Fiscal Decentralization, Regional Income Inequality, and the Provision of Local Public Goods: Evidence from Indonesia

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Abstract

The objective of this paper is to clarify the potential joint determination between fiscal decentralization, regional inequality, and the provision of local public goods in Indonesia. Using provincial-level data over the period 2001-2014, we estimate the simultaneous equation model (SEM) to circumvent the possibility of interdependence between the interest variables.

The result reveals that fiscal decentralization is associated with lower regional income disparity but not *vice versa*. The result confirms that regional income inequality and the provision of public goods are simultaneously determined. The result provides no evidence of interdependence between fiscal decentralization and the provision of local public goods.

Keywords: fiscal decentralization, regional inequality, local public goods, Indonesia, simultaneous equation model.

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I. Introduction

In recent years, several theoretical and empirical studies have analyzed the relationship between fiscal decentralization, regional income inequality, and the provision of local public goods. Some empirical studies reveal that fiscal decentralization, by enabling the local government of the impoverished region to stimulate a pro-growth policy, decreases regional inequality. However, scholars propose that the degree of fiscal decentralization may depend on the existing regional income inequalities. This is because the government may shift to centralize or decentralize its resources depending on its consideration of the contribution of fiscal centralization or fiscal decentralization toward regional convergence. Moreover, scholars provide evidence that local governments are more capable of providing efficient local public goods compared to central governments, which can motivate a country to fiscally decentralize. Alternatively, researchers have reported that fiscal decentralization enables the local government to deliver a more substantial diversity of public goods to accommodate varying preferences toward the provision of local public goods. Finally, empirical evidence has also emerged indicating that a society within a large regional income inequality scenario often demands the government to deliver a greater redistribution policy, especially in providing public goods to reduce the income gap. However, several studies proposed that the provision of public goods can have a bearing on regional income disparity. This study indicates that any of these variables (to a certain degree) can be influenced by the other two.

The main objective of this paper is to clarify the potential joint determination between fiscal decentralization, regional inequality, and the provision of local public goods in the case of Indonesia. Most existing studies consider the possibility of interdependence by employing instrumental variables (IVs) techniques such as two-stage least squares (2-SLS). The

difficulty of finding appropriate instruments for the endogenous variables and the chance of persistence over time of the interest variables may compromise this estimation method (Lessmann 2012; Kyriacou, Muinello-Gallo, & Roca-Sogales 2017). To address this limitation, this paper accommodates the probability of interdependence between fiscal decentralization, regional inequality, and the provision of local public goods by applying a simultaneous equation model (SEM). SEM can provide consistent estimates and produce a more efficient estimation than the single equation approach and also help to identify the potential interdependence between the key variables. Indonesia provides an ideal case to examine the topic. First, after decades of being a heavily centralized country, Indonesia experienced a 'big bang' decentralization in 2001 that authorized the local government to deliver local public goods and design a pro-growth development program to accommodate local needs. Second, the size of Indonesia and its economic and social diversity has resulted in a significant difference in regional economic development and the income inequalities for a long period of time (Statistics Indonesia 2016). Also, public goods in Indonesia are in a state of under-fulfillment. Indonesia ranks 60th in infrastructure development and 100th in health and primary education progress out of 138 countries, which damages its global competitiveness (World Economic Forum 2017). This study offers several new insights. First, it fills the gap of limited analysis on this topic. This study addresses the probability of joint determination among the provision of public goods, regional income inequality, and fiscal decentralization by applying SEM, which directly addresses interdependence between the key variables. To conclude, this study proposes policy implications based on estimation results to assist the Indonesian central and local governments in dealing with the interaction between the variables of interest.

The paper is organized as follows. Section 2 reviews the literature findings that explain the comprehensive relationship of the examined variables. Section 3 describes the

data, key variables, and empirical methodology. Section 4 reports on the results and a sensitivity check and then discusses the findings. Section 5 concludes the study and presents policy implications.

II. Literature Review

The channel links fiscal decentralization, regional inequality, and the provision of local public goods as described in Figure 1, which is explained in the sub-chapters below.

