector (*nawage*), non-agricultural labor in rural areas (*nawork*), labor force in rural areas (*rlf*), area of agricultural land (*land*), provincial minimum wages (*pmw*), vector of initial variables (e.i. poverty rate in rural areas in 2002 and proportion of 15+ years old rural population who did not complete nine years education in 2002 as a proxy of education level).

By using the order condition, the result of identification process shows that all of the structural equations in the system are overidentified, so they could be estimated. Our focus of estimation is the value of β_{21} that shows the percent growth of the rural non-agricultural sector due to the growth in the rural agricultural sector by one percent. The coefficient also represents the strength of the linkages between the agricultural sector and the non-agricultural sector in rural areas. Meanwhile, in scrutinizing the impacts of the agricultural growth on poverty in rural areas we use panel data regression model. As in equation (1) to (6), we also use the double log regression model. The model that we estimate is:

$$RP_{it} = \alpha + \beta_1 \ln(aproductivity)_{it} + \beta_2 \ln(naproductivity)_{it} + \beta_3 \ln(awage)_{it} + \beta_4 \ln(nawage)_{it} + \beta_5 \ln(rcpi)_{it} + (u_i + \varepsilon_{it}) \quad (7)$$

The model asses the impact of the rural agricultural sector productivity (aproductivity) growth and the rural non-agricultural sector productivity (naproductivity) growth on the incidence of poverty in rural areas.The term of productivity is defined as the output per worker of each sector.We also investigate the impact of other related variables on poverty in rural areas such as the growth in agricultural and non-agricultural wages as well as inflation rates in rural areas (*rcpi*).

4.2. The Data

All data used in our study are from BPS-Statistics Indonesia. We use panel data consisting of 23 provinces that were observed for the period of 2002-2008. We only observed those provinces instead of the total 33 provinces because of the limitation of data availability for certain variables in some provinces. In estimating the growth multiplier of the agricultural sector in rural areas, we use Gross Regional Domestic Product (GRDP) at the provincial level. Because BPS does not disaggregate the GRDP data by rural and urban areas, we have to estimate the proportion of GRDP by sector in every province that goes to rural areas. As the solution, we use the share of the agricultural sector labor in rural areas as the allocator. The share is the proportion of the agricultural labor living in rural area of the total number of labor in every province. We consider that the distribution of the GRDP data by area could be explained very well by the distribution of labor in rural and urban areas. Moreover, the poverty rate data used in our research is derived from The Foster–Greer–Thorbecke (FGT) index estimated by BPSs.

5. Results

We use the three stages least square (3SLS) method to estimate all of the structural equations. The estimation results of equations (1) to (6) are shown in Table 1. The results show that the growth of the rural agricultural sector has positive and significant impacts on the growth of the rural non-agricultural sector. The impacts are considered relatively high. One percent growth of the rural agricultural sector will induce growth of the rural non-agricultural sector by 1.35 percent.

Our findings basically confirm that there are strong linkages between the agricultural sector and the non-agricultural sector in rural areas. The linkages include both production linkages and consumption linkages. The strong linkages between the two sectors mean that an increase of income in the rural agricultural sector will stimulate the increase of income in the rural non-agricultural sector through the rising of demand for goods and services produced by the non-agricultural sector in rural areas. At the end, such mechanism will boost the non-agricultural activities in rural areas and create more opportunities for rural people including the poor to gain more income. In addition, the growth of the rural non-agricultural sector also has positive and significant impacts on the rural agricultural sector although it is relatively lower than the impacts of the rural agricultural growth on the rural non-agricultural growth. This study finds that one percent growth of the non-agricultural sector will induce 0.41 percent growth in the agricultural sector in rural areas. It confirms that an increase of income in the rural non-agricultural sector will also stimulate the demand for the agricultural products in rural areas.

The interdependence relationship between the agricultural sector and the non-agricultural sector in rural areas has the implication that the development of the two sectors in rural areas must be conducted simultaneously through an integrated policy. In other words, the development of the agricultural sector in rural areas should not only focused on food production but also should be directed to produce agricultural commodities needed by the non-agricultural sector in rural areas. Moreover, the development of the non-agricultural sector in rural areas must support the rural agricultural sector and creates more opportunities

