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DOCTORAL THESIS

Essays on fiscal decentralization, regional income inequality and local
public goods provision: The case of Indonesia

Author:

Matondang Elsa Siburian

Supervisor:

Prof. Hiroshi SAIGO

Prof. Yukiko FUKAGAWA

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**ESSAYS ON FISCAL DECENTRALIZATION, REGIONAL
INCOME INEQUALITY AND LOCAL PUBLIC GOODS
PROVISION: THE CASE OF INDONESIA**

Table of Contents

1. Introduction.....	8
1.1. Decentralization in Indonesia	8
1.2. Overview of the Thesis.....	13
2. The Effect of Regional Income Inequality and Social Diversity on The Provision of Local Public Goods in Indonesia	19
2.1. Introduction.....	20
2.2. Income Inequality, Social Diversity and Provision of Public Goods	22
2.3 Key Variables Measurement and Empirical Analysis	24
2.3.1. Data and Key Variables	24
2.3.2. Empirical Analysis.....	27
2.3.3. Persistence and Endogeneity.....	29
2.4 Estimation Results and Robustness Check	31
2.4.1. Estimation Results	31
2.4.2. Robustness Check	37
2.5. Conclusions	41
3. Fiscal Decentralization and Regional Income Inequality: Evidence from Indonesia	43
3.1. Introduction.....	43
3.2. Research Methods and Materials	45
3.3. Results and Discussions	47
3.4. Conclusions	52
4. Fiscal Decentralization, Regional Income Inequality, and the Provision of Local Public Goods: A Case Study in Indonesia	53
4.1. Introduction.....	53
4.2. Literature Review	55

4.2.1. Fiscal Decentralization and Income Inequality	55
4.2.2. Fiscal Decentralization and Public Goods	56
4.2.3. Income Inequality and Public Goods	57
4.3. Key Variables Measurement and Empirical Analysis	58
4.3.1. Data and Key Variables	58
4.3.2. Empirical Analysis	59
4.4. Estimation Results and Robustness Check	62
4.4.1. Estimation Results	62
4.4.2. Robustness Check	66
4.5. Conclusion	68
5. Summary	69

List of Figures

Figure. 1. Share of intergovernmental transfer in total central government spending 2001- 2014.....	10
Figure 2. Share of the source of the district/municipality government revenue 2005- 2014.....	11
Figure. 3. Share of DAU, DAK, and DBH in the total intergovernmental transfer 2001- 2014.....	12
Figure. 4. The effects of intra-province income inequality and social diversity on provision of local public goods.....	14
Figure. 5. Intra-province income inequality and fiscal decentralization.....	15
Figure. 6. Intra-province income inequality, fiscal decentralization, and provision of public goods.....	17
Figure. 7. Estimation result.....	70

List of Table

Table 2.1 Summary statistics of the variables	25
Table 2.2 Estimation result based on ethnic fractionalization index	32
Table 2.3 Estimation result based on ethnic polarization index	33
Table 2.4 Robustness check results based on ethnic fractionalization index	39
Table 2.5 Robustness check results based on ethnic polarization index.....	40
Table 3.1 Estimation results.....	49
Table 3.2 Robustness check.....	51
Table 4.1 Estimation results.....	63
Table 4.2 Robustness check.....	67

List of Appendix

Appendix A: Inclusion of both ethnic fractionalization index and ethnic polarization index.....	42
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Chapter 1

Introduction

Studies on fiscal decentralization, regional inequality, and the provision of local public goods have been developed rapidly in recent years. Most of the study on this topic is based on the cross-country analysis. In addition, single-country analysis confines its focus mostly on developed areas. Analysis of developing countries is, on the other hand, very limited. A reason for this scarcity is that analytical results in developing countries depend on conditions that are particular to a country under study.

Clarifying the interplay among fiscal decentralization, an intra- income inequality, and the provision of public goods is crucial to Indonesia because of its ‘big bang’ decentralization in 2001. The main purpose of the decentralization is to empower the local governments to mitigate broad regional inequalities across the region. The Indonesian decentralization laws authorize the local government to exercise substantial political and economic power to govern their region. The laws decentralized control over government expenditure to the local governments (Pal and Wahaaj, 2017). The central government only left with six basic functions (i.e., foreign affairs, defence, national security, finance, justice, and religion), while the provision of the local public goods was mostly shifted to the local governments (Law number 23/2014 regarding Local Government). Therefore, examining whether empowerment has reduced economic inequality as much as expected is of essential importance as a policy assessment.

1.1. Decentralization in Indonesia

Decentralization in Indonesia introduced through the enactment of Law number 22/1999 as lastly amended with Law number 23/2014 regarding Local Government. The law

has drawn a separation function between central and local government including the funding to support it and how the local government running its business. The central government retained six absolute functions such as foreign affairs, defence, fiscal and monetary, law enforcement, justice, and religion. The provision of public goods, basically transferred to the local government. Indonesian decentralization law granted significant expenditure discretion to the local government, while the main taxing right remains on the central government (Ahmad and Mansoor, 2002; Nasution, 2016).

Law number 23/2014 regarding Local Government from article 9 to 25 regulate the separation function between central and local government. As aforementioned, the central government deals with six absolute functions. Both central and local government provides the public good. The separation function in public goods provision between central and local government is stipulated in article 13 Law number 23/2014. The central government provided public goods based on efficiency, the scope of externality, and national strategic (article 13 point 2). The local government provides public goods based on location, user, the scope of externality, and efficiency (article 13 points 3 and 4). For instance, provision of energy infrastructures (e.g., oil and gas, geothermal, and electricity) is provided solely by the central government because the energy sector considered as a national strategic sector that has a national impact which usually managed by state-owned enterprises. The provision of infrastructure in other sectors, such as transportation, housing, and public works are divided by central and local governments, according to article 13 Law number 23/2014.

The financial relationship between the local government and the central government is regulated in Law number 25/1999 as lastly amended with Law number 33/2004 regarding Fiscal Balance between Central and Local Government. The law stipulated that the minimum share of the general allocation transfer (DAU) is 26% of the net revenue. The intergovernmental transfer in Indonesia consists of three major transfer, such as: the general

allocation fund (*Dana Alokasi Umum -DAU*); the specific allocation grant (*Dana Alokasi Khusus – DAK*); and the natural resources and tax revenue sharing (*Dana Bagi Hasil – DBH*).

There are also several minor transfer such as special autonomy funds (*Dana Otonomi Khusus*); village fund (*Dana Desa*); grants (*Hibah*); assistance funds (*Tugas Perbantuan*); and incentives funds (*Dana Insentif Daerah*) (Gonschorek and Schulze, 2019). The average share of intergovernmental transfer to the total central government spending is around 30 percent within the period of 2001-2014 (Figure 1).