FIGURE 1 HERE

1. *Fiscal decentralization and income inequality*

Regarding the influence of fiscal decentralization on regional income inequality, fiscal decentralization is applauded for empowering local governments to reduce the income gap because it is assumed that local governments are more well-informed than central governments on how to address regional inequality. Empirical works by Ezcurra & Pascual (2008), Sepulveda & Martinez-Vazquez (2011), and Ametoglo, Guo, & Wonyra (2018) support this hypothesis. Alternatively, fiscal decentralization may broaden regional inequality because it triggers regional competition in absorbing economic resources (Prud'homme 1995; Martinez-Vazquez & McNab 2003; Zhang 2006) and confines the interregional and intraregional positive externalities created by a centralized redistribution policy (Rodriguez-Pose & Gill 2004; Liu, Martinez-Vazquez, & Wu 2016). Several empirical studies support this argument such as Silva (2005), Bonet (2006), Sacchi & Salotti (2011), and Liu *et al.* (2016).

Regional income inequality may affect the level of fiscal decentralization (Bolton & Roland 1997; Beramendi 2007; Lessmann 2012). Dissatisfaction regarding the central

government's failure to reduce poverty and income disparity and also the expectation that larger local government authority in a fiscally decentralized system can address these issues, has triggered stronger demand to decentralize the country (Sepulveda & Martinez-Vazquez 2011). However, wide regional income inequality may trigger support for centralization because the central government has the authority to allocate resources across regions and this narrows the income gap between regions (Oates 1972; Lessmann 2009; Stegarescu 2009; Sacchi & Salotti 2014).

2. *Fiscal decentralization and public goods*

Several studies propose that efficiency in providing local public goods is one of the primary considerations for a country to decentralize (Oates 1972; Ahmad & Brosio 2009). Fiscal decentralization lowers the transaction cost for the delivery of public goods by removing bureaucracy layers, shortening the decision-making process, and reducing the information cost associated with diseconomies of scale because the local government is assumed to be more responsive to local needs than the central government (Shah 1998).

Decentralization accommodates the diverse preferences across regions toward the provision of public goods which increases the provision of the local public goods (Musgrave 1969; Oates 1972). In contrast, several studies argue that local government has better information regarding local preferences, but this may not always be the case. This is because gathering information is not only expensive but also a time-consuming process, which involves experienced human resources, reliable information, and a technology system. These factors are rarely available at the local government level, especially in a developing economy. Therefore, there may be a reduction in the supply of public goods (Prud'homme 1995; Rodriguez-Pose & Gill 2004).

3. *Income inequality and public goods*

Regarding the impact of income inequality on the provision public goods, the classical public choice model proposed by Romer (1975), Roberts (1977) and Meltzer & Richard (1981) suggests that broadening income inequality leads to a larger demand of public goods because it imposes political pressure on the government to redistribute income. Large regional income inequality results in a demand of public goods on education, health, childcare, and infrastructure sectors to close the income gap (Alesina & Perotti 1993; Alesina & Rodrik 1994).

The results of the literature on the effect of the provision of public goods on income inequality is inconclusive. It has been argued that spending on public goods in the health and education sector reduces the income gap by generating an equal distribution of human capital (Tiongson, Davoodi, & Asawanuchit 2003). Alternatively, Ferreira (1995) and Brakman Garretsen, & van Marrewijk (2002) argue that spending on public goods and regional inequality is positively related. A within-country analysis by Banerjee (2004), Banerjee & Somanathan (2007), and Bajaar & Rajeev (2015) for India revealed that spending on public goods is associated with large income inequality. In their study in Bangladesh, Khandker & Koolwal (2007) found the same result.

III.   Key variables and empirical analysis

1.   *Key variables*

This study applies province-level data from 2001 to 2014 for 33 provinces in Indonesia (the Kalimantan Utara Province is excluded since it was established in 2013). The data originated from several resources (see Appendix A for the details). Table 1 presents the summary statistics of the variables in this paper.