Table 1: Results of Estimation of Simultaneous Equations Model

Dependent Variables	Independent Variables	3SLS	Dependent Variables	Independent Variables	3SLS
Log of rural agricultural GDP	Log of rural non-agricultural GDP	0.406** (19.29)	Log of rural non-agricultural GDP	Log of rural agricultural GDP	1.353** (16.50)
	Log of gricultural land area	0.254** (6.50)		Log of urban GDP	0.279** (10.42)
	Education level in 2002	0.252** (8.42)		Education level in 2002	-0.406** (-7.48)
	Rural poverty rate in 2002	-0.051 (-1.24)		Rural poverty rate in 2002	0.127* (2.06)
	Constant	10.451** (22.90)		Constant	-12.567** (-9.25)
	Number of observations = 161; R2 = 0.936; P(Chi-stat) = 0.000			Number of observations = 161; R2 = 0.908; P(Chi-stat) = 0.000	
Log of rural agricultural wage	Log of rural agricultural GDP	0.717** (8.79)	Log of rural non-agricultural wage	Log of rural non-agricultural GDP	0.153** (4.01)
	Log of provincial minimum wages	0.442** (5.76)		Log of provincial minimum wages	0.376** (5.37)
	Log of labor force in rural areas	-0.882** (-4.65)		Log of labor force in rural areas	-0.141 (-0.17)
	Education level in 2002	0.072 (0.52)		Education level in 2002	-0.028 (-0.18)
	Rural poverty rate in 2002	-0.150** (-2.84)		Rural poverty rate in 2002	-0.158** (-3.42)
	Constant	-2.618 (-1.89)		Constant	6.099** (6.23)
	Number of observations = 161; R2 = 0.679; P(Chi-stat) = 0.000			Number of observations = 161; R2 = 0.454; P(Chi-stat) = 0.000	
Log of rural agricultural labor	Log of rural agricultural GDP	0.481** (5.86)	Log of rural non-agricultural labor	Log of rural non-agricultural GDP	0.283** (8.16)
	Log of rural non-agricultural GDP	-0.142** (-3.60)		Log of provincial minimum wages	-0.064 (-0.77)
	Education level in 2002	0.610** (17.05)		Education level in 2002	0.740** (17.60)
	Rural poverty rate in 2002	0.182** (5.64)		Rural poverty rate in 2002	-0.223** (-3.41)
	Constant	-4.261** (-4.35)		Constant	-5.288** (-4.37)
	Number of observations = 161; R2 = 0.966; P(Chi-stat) = 0.000			Number of observations = 161; R2 = 0.902; P(Chi-stat) = 0.000	

Notes: Number in parentheses are Z-values. ** Is significant at 1% level.* Is significant at 5 % level

for rural people, especially small farmers, so they do not only rely on the agriculture sector as their source of income. Besides having significant impacts on the growth of the non-agricultural sector in rural areas, the results of estimation also show that the growth of the rural agricultural sector stimulates jobs creation and lift up the level of wage in rural areas, not only in the agricultural sector itself but also in the non-agricultural sector. These facts obviously affirm that the agricultural sector is still the main driver of the rural economy in Indonesia.

Table 1: Results of Estimation of Simultaneous Equations Model

Independent Variables	Fixed Effect (GLS)
Log of rural agricultural productivity	-3.909** (-3.721)
Log of rural non-agricultural productivity	-3.971** (-3.441)
Log of rural agricultural wage	-1.077* (-2.560)
Log of rural non-agricultural wage	-0.594 (-1.773
Log of rural consumer price indix	0.528** (4.484)
Constant	168.694** (10.112)
Number of observations	161
Adjusted R-squared	0.9832
F-statistics	347.571**

Notes: Number in parentheses are t-values. ** Is significant at 1% level.* Is significant at 5 % level

Meanwhile, for the model of the agricultural productivity growth impacts on poverty in rural areas we use the Generalized Least Squares (GLS) method for the panel data. We estimate equation (7) using fixed effect model. The estimation results show that both an increase in the productivity of the rural agricultural sector and the productivity of the rural non-agricultural sector have a significant contribution in reducing the incidence of poverty in rural areas. One percent growth in both sectors productivity will reduce the number of poor people in rural areas by 3.9 percent and 4.0 percent respectively. These findings basically give a clear evidence for two things. First, the agricultural sector still plays a very crucial role in the eradication of poverty in rural Indonesia, which for a long time has been the center of poverty in the country. Second, the role of the non-agricultural sector in rural areas becomes more essential in boosting the welfare of rural poor people.

6. Conclusion

Although the economic structural transformation has occured massively over the last five decades, our study firmly proves that the agricultural sector still plays a very significant role in the Indonesia's economy, particularly in rural areas, where approximately 47 percent of the Indonesian population live. We found out that the sector is still the driving engine of the rural economy that can stimulate the growth of the non-agricultural sector in rural areas in many ways as well as enhance the jobs creation and the level of wage in the areas.

Our study also asserts the powerful impacts of the rural agricultural sector growth together with the rural non-agricultural growth on poverty reduction in rural areas, the home for 63 percent of Indonesian poor people. It means that the rural sector is the key to success in poverty eradication measures in Indonesia, and the role of the rural non-agricultural sector becomes more decisive in the context of rural development in the country. As a consequence, besides enhancing the growth of the agricultural sector productivity, Indonesia also must pay more attention to the development of the rural non-agricultural sector to support poverty reduction in rural areas.

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