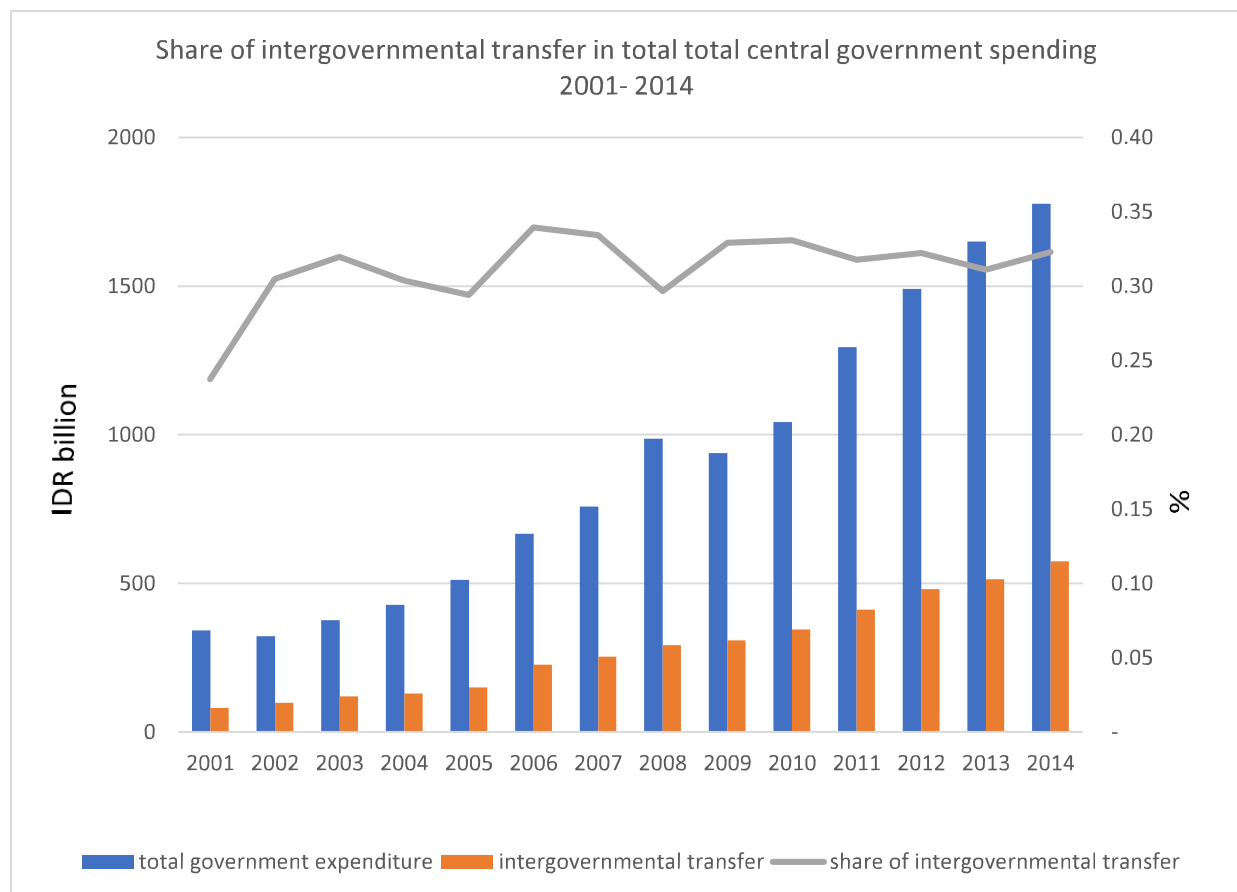


Figure 1. Share of intergovernmental transfer in total central government spending 2001- 2014.

Source: Statistics Indonesia.

The intergovernmental transfer becomes a significant source of revenue for the district government to perform its functions. The average share of own-source revenue,

intergovernmental transfer, other revenue, and local government financing to the total local government revenue is 7.38%, 75.87%, 9.84%, and 6.91%, respectively during 2001-2014 (Figure 2). The own source revenue is generated from local tax, local retributions, and local government-owned enterprises. Other local government revenue consists of grants, emergency fund, and other revenues. The local government financing consists of surplus balance from the previous budget year, local government bonds, and income from the sale of local government's assets. (Ministry of Finance, 2012). Although the trend of the share of intergovernmental transfer to the total local government revenue is decreasing, the contribution of the intergovernmental transfer still significant. In other words, the local government significantly relies on the intergovernmental transfer as the revenue source.

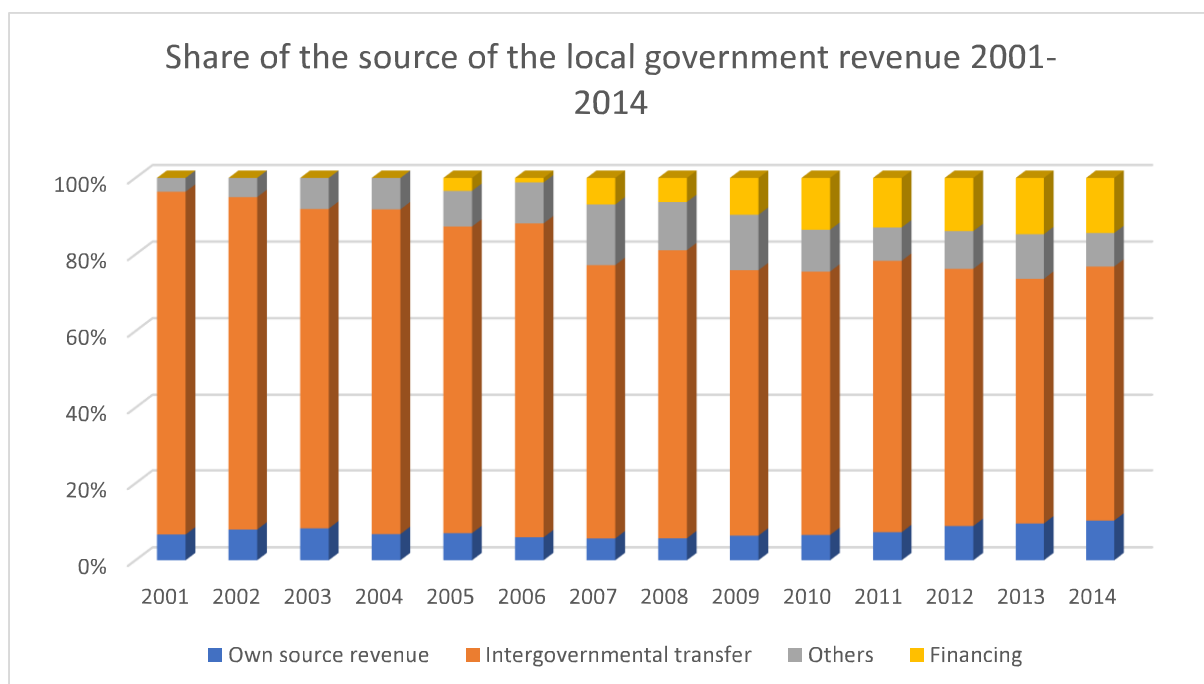


Figure 2. Share of the source of the district/municipality in government revenue 2005-2014.

Source: Ministry of Finance and Statistics Indonesia

DAU, DBH, and DAK are the major intergovernmental transfer. In district level, the average share of DAU, DAK, and DBH in the intergovernmental transfer is 67.7 %, 27.4%, and 4.9% during the period of 2001-2014 (Figure 3). After 2014, DAK has increased substantially due to the central government's policy in improving physical and capital investment. DAK is an earmarked fund for physical capital investments and operational and maintenance which aligned with national development priorities. DAU is a non-earmarked, formula based, and general-purpose grant. Being a non-earmarked and a general-purpose grant, the local government could use DAU without restrictions to choose their spending pattern. Only recently in Law number 18/2016 regarding the national budget article 11(15) stipulates that 25% of DAU and DBH funds are earmarked for physical capital.