Table 1. Summary statistics

Variable	Observation	Mean	Std. Deviation
Fiscal decentralization (FD)	462	0.019	0.016
Regional inequality (RI)	462	0.151	0.118
Public goods (PG)	462	29.293	1.063
Ethnic fractionalization index	462	0.538	0.189
Regional income per capita, log	462	16.105	0.899
Population, log	462	15.151	1.018
Share of trade to total regional GDP (%)	462	0.380	0.301
Area, log kilometer squared	462	10.472	1.197
Population density	462	667.307	2,345.391
Intragovernmental transfer per capita, log	462	13.900	1.028
Unemployment	462	7.369	3.448
Years of schooling	462	7.561	1.506
Share of urban population (%)	462	43.490	18.246
Dependency ratio (%)	462	49.500	22.609

Source: Statistics Indonesia, Indonesia Ministry of Finance

Several critical variables are employed in this analysis such as the measure of the local provision of public goods, regional inequality, and fiscal decentralization. Regional

capital expenditure is used as a proxy for the provision of local public goods following Lewis (2013). Capital expenditure is defined as an expenditure that was used to obtain capital stock in terms of physical assets, which covers land, buildings, roads, irrigation, and others that belong to the local government (Indonesian Ministry of Finance 2016).

This paper applies a population-weighted coefficient of variation as a measure of regional income inequality. The population-weighted coefficient of variation offers several characteristics that may not be found in other inequality measures such as independent scale, population size, number of regions and satisfaction of the Pigou-Dalton transfer principle (Cowell 1995; Firebaugh 2011). The population-weighted coefficient of variation is defined as:

$$PWCV = \frac{1}{\bar{y}} \left[\sum_{i=1}^{n} p_i \left(y_i - \bar{y} \right)^2 \right]^{1/2} , \tag{1}$$

where $\bar{y} = \sum_{i=1}^{n} p_i y_i$; y_i and p_i are the GDP per capita and population share of the province, respectively, and n is the number of provinces.

This paper estimates fiscal decentralization by employing an expenditure-based decentralization measure, which is more suitable in the case of Indonesia since Indonesian decentralization introduced a significant change in the allocation of expenditure but not in revenue collection. The Indonesian fiscal decentralization law authorizes a substantial expenditure discretion to the local government in prioritizing expenditures, but the main taxing right remains with the central government (Ahmad 2002; Nasution 2016). Therefore, we consider the expenditure-based fiscal decentralization measures that are appropriate for the Indonesian context. The expenditure-based fiscal decentralization measure is defined as the ratio of local government spending to total government spending. This index has been widely used in previous research (Bonet 2006; Lessmann 2009; Rodriguez-Pose & Ezcurra 2010; Sacchi & Salotti 2011; Liu *et al*. 2016).

2. *Empirical analysis*

This study applies a simultaneous equation model (SEM) to circumvent the potential joint determination among the key variables. The model takes the following form:

$$FD_{kt} = \alpha_0 + \alpha_1\, PG_{kt} + \alpha_2\, RI_{kt} + \alpha_3\, X_{1,kt} + \mu_{1,kt}\ , \tag{2}$$

$$RI_{kt} = \beta_0 + \beta_1\, PG_{kt} + \beta_2\, FD_{kt} + \beta_3\, Y_{2,kt} + \mu_{2,kt}\ , \tag{3}$$

$$PG_{kt} = \gamma_0 + \gamma_1\, FD_{kt} + \gamma_2\, RI_{kt} + \gamma_3\, Z_{3,kt} + \mu_{3,kt}\ , \tag{4}$$

where subscript k and t refer to province and year, respectively; FD_{kt}, RI_{kt}, and PG_{kt} refer to the dependent variables of fiscal decentralization, regional inequality and the provision of public goods, respectively; $(\alpha_0, \beta_0, \gamma_0)$ are the constant terms; $(\alpha_1, \beta_1, \gamma_1)$ and $(\alpha_2, \beta_2, \gamma_2)$ are the parameters associated with endogenous variables; $(\alpha_3, \beta_3, \gamma_3)$ are the parameters associated with the control variables $X_{1,kt}$, $Y_{2,kt}$ and $Z_{3,kt,}$, respectively; and $(\mu_{1,kt}, \mu_{2,kt}, \mu_{3,kt})$ are the error terms for equations (3), (4) and (5), respectively.

Previous studies using the instrumental variables method to deal with simultaneity offered possible but often insufficient solutions (Martinez-Vazquez, Lago-Penas, & Sacchi 2017). This paper deals explicitly with the potential simultaneity between the critical variables using SEM, which generates a consistent and more efficient estimate than a single-equation approach and eventually assists in the identification of joint determination between the three key variables (Wooldridge 2010). The existence of persistence and endogeneity in the estimation also biases the estimated impact of the critical variables. The full set of three equations is jointly estimated using the system instrumental variables (SIV) method which constructed on the principle of a generalized method of moment (GMM) to obtain a consistent and more efficient estimator (Baltagi 2013; Greene 2017). GMM with heteroskedasticity and autocorrelation (GMM-HAC) is employed to account for the

heteroskedasticity and contemporaneous correlation of the disturbances across equations that contain endogenous variables by using the default Newey-West (Bartlett kernel function) specifications of heteroskedasticity and autocorrelation (HAC) estimators of the covariance matrix (Baum, 2006; Baum , Schaffer, & Stillman 2007). In all of the equations, the number of exclusions is sufficient to satisfy the order condition of the identification. The system is identified since each equation has at least two nonzero variables of the excluded exogenous variables from the other two (Wooldridge 2010).

This study includes several control variables for each estimation based on the existing studies. The estimations always control for ethnic heterogeneity, regional income per capita, population, and openness to international trade. An ethnically diverse society calls for greater autonomy and thereby increases support for fiscal decentralization (Panizza 1999; Alesina & Spolaore 2003). Moreover, a socially plural society has different preferences over what to provide and where and how to provide public goods (Benabou 2000; Chandra 2001). Finally, several researchers suggest that a more diverse society is associated with a larger income gap due to a lack of trust (Easterly 1999) and the judgment of the policy-maker in a diverse society in allocating resources (Franck & Rainer 2012). The income level may affect the provision of public goods (Kuijs 2000; Akitoby, Clements, & Gupta 2006). A rich region is more proficient in reducing the income disparity compared to poor regions (Lessmann 2009; Liu *et al*. 2016; Kyriacou *et al*. 2017). Several researchers suggest that decentralization is positively associated with regional income (Panizza 1999; Latelier 2005; Bodman & Hodge 2010). Demographic factors, such as population, affects the number of public goods provided by the government (Alesina, Baqir, & Easterly 1999; Shonchoy 2010). The regional population is applied to control the effect of the demographic factor on fiscal decentralization (Wallis & Oates 1988; Panizza 1999) and regional disparity (Sylwester 2003; Lesmann 2009). The provision of public goods is one of the many ways that the government protects society

against external risk in an open economy (Rodrik 1998; Shelton 2007). Furthermore, increasing trade may influence regional disparities (Rodriguez-Pose 2012; Dabla-Norris, Kochar, Suphaphiphat, Ricka, & Sounta 2015). This study employs an ethnic fractionalization index, the log of regional GDP per capita, the log of regional population, and the share of regional trade (total export and import) to regional GDP to measure ethnic diversity, regional income, population, and openness to international trade, respectively.

Population density, the geographic size of the region (area), and intra-governmental transfer per capita are controlled when estimating the fiscal decentralization equation. A small region is more likely to be easier to govern and logistically cheaper to manage. Hence, it calls for a lower demand for decentralization (Panizza 1999; Arzhagi & Henderson 2005). The surface area (in square kilometers) of the regions is applied to measure the geographic region size. The intra-governmental transfer also contributes to a determination of the autonomy of the local government. The intra-governmental fund is a substitute for local revenue to support the local government so that it can perform its functions (Latelier 2005; Bodman & Hodge 2010; Lewis 2014). The log of intra-governmental per capita is used in this study to represent intra-governmental transfer.

In estimating the regional income inequality equation, this study applies a human capital variable and unemployment. The contribution of human capital is vital for economic outcomes including income distribution (Mankiw, Romer, &Weil 1992; Barro & Lee 2001). Years of schooling is also applied as a proxy for human capital.

The estimation of public goods controls for the share of the urban population and the dependency ratio. A greater share of the urban population and the dependency ratio triggers a larger demand for public goods from the local government (Gisselquist 2015; Coady & Dizioli 2017). The dependency ratio is measured as the number of the population that is under 15 and over 65 years old against the number of people between 15 and 64 years old.