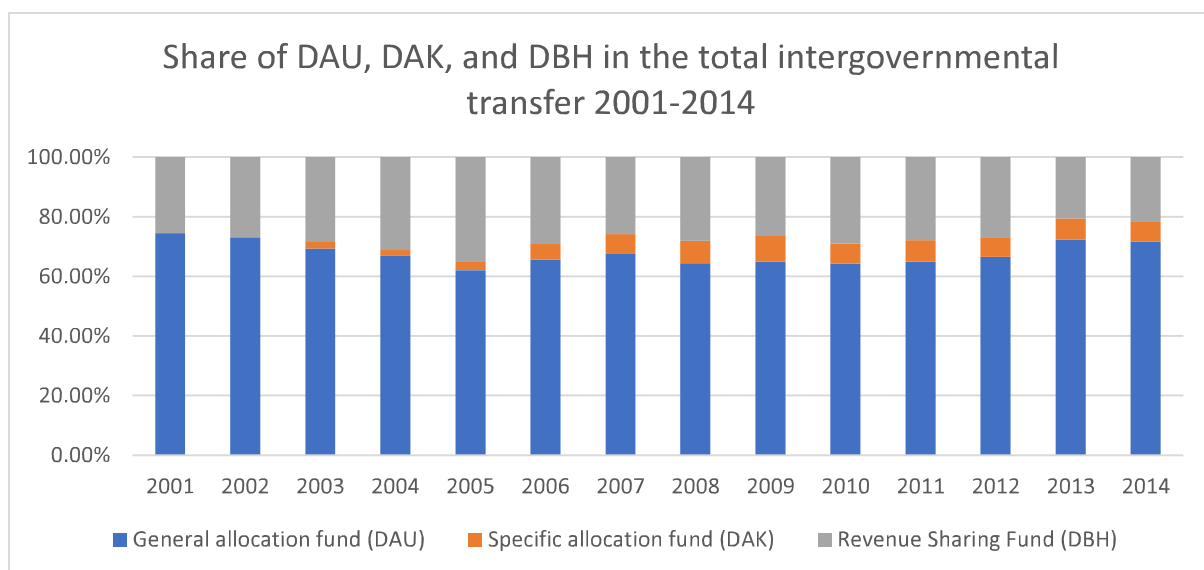


Figure 3. Share of DAU, DAK, and DBH in the total intergovernmental transfer 2001-2014.

Source: Statistics Indonesia

1.2. Overview of the Thesis

In assessing the effects of the Indonesian decentralization, we need to take possible dependence between decentralization and intra-province inequality into account. Which is more prevalent is dependent on a nation's social and economic circumstances. This is particularly true if we incorporate another factor, ethnic diversity, into the analysis. In other words, we should construct simultaneous equation models to provide an unbiased estimation.

Keeping this in mind, the main objectives of this dissertation are as follows:

- 1) to elaborate on the influence of social diversity and intra-province income inequality on the provision of local public goods;
- 2) to explain the interaction between intra-province income inequality and fiscal decentralization; and
- 3) to clarify the relationship between provision of local public goods, intra-province income inequality and fiscal decentralization.

This dissertation is based on three essays to explain the fiscal decentralization, intra-province inequality and the provision of local public goods in one of the most ethnically diversified countries, Indonesia. The first essay (chapter 2) examines the effects of intra-province income inequality and social diversity on local public goods delivery. The second one (chapter 3) investigates the possibility of simultaneity between fiscal decentralization and intra-province income inequality. The third one (chapter 4) explores the possibility of potential joint determination between fiscal decentralization, intra-province inequality, and the provision of local public goods. In what follows, we describe similarities and differences among chapters 2 through 4 in detail.

The relationship of the interest variables in this dissertation describes in Figures 4, 5, and 6 below.

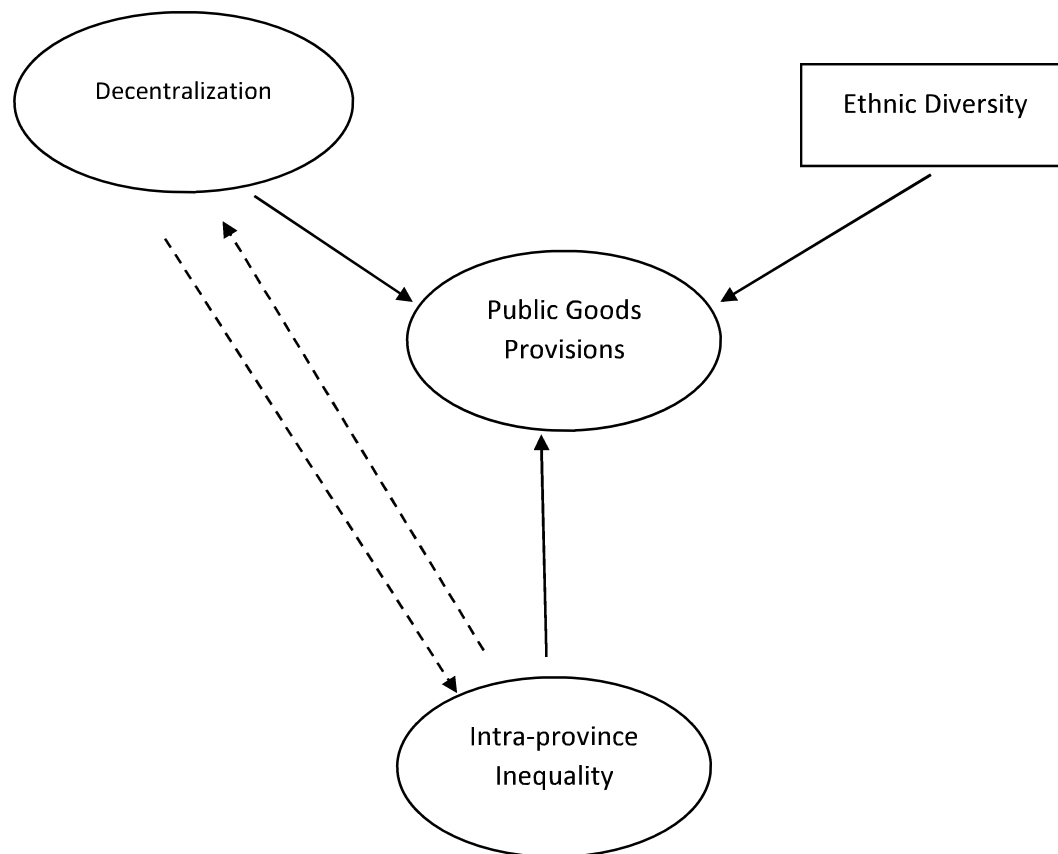


Figure 4. The effects of intra-province income inequality and social diversity on provision of local public goods.

Notes:

- (a) ○ endogenous variables;
- (b) □ exogenous variables;
- (c) → effects of the independent variables on the dependent variable;
- (d) - - → possible dependence between the independent variables.
- (e) The figure shows only the variables of primary interest. Refer to the model in chapters 2 for detail.

In chapter 2, to quantify the effects of ethnic diversity and intra-province income inequality on the provision of local public goods in Indonesia, we analyze Indonesian province-level data from 2001-2014. The theory proposes that several factors, such as income inequality (Meltzer and Richard, 1981; Benabou, 2000) and social diversity (Alessina et al., 1999; Houle,

2017) influence the provision of public goods. Accordingly, the model estimated in chapter 2, shown by Figure 4, regresses public goods provision against fiscal decentralization and intra-province income inequality as well as ethnic diversity. The empirical results in chapter 2 conclude that ethnic diversity enhanced the provision of local public goods. At the same time, intra-province income inequality has no significant effects on local public goods delivery and that intragovernmental transfer shows strong support for the provision of public goods on education and the infrastructure sector. This chapter contributes to the literature by providing a broader measure of ethnic diversity by applying both fractionalization and polarization indexes to capture a comprehensive knowledge regarding the influence of ethnic diversity on the public good provision.

The second objective is addressed in chapter 3, as described in Figure 5. That is, it examines possible interdependence between income inequality and fiscal decentralization. Income inequality is capable of shaping the level of fiscal decentralization within a country, as suggested by several studies (Bolton and Roland, 1997; La Porta et al., 1998). Alternatively, other researchers conclude that fiscal decentralization may alter regional income inequality across the region (Prud'homme, 1995; Rodriguez-Pose and Ezcurra, 2010). Theory suggests that social diversity may influence income inequality (Borjas, 1999; Gerring et al., 2015) and fiscal decentralization (Oates, 1972; Panizza, 1999). In chapter 3, we use an expenditure-based fiscal decentralization measure to reflect the features of the Indonesian decentralization policy, which authorizes a significant local government discretion on the expenditure. The results show that fiscal decentralization alleviates income inequality and that regional inequality has no significant incidence on fiscal decentralization. The estimation also shows that ethnic diversity has a positive relationship with decentralization.

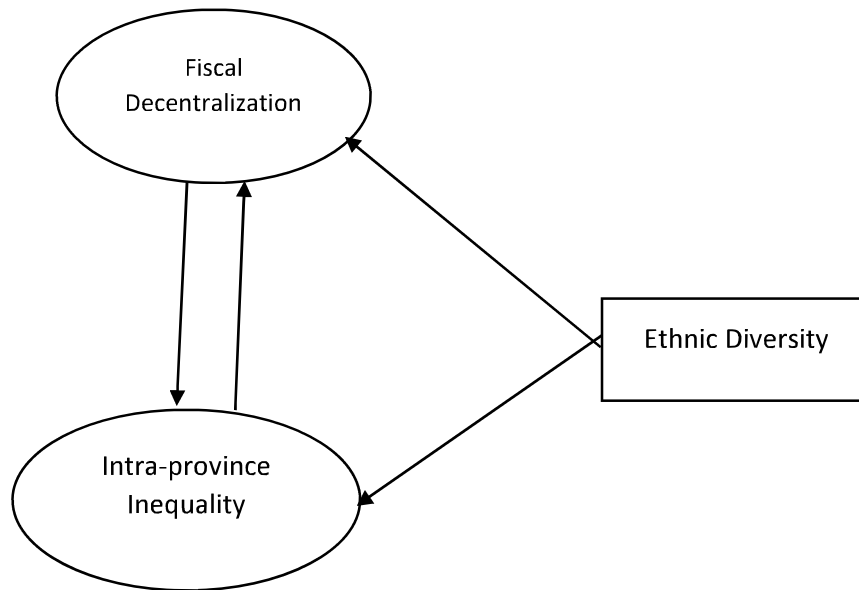


Figure 5. Intra – regional income inequality and fiscal decentralization.

Notes:

- (a) ○ endogenous variables;
- (b) □ exogenous variables;
- (c) → effects of the independent variables on the dependent variables;
- (d) The figure shows only the variables of primary interest. Refer to the model in chapters 3 for detail.

Chapter 4 points out the possibility of the potential simultaneity between fiscal decentralization, intra-province inequality, and the provision of local public goods in Indonesia, as described in Figure 6. Previous studies indicate that any of these variables can be influenced to some extent by the other two. Arrows 1 and 2 describe the possibility of joint determination between intra-province inequality and decentralization; arrows 3 and 4 show the possible simultaneity between decentralization and public goods provision; and arrows 5 and 6 present the potential interdependence between intra-province inequality and public goods provision. Arrows a, b, and c describe the possible influence of ethnic diversity on intra-province inequality, decentralization, and public goods provision, respectively.

The empirical results reveal that fiscal decentralization reduces intra-province income disparity but does not support the idea that income intra-province inequality affects fiscal decentralization. The results also suggest that intra-province income inequality and the provision of public goods are simultaneously determined. The results provide no evidence of dependence between fiscal decentralization and the provision of local public goods. This essay expands the literature by providing a comprehensive study regarding the relationship between the variables of interest in a developing country.

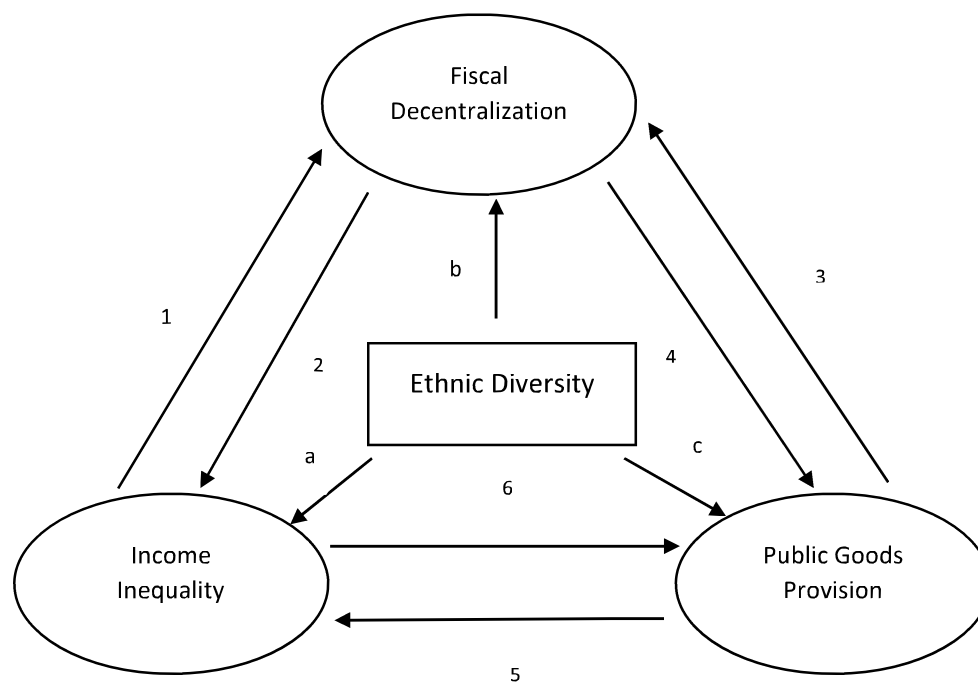





Figure 6. Intra-province Income inequality, fiscal decentralization, and provision of public goods.

Notes:

- (a)  endogenous variables;
- (b)  exogenous variables;
- (c)  effects of the independent variables on the dependent variables;
- (d) The figure shows only the variables of primary interest. Refer to the model in chapters 4 for detail.

To summarize, the model used in chapter 4 is the most comprehensive in that it incorporates the other two used in chapters 2 and 3 as a sub-model. However, to analyze the complex relationships among fiscal decentralization, intra-province income inequality, and public good provision, we take a step-by-step approach. First, we examine the effects of fiscal decentralization and intra-province income inequality together with ethnic diversity on the public good provision (chapter 2). Second, we check interdependence between fiscal decentralization and intra-province income inequality both of which are employed as the independent variables at the first step (chapter 3). Finally, since fiscal decentralization significantly affects intra-province income inequality, we estimate a comprehensive model described in Figure 6 to analyze the relation among the three variables (chapter 4). The results in chapters 2 to 4 are unified in chapter 5.

Chapter 2

The Effect of Regional Income Inequality and Social Diversity on the Provision of Local Public Goods in Indonesia ^{*1}

In this chapter, we investigate the influence of social diversity and intra-province income inequality on the provision of local public goods. This chapter employs broader measures on cultural (ethnic) diversity by applying both fractionalization and polarization indexes to obtain comprehensive knowledge regarding the influence of ethnic diversity on the public good provision. Using panel data to circumvent endogeneity, we find that ethnic diversity is related with the more extensive provision of local public goods and that there is no significant influence of intra-province income inequality on the provision of local public goods. To manage the variety of ethnicities in the nation, the Indonesian central government should set the minimum amount to be allocated to provide local public goods for ethnic minorities within a province to ensure equal access of local public goods and the local government should provide financial and institutional support for local people based on their expertise to increase economic welfare.

The remainder of this chapter is structured as follows. Section 1 presents the introduction, and Section 2 reviews literature on the relationship between income distribution and ethnic diversity with public goods provision with fiscal decentralization as one of the control variables. Section 3 describes data, key variable measurements, and empirical analysis. Finally, it reports on results and a robustness test in section 4 before concluding in section 5.

¹ This chapter is an outgrowth of the paper published on International Journal of Social Economics Vol. 47(1), pp. 111-126. <https://doi.org/10.1108/IJSE-12-2018-0661>

2.1. Introduction

The provision of public goods has a substantial impact on economic growth. Thus, the efficient distribution of public goods in society is essential to boost the economy. Finding factors influencing public goods provision is of practical importance for policy makers. However, there is no established theory about what determines public goods provision. Take income inequality as an example. Some researchers, such as Romer (1975), Roberts (1975), and Meltzer and Richard (1981), assert that in a democratic society, income inequality demands more public goods because it imposes political pressure on the government to redistribute income. Several researches find that there is no statistically significant correlation between income inequality and public goods provision (Shelton, 2007; Larcinese, 2007). Recently, several literatures indicate that there is potential simultaneity between the provision of public goods and inequality (Aristei and Perugini, 2014; Doerrenberg and Peichl, 2014; Guzi and Kahanec, 2018). In short, findings of the effects of income inequality on public goods supply are mixed in the previous research.

Similarly, there exists no agreement on the impacts of social diversity on public goods provision. Some researchers, on the one hand, observe that a diversified society demands a lesser amount of public goods than a homogenous society. Their justification for this result is the existence of collective action problems (Habyarimana et al., 2007), more extensive variety of preferences (Alesina et al., 1999; Chandra, 2001), and the political effect of ethnic diversity (Soss et al., 2008 and 2011; Franck and Rainer, 2012) on the provision of public goods. Their opponents, on the other hand, argue that diversity expands provision of public goods to accommodate inter-ethnics different preferences (Boustan et al., 2010; Rugh and Trounstein, 2011; Gibson and Hoffman, 2013; Gisselquist et al., 2016). In summary, the relationship between social diversity and public goods provision is inconclusive at best.

The main objective of this chapter is to quantify the effects of regional income disparity and social diversity on local public goods delivery in Indonesia, as summarized in Figure 4. In particular, we focus on intra-province differences to emphasize how social and economic heterogeneity affects public goods provision by a local government in a country. Indonesia provides an ideal setting to examine the topic. First of all, the delivery of its public goods is in a state of disrepair. Out of 138 economies, it ranks 60th in infrastructure development and 100th in health and primary education progress (World Economic Forum, 2017). Secondly, Indonesia has a long history of regional imbalances. Its size as well as economic and social diversity results in a significant difference in regional economies and the income distribution. On the one hand, several rich regions produce per capita income that is comparable to that of much richer developing countries. On the other hand, the poor regions' income level is as low as that of the poorest countries. (Hill, 2014). Lastly, Indonesia's heterogeneity in society is even more remarkable. It consists of more than one thousand ethnicities (Statistics Indonesia, 2015). Alesina et al. (2003), Fearon (2003), and Mavridis (2015), for instance, describe the country as one of the most diversified societies in the world in terms of ethnicity.

Using recent provincial-level data from 2000 to 2014, we analyze the determinants of local public goods provision in Indonesia by including regional income disparity and social diversity variables. It contributes to the growing body of literature on this topic in several aspects. First, the econometric model in this chapter accommodates the endogeneity and persistence of the critical variables over time, which is not addressed correctly in the existing literature. Second, this chapter provides a broader measure of cultural (ethnic) diversity by applying both fractionalization and polarization indexes to capture a comprehensive knowledge regarding the influence of ethnic diversity on public goods provision. Lastly, this chapter proposes policy recommendations based on the estimation results to assist the Indonesian

central and local governments to deal with the effect of social diversity on local public goods provisions.

2.2. Income Inequality, Social Diversity, and Provision of Public Goods

So far, despite prevalent research interest in the relationship between income disparity and public goods provision, the results seem to be inconclusive. In response to broadening of income disparity, the government are likely to entail greater use of taxation for redistribution policy thus affect the size of public goods provision (Romer, 1975; Roberts, 1975; Meltzer and Richard, 1981). Benabou (2000) and asserts that more income inequality is associated with less, rather than the more, provision of public goods because support for redistributive policies decrease as inequality is alleviated. Several studies find no statistically significant correlation between income inequality and public goods provision (Shelton, 2007; Larcinese, 2007; Lupu and Pontunson, 2011). Other researchers argue that there is an influence of government's redistributive policy on levels of inequality, and, simultaneously, inequality also affect government's redistributive policy (Aristei and Perugini, 2014; Doerrenberg and Peichl, 2014; Guzi and Kahanec, 2018).

Studies regarding diversity have started to grow since Easterly and Levine (1997) explained that a fragmented society tends to grow slower than a more homogenous community based on their analysis in the African countries. The reason for this is that a fragmented society is associated with inadequate public goods. However, there are several mechanisms that may explain the inverse relationship between diversity and public goods provision. The first one is the larger differences in group preferences. In a more diverse society, many disagree on the public goods compositions and/or the way of financing them (Benabou, 2000). Alesina et al. (1999) posit that when individuals have different choices, they want to pull fewer resources

together for public projects. Education is a classic example to describe a polarized preference in a heterogeneous society (Panizza, 1999). A second one is that diversity may dampen the provision of public goods because a group prefers not to share with another group's members (Alesina et al., 1999 and Gisselquist et al., 2016). A third one is regarding collective action. Habyarimana et al. (2007) and Miguel and Gugerty (2005) find that shared culture and language, geographic proximity, and within-group relationship make the collective action less complicated in a homogenous society. The last one is regarding the influence of diversity on the government. Soss et al. (2008 and 2011) confirm that the group label may affect how the authority in assessing disparity between groups in society. Diversity may cloud the judgment of the policy-maker in distributing resources in an economically efficient way to support their group (Franck and Rainer, 2012). Several empirical works confirm the negative effect of diversity on public goods provision, such as Easterly and Levine, 1997; Alesina et al., 1999; Alesina and Glaeser, 2004; Alesina and Ferrara, 2005; Baldwin and Huber, 2010). The existing literature on developing countries (India by Banerjee et al., 2005; Kenya by Michael and Guggerty, 2005; Sub-Saharan Africa by Jackson, 2013; and Zambia by Gisselquist et al., 2016) concludes that provision of public goods is lower in an ethnically diverse society.

Some studies, however, yield opposite results. A diverse society that contains different groups existing together is a talent-pool since they may complement each other (Alesina and La Ferrara, 2000). This may explain why a diverse society such as Singapore, New York, and London is prosperous in terms of economic outcomes (Mavridis, 2015). Boustan et al. (2010), in their multi-level government study about the US economy indicate that diversity is associated with larger productive public goods provision. On the provision of local public goods in US cities, Rugh and Trounstein (2011) confirm that diverse cities spend a significant amount of public goods compared to less diverse cities. Studies in developing countries (Liberia by Fearon et al., 2009; Zambia by Gibson and Hoffman, 2013; India, and Kenya by

Lee, 2018) conclude that diversity created an incentive to build a political coalition that fosters cooperation between legislators and leads to more provision of public goods. Based on the abovementioned literature, the evidence of the relationship between diversity and the provision of public goods in both developed and developing countries are mixed at best.

2.3. Key Variables Measurement and Empirical Analysis.

2.3.1. Data and Key Variables

Analysis of this dissertation covers province-level data from 2001 to 2014 for 33 provinces in Indonesia except for Kalimantan Utara, since it was established in 2013. Table 2.1 presents the summary statistics of variables in this dissertation.

Table 2.1: Summary statistics of the variables²

Variable	Observation	Mean	Std.Deviation	Source
Fiscal decentralization (FD)	452	0.28	0.18	Ministry of Finance, calculated by author
Regional Inequality (RI) - Gini	439	0.33	0.05	Statistics Indonesia
Regional Inequality (RI) - PWCV	439	1.40	0.36	Statistics Indonesia, calculated by author
Education spending, log	454	28.07	1.12	Ministry of Finance
Health spending, log	451	26.95	1.17	Ministry of Finance
Infrastructure spending, log	451	27.68	1.28	Ministry of Finance
Public Goods (PG), log	451	27.98	1.15	Ministry of Finance
Ethnic fractionalization index	442	0.63	0.25	Statistics Indonesia, calculated by author
Ethnic polarization index	442	0.55	0.19	Statistics Indonesia, calculated by author
Regional income per capita, log	456	16.11	0.90	Statistics Indonesia,
Population, log	439	15.16	1.01	Statistics Indonesia,
Share of trade to total gdp (%)	453	0.39	0.30	Statistics Indonesia,
Area, log kilometre square	454	10.47	1.20	Statistics Indonesia,
Population density	442	676.33	2360	Statistics Indonesia,
Intragovernmental transfer per capita, log	449	13.91	1.03	Ministry of Finance
Unemployment	447	7.62	3.23	Statistics Indonesia,
Years of schooling	451	7.75	0.94	Statistics Indonesia,
Share of urban population (%)	450	43.99	18.22	Statistics Indonesia,
Dependency ratio (%)	451	49.49	22.68	Statistics Indonesia,
Conflicts	449	127.30	244.73	The World Bank and Coordinating Ministry of Human Development and Culture

² Note: Table 2.1 contains all variables that are used in this dissertation.

The critical variables here are the measure of the public goods provision, intra-province inequality, and measure of social diversity. Following Alesina et al. (1999), Boustan et al. (2010), Gisselquist (2014), and Kis-Katoz and Sjahrir (2017), we regard the local government's spending on education, health, and infrastructure sectors as a proxy to measure the provision of public goods. Aschauer (1989) and Alesina et al. (1999) categorize public goods in education, health, and infrastructure sectors as productive public goods that trigger economic growth and therefore improve welfare. Indonesian local public investment in these three sectors holds a significant share of the total local government expenditure with an increasing trend (Statistics Indonesia, 2016). The local government is responsible for providing the first nine years of education (World Bank, 2013); primary healthcare services, financing, and human resources (World Bank, 2008); roads, transportations, and water services (World Bank, 2007).

The measure of inequality in this dissertation is using intra-province inequality measures. Both Gini index and population weighted coefficient of variation employed in this dissertation are an intra-province inequality. The main estimation in this chapter using a Gini index. A significant advantage of this index against others is that it is independent of scale, and it satisfies the principle of transfers (Firebaugh, 2003). In this dissertation, social diversity refers to ethnic diversity. The first index is the ethnic fractionalization index defined as the probability that two individuals selected at random from a country will be from the different ethnic groups. Fractionalization is estimated as:

$$EthnicityF_b = 1 - \sum_{h=1}^N S_{hb}^2, \quad (2.1)$$

where $h = 1, \dots, N$ show an ethnic group, N is the number of groups, and S_{hb} are the share of ethnicity h in province b . The index ranges from 0 to 1. The index is 0 if all the population in the region belongs to the same ethnic, and it increases monotonically with ethnic diversity

(Esteban and Ray, 2008). Index (2.1) is commonly used in the literature (See Easterly and Levine, 1997; Alesina et al., 1999; Alesina et al., 2003; Banerjee et al., 2005; Esteban and Ray, 2008; Jackson, 2013; Gisselquist et al., 2016; Gerring, 2015; Mavridis, 2015; Houle, 2017; Lee, 2018).

The second measurement of social diversity is the ethnic polarization index. This index captures how far the regional divides in a situation when there exist two of a few different groups of almost equal size (Esteban and Ray, 1994). Polarization index is defined as:

$$EthnicSP_b = 1 - \sum_{h=1}^N \left(\frac{0.5 - S_{hb}}{0.5} \right)^2 S_{hb} , \quad (2.2)$$

where S_{hb} is defined in equation (1). Polarization index ranges from 0 to 1, where it reaches 1 when a province has two groups, each accounting for 50 percent of total population. This index is used in several works of literature, such as Montalvo and Reynal-Querol (2005a, 2005b), Alesina and Ferrara (2005), Arifin et al., (2015), and Mavridis (2015). The ethnic diversification indexes are extrapolated from the Indonesian population census data 2000 and 2010.

In 2002, two new provinces, Kepulauan Riau and Sulawesi Barat proliferated from Riau and Sulawesi Selatan, respectively. The estimation in this dissertation deals with the possibility of spatial correlation between the newly established provinces and their parents by clustering on the panel identifier variable (Roodman, 2009).

2.3.2. Empirical Analysis

To check the empirical influence of intra-province income inequality and social diversity on public goods provision in each sector, this study uses the following estimation model:

$$PG_{bt} = \alpha + \gamma_1 PG_{bt-1} + \gamma_2 Gini_{bt} + \gamma_3 Ethnic_{bt} + \gamma_4 Z_{bt} + \varphi_b + \omega_t + \varepsilon_{bt}, \quad (2.3)$$

where subscript b and t refer to province and year, respectively; α , $\gamma_1, \gamma_2, \gamma_3$, and γ_4 , are the parameters to be estimated; φ_b and ω_t represent the fixed effects of province and time, respectively; and ε_{bt} is the error term. The dependent variable, PG_{bt} , is the measure of public goods provision. The independent variables are the previous value of the dependent variable (PG_{bt-1}); the intra-province income inequality measure ($Gini_{bt}$); the measure of ethnic diversity within the region ($Ethnic_{bt}$) which is measured by ethnic fractionalization index ($EthnicF_{bt}$) and ethnic polarization index ($EthnicP_{bt}$); and Z_{bt} are the control variables.

The estimation controls for a series of variables based on previous researches. Regional income per capita, population, dependency ratio, the share of the urban population, trade openness ratio, intragovernmental transfer, and the number of conflicts. Wagner (1883) claims that government expenditure increases as the national income rises (Wagner's law). Several works of literature support this finding, such as Kuijs (2000) and Akitoby, et al. (2006). The opposite correlation is identified by Musgrave (1969), Bird (1971), and Wildavsky (1975). This chapter employs regional income per capita as the measurement of income. Demographic factors such as population, dependency ratio, and the share of the urban population tend to affect the amount of public goods provided by the government (Dao, 1995; Alesina et al., 1999; Shonchoy, 2010; Gisselquist, 2014, and Coady and Dizioli, 2017). The dependency ratio is measured as the number of populations aged under 15 and over 65 against the number of people aged between 15 and 65. Rodrik (1998) and Shelton (2007) suggest that more public goods are provided by the government to protect its people from external risks such as the volatility of exchange rates and fluctuation of supply and demand in a more open economy. This study applies the share of trade (total export and import) to regional GDP as a trade openness

indicator. The Indonesian decentralization law stipulates that the central government regularly transfers intragovernmental transfer to the local governments. The transfer contributes significantly to local government revenue. Lewis (2013), in his study on Indonesian local governments, indicates that intragovernmental transfer has a positive impact on capital expenditure. The log of intragovernmental per capita is employed in this study to capture fiscal decentralization. The more heterogeneous it is, the more likely a society experiences violence (instability) due to conflict of preferences in term of political and economic resources that may affect the provision of public goods and economic outcomes (Alesina et al., 1996; Barro, 1996; Easterly and Levine, 1997; Annet, 2000). The number of conflicts in a region is used to capture the instability in this study.

Data used in this dissertation is unbalanced panel data due to the data availability of newly established provinces. A forward orthogonal deviation (FOD) proposed by Arellano and Bover (1995) to deal with unbalanced panel data using the average of all future observations (Roodman, 2009).

2.3.3. Persistence and Endogeneity

This study circumvents two econometric issues, namely persistence and endogeneity. In the estimation, the local government provision of public goods, the intra-province income inequality, and ethnic diversity tend to change slowly within the region over the study period. Persistence will generate biased estimates and cannot be solved by OLS or the fixed-effects estimation (Coady and Dizioly, 2017).

The relationship between income intra-province and government spending may reflect endogeneity. Government spending may affect income disparity in the region, and the existence of intra-province income inequality may influence the local government spending policy. The central government allocates the intragovernmental transfer based on a specific

formula, which has a positive relationship with government expenditure. However, the allocation formula includes the value of past actual government spending. Therefore, the preceding value of local government spending may affect the present value of the intragovernmental transfer. Endogeneity also occurs between income and government spending. Wagner's law states that government expenditure is an outcome of the growth of national income, whereas several studies confirm that they are mutually dependent.

The existence of persistence and endogeneity in the variables biases the estimated impact of the critical variables. To circumvent bias, we employ dynamic panel estimation techniques. Past values of the dependent variables are included as an additional independent variable to control for persistence. However, this implies that the exogeneity assumption is violated so that the estimates are biased. Arellano and Bond (1991) propose that a first-differenced GMM (difference GMM) estimator may address persistence and endogeneity problems by differencing the variables and then applying proper lagged values of variables instruments. Blundel and Bond (1998) argue, however, that difference GMM estimator has a weak instrument problem and that it worsens if the data is persistent. System GMM circumvents the weak instrument problem by differencing the equation to remove panel effects and applying instruments to form moment conditions. System GMM possesses several advantages, such as: providing efficient estimator in the presence of persistence, overcoming omitted variables, providing robust estimators in the presence of measurement error, and providing solution for endogeneity (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998; Greene, 2011). Here we employ two-step System GMM, which results in more asymptotically efficient estimates than one-step System GMM (Windmeijer, 2005; Hayashi, 2000; Baltagi, 2013). Lagged endogenous variables and differences of exogenous variables are possible instruments for differenced equation, while lagged differences of endogenous variables and exogenous variables are instruments for the level

equation. The validity of the over-identifying restrictions is tested with the Hansen J statistics. The Arellano-Bond test is also performed to check for serial correlation of the disturbances. All the necessary diagnostic tests are shown in the estimation results.

2.4. Estimation Results and Robustness Check

Tables 2.2 and 2.3 present the estimation results. The tables show the estimated coefficients, the associated z test statistics based on robust standard errors, and statistical significance of the estimated coefficients.

2.4.1. Estimation results

Tables 2.2 and 2.3 present the estimation results based on ethnic fractionalization index and ethnic polarization indexes for each sector, respectively. There are several points to be highlighted in Tables 2.2 and 2.3 based on the estimation results. First, let us check the statistical aspects of the estimation results in the two tables. The model fits the data reasonably well in each regression. For all estimations, the p-value of the Wald statistics for the system GMM estimations is highly significant. The p-value of the Arellano-Bond test for serial correlation indicates that the GMM estimators are consistent. The results also show that the first lag of the local government's spending in each sector is a significant determinant of current period expenditures (attempts to include further lags of the dependent variables showed no significant signs). It supports that the dynamic model is appropriate for this analysis. The Hansen test shows that the overidentifying restrictions are valid (Roodman, 2009; Cameron and Trivedi, 2010).

Table 2.2: Estimation result based on ethnic fractionalization index

Variable	Education	Health	Infrastructure
Lag of education spending	1.027***		
Lag of health spending		0.92***	
Lag of infrastructure expenditure			0.979***
Gini index	0.56	-0.785	-0.153
Ethnic fractionalization index	0.219*	0.313**	0.387*
Log of regional income per capita	-0.318***	-0.255***	-0.373***
Log of Population	0.0002	0.121	0.117
Share of urban population	0.010**	0.01***	0.016***
Dependency ratio	-0.0001	0.00001	0.001***
Share of trade to total RGDP	0.00002	0.0002**	0.0001
Log of transfer per capita	0.099	0.206	0.366***
Conflicts	-0.096	0.012	-0.278**
AR (1) test p-value	0.020	0.023	0.005
AR (2) test p-value	0.191	0.244	0.601
Wald statistic p-value	0.000	0.000	0.000
Hansen J Test p-value	0.468	0.450	0.367

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

Source: Author's calculations.

Table 2.3: Estimation result based on ethnic polarization index

Variable	Education	Health	Infrastructure
Lag of education spending	0.920***		
Lag of health spending		0.864***	
Lag of infrastructure expenditure			0.994***
Gini index	-0.052	-0.029	-0.076
Ethnic polarization index	0.143*	0.177*	0.231
Log of regional income per capita	-0.143**	-0.110**	-0.128
Log of Population	0.096	0.17	0.022
Share of urban population	0.006*	0.005**	0.007
Dependency ratio	-0.0002	-0.00005	0.001***
Share of trade to total RGDP	0.0001**	0.00007	0.00007
Log of transfer per capita	0.157***	0.224**	0.189
Conflicts	-0.042	-0.009	-0.173
AR (1) test p-value	0.020	0.021	0.007
AR (2) test p-value	0.224	0.295	0.870
Wald statistic p-value	0.000	0.000	0.000
Hansen J Test p-value	0.123	0.110	0.232

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

Source: Author's calculations.

On the economic significance of the results, for all the estimation, the empirical results provide no significant evidence of the influence of regional income disparity on local public goods provision. A possible reason for this result is the distinction between the short-run (first round) effect and the long-run (second-round) effect of public goods provision on intra-province income inequality. For instance, the effect of public social transfer will affect disposable income immediately while the effect of public goods provision on education, health, and infrastructure may affect intra-province income inequality in a more extended period (Chu et al., 2000; Anderson et al., 2017). Another possible explanation is that the conclusion of existing literature on this subject is inconclusive because it is affected by a range of factors such as control variables, analytical method, method of measuring intra-province income inequality and provision of public goods, and the country. The results are mixed with a fewer consistent pattern. Empirical studies in developing countries (Latin America and Sub-Saharan African) also present an inconclusive result (Shelton, 2007; Anderson et al., 2017).

The results find that ethnic diversity is associated with more provision of local public goods in all three sectors. When social diversity is measured by ethnic fractionalization index, a one percent increase in the ethnic fractionalization index is associated with of the increase in the provision of local public goods in all sectors in this analysis, specifically, 0.219 percent in education; 0.313 percent in health; and 0.387 percent in infrastructure. When social diversity is measured by the ethnic polarization index, a one percent increase in ethnic polarization leads to 0.143 percent increases in the provision of local public goods in the education sector, 0.177 percent increases in the health sector, while it is not significant in the infrastructure sector.

To begin with, Indonesia consists of more than one thousand ethnicities that coexist within the country (Statistics Indonesia, 2015). Alesina et al. (2003) and Fearon (2003) measure that Indonesia's ethnic fractionalization index is 0.7351 and 0.766, respectively. Recent work by Arifin et al. (2015) estimated Indonesian ethnic fractionalization index is 0.81, and the

ethnic polarization index is 0.5. A socially plural society has a greater variety of preferences over the provision of public goods and is also familiar with conflicts and competitions. Indonesian ethnic diversity forces the local government to provide a greater mix of public goods to satisfy the different preferences of the local constituents in order to avoid conflicts and survive the competitions with other regions. For instance, in the education sector, Panizza (1999) argues that education is an example of public goods on which preferences of the local people may differ. After the implementation of decentralization, the Indonesian central government enforced Law number 20/2003 regarding the National Education System, which regulates local content in the primary and middle education level. The local content subject covers the introduction of vernacular languages, traditional art, and local culture to the students in all regions to preserve the region's local identity. In providing local content subjects, regions with more diverse ethnicities have to provide more resources to accommodate different student preferences compared to a less ethnic-fragmented region. Bertrand (2003), in his study about Indonesia, asserts that ethnic conflicts in Indonesia resulted from the institutionalization of marginalized and excluded groups. These conflicts involved the representation of various ethnic groups and their access to power and resources. Failing to solve this problem correctly will exclude particular ethnic groups (i.e., raising the discrimination issue), which results in lower access of public goods for certain ethnicities in the local society that may trigger conflicts. In other words, in an ethnically diverse society, a greater mix of public goods is essential to accommodate various preferences of public goods and to ensure that each group has equal access to public goods. The same argument applies to the health and infrastructure sectors.

Moreover, ethnic diversity is related to political fragmentation. The different interests across ethnicity require a political institution that can integrate diversified interests, avoid conflicts, and make acceptable policies to motivate the politicians to form an inter-ethnic

coalition to gain local political access. This is a common practice in local Indonesian politicians. The politicians are willing to compromise through pairing with the inter-ethnic coalition in the local government elections. Lijphart (1999) introduces the coalition concept as consociationalism. Most winning contenders in Indonesian local government ballots are those who are supported by cross-cultural voters, not those supported by a single group (Aspinall, 2011 and Tadjoeidin, 2014). Once elected, the politicians must deliver their end of the bargain to their constituents. Otherwise, the politicians will face impeachment and be unable to get re-elected. Delivering the campaign's promises means that the politician must be able to accommodate different groups' preferences through the more significant provision of public goods (Annet, 2000; Bawn and Rosenbluth, 2006). Fearon et al. (2009), in their study about Liberia, argue that a development program motivated by ethnic diversity improved public service provisions through cooperation. This result coincides with that of Posner (2005) and Gibson and Hoffman (2013) on their studies about Zambia. That is, voters in Zambia keep a rough ethnic score of the paybacks their group is receiving in exchange for political support. Similarly, in Indonesia, a councillor under political pressure should assure the voters that they would obtain a fair share of benefits by voting him/her.

As for the control variables, the result confirms the negative relationship between regional income per capita and the provision of public goods. Wagner and Weber (1977), Abizadeth and Gray (1985), Ram (1987), and Shelton (2007) provide the same result. A strong and positive association of the share of the urban population with the provision of public goods is found in all sectors. The increasing percentage of the urban population in Indonesia triggers growing demands for public goods. The dependency ratio is also associated with more expenditure on the infrastructure sector. The result supports the previous studies, such as Dao (1995), Alesina, et al., (1999), Shonchoy (2010), Gisselquist et al. (2016), and Coady and Dizioli, (2017). The intragovernmental transfer also shows strong support for the provision of

public goods on education and the infrastructure sector. This is an uplifting finding for the policymakers since one of the primary objectives of the fiscal decentralization is to enable the local government to provide local public goods (Oates, 1972).

An attempt to include both ethnic fractionalization index and ethnic polarization indexes is described in attachment A. The estimation result provides no significant evidence of the impact of intra-province inequality and ethnic diversity indexes on local public goods provision. A possible explanation for this result is that these two indexes are nonlinearly interacted, so that they show no significance when both of them are included in the independent variables.

2.4.2. Robustness Check

To test the robustness of the analytical results, we employ alternative measures of public goods provisions and intra-province income inequality with both ethnic fractionalization and polarization indexes. This paper applies capital expenditure as the proxy for the provision of local capital goods. Indonesian Government Accounting Standard (Indonesian Ministry of Finance, 2016) defines capital expenditure as an item of expense that is used to acquire capital stock in terms of physical assets. Physical capital stock belonging to a local government covers land, buildings, roads, irrigations, and others. This study applies the weighted population coefficient of variation as a substitute to measure intra-