IV. Estimation results and robustness check

1. Estimation results

Table 2 presents the estimation results. For all of the estimations, the *p-value* of the Kleibergen-Paap rk LM statistic, which is an LM test of whether the excluded instruments are relevant or correlated with endogenous regressors, are below the significance level of 0.01 and this rejects the null hypothesis (i.e., the IVs are irrelevant). Hence, the model is identifiable. The *p-values* of the Kleibergen-Paap rk Wald statistic, which tests the correlation of the instruments with the regressor but weakly, are below a 0.01 significance level. These results indicate that no weak IVs exist. The *p-value* of the Hansen J statistics in all of the estimations fails to reject the null hypothesis, which indicates that the overidentifying restrictions are valid (Baum *et al*. 2007; Roodman 2009; Cameron & Trivedi 2010).

Table 2. Estimation results

	FD	RI	PG
Fiscal decentralization (FD)		-0.044**	-0.409
Regional inequality (RI)	-0.096		0.050**
Public goods (PG)	-0.004	0.027***	
Ethnic fractionalization index	0.017	0.146*	0.049
Income per capita	0.079***	-0.046	0.632**
Population	0.02	-0.042	0.569***
Share of trade	0.143**	0.133**	0.012
Area	0.03*		
Population density	0.00002**		
Intragovernmental transfer per capita	-0.038		
Unemployment		0.018**	
Years of schooling		-0.068**	
Urban population			-0.005
Dependency ratio			0.001

N	462	462	462
Kleibergen-Paap rk LM p-value	0.000	0.000	0.000
Kleibergen-Paap rk Wald p-value	0.000	0.000	0.000
Hansen J test p-value	0.331	0.378	0.403

*, **, *** measures statistical significance at the 10, 5, and 1 percent level, respectively.

Source: Author's estimation.

For the second finding, we focused on the economic significance of the result. Beginning with the relationship between the fiscal decentralization and the provision of local public goods, the results indicate no evidence of joint determination between these two variables of interest. For the interaction between fiscal decentralization and regional income inequality, the result reveals that fiscal decentralization is associated with lower regional income inequality but does not support the argument that regional income inequalities have an influence on the degree of decentralization. This result indicates that fiscal decentralization is associated with lower regional inequality. When the fiscal decentralization index increases by 1 point, the regional inequality decreases by 0.044 points. Fiscal decentralization authorizes local governments with substantial political and economic power to govern their regions in accommodating local preferences. Indonesian local governments enjoy almost full discretion in designing local economic development programs within their region. They can design and implement a set of locally customized pro-growth policy programs which is not possible during the centralization period. Due to different situations and preferences across the regions, each local government has a different pro-growth program. The intra-governmental transfer fund from the central government becomes a primary source of most local governments to level the development gap between regions by introducing local pro-growth programs that can counterbalance the detrimental effect of fiscal decentralization on income distribution. The design of Indonesian intra-governmental transfer

has reduced the regional inequality and inter-region rivalry triggered by decentralization (Hoffman & Guerra 2007).

Regarding the relationship between regional income inequality and the provision of local public goods, the result confirms that these two variables are simultaneously determined. When the measure of regional inequality increases by 1 point, the provision of public goods increases by 0.050 points. Since decentralization, the financial and political powers of the local governments significantly increased along with the responsibility. Large regional income inequalities in Indonesia have forced the local government to provide more local public goods. It is widely accepted that improving the provision of local public goods (i.e., especially in the education, health, and infrastructure sectors) to offer equal opportunity for all provides opportunities for a good start in life (World Bank 2007). To address large income inequality, the Indonesian government has made a clear commitment to provide local public goods, especially in the education and health sectors. The local government is obligated to allocate at least twenty percent and ten percent of the local budget for the education (Law 20 in 2003) and health (Law 36 in 2009) sectors, respectively. Since then, to ensure equal access for local constituents, each local government has provided a greater mix of local public goods.

Simultaneously, when the provision of public goods increases by 1 point, the regional income inequality increases by 0.027 points. One possible explanation is the different state of initial economic development, and the uneven distribution of resources among regions may influence the impact of the provision of local public goods, which worsens regional income inequality. Intra-governmental transfer enables local Indonesian governments to deliver local public goods to their constituents without intervention from the central government. Initially rich regions had sufficient resources to provide more advanced public goods and the ability to attract skilled workers. In addition, rich regions that had more advanced public goods (e.g., modern public clinics, well-equipped public schools, and more electricity, bridges, and roads)

that enabled them to concentrate on generating more value-added goods/services with skilled workers who are more productive compared to rest of the country. However, poor regions must struggle to provide basic public goods using workers with limited skills and attempt to catch up with developed regions. Without any intervention from the central government to manage resource allocation between rich and poor regions, the provision of local public goods will exacerbate regional income disparity.

Finally, we address the results regarding the control variables. In the fiscal decentralization equation, the variables of regional income per capita, trade, population density, and geographic area present positive and significant signs. The estimation of regional income inequality showed that ethnic diversity, trade, and unemployment positively correlated with income inequality, while the years of schooling contributed negatively to the distribution of income. Regional income per capita and population were associated with a larger provision of public goods.

2.   Robustness check

The robustness of the results can be evaluated by employing an alternative measure of fiscal decentralization, regional income inequality, and the provision of public goods. This paper employs a revenue decentralization measure, i.e., the Gini index, and a log of regional infrastructure expenditures as a substitute to measure fiscal decentralization, regional income inequality, and the provision of public goods. The revenue decentralization measure defines as the ratio of local government revenue to total government revenue. Table 3 summarizes the results of the sensitivity check with an alternative measure of the key variables. Overall, the result is robust for the changes of important variables.

Table 3. Robustness check

Robustness check	FD	RI	PG
Fiscal decentralization (FD)		-0.025**	0.058
Regional inequality (RI)	-0.005		0.08***
Public goods (PG)	0.0006	0.04**	
Ethnic fractionalization index	-0.0009	-0.012	-0.047
Income per capita	0.001*	-0.0007	0.6***
Population	0.002***	-0.009	0.394***
Share of trade	0.003***	-0.009	0.353*
Area	0.001*		
Population density	0.000001***		
Intragovernmental transfer per capita	0.0008		
Unemployment		0.0002	
Years of schooling		0.013	
Urban population			-0.029
Dependency ratio			0.008*
N	462	462	462
Kleibergen-Paap rk LM p-value	0.000	0.000	0.000
Kleibergen-Paap rk Wald	0.000	0.000	0.000
Hansen J test p-value	0.415	0.493	0.206

Source: Author's estimation

V. Conclusion

Literature studies on the determinants of fiscal decentralization, regional income disparities and the provision of public goods indicate a possibility that these variables are interdependent. To address the limitation of previous studies on this topic, this study applies the SEM approach, which directly addresses the potential interdependencies among the key variables.

The result reveals that fiscal decentralization is associated with lower regional income disparity but does not support the idea that income inequalities have an influence on fiscal decentralization. The result confirms that regional income inequality and the provision of public goods are simultaneously determined. The result provides no evidence of a significant dependence between fiscal decentralization and the provision of local public goods.

Fiscal decentralization enables each local government to design and implement a local pro-growth development program to level the development gap between regions and may counterbalance the detrimental effect of fiscal decentralization on income inequality. To address the broad income gap, Indonesian local governments provide a significant amount of local public goods to their constituents, especially in the productive sectors such as education and health. At the same time, the provision of local public goods seems to worsen regional disparity. The different state of initial economic development and the uneven distribution of

resources among regions may affect the impact of the provision of public goods on regional inequality.

Since regional income and the provision of local public goods are simultaneously determined, there must be an intervention from the central government to avoid the adverse impact of the provision of public goods on regional income inequality. The central government should be able to evaluate the impact of each local government policy on a nationwide level to mitigate the detrimental effect of the provision of public goods on income distribution. The central government should also distribute resources more evenly among regions to circumvent the widening of regional inequality.

Appendix A

Data and Sources

Variable	Source
Fiscal decentralization	Indonesia Ministry of Finance
Regional inequality	Statistics Indonesia
Regional capital expenditure	Statistics Indonesia
Ethnic fractionalization index	Statistics Indonesia
Regional income per capita	Statistics Indonesia
Population	Statistics Indonesia
Share of trade to total GDP	Statistics Indonesia
Area	Statistics Indonesia
Population density	Statistics Indonesia
Intra-governmental transfer per capita	Statistics Indonesia
Unemployment	Statistics Indonesia
Years of schooling	Statistics Indonesia
Share of urban population	Statistics Indonesia
Dependency ratio	Statistics Indonesia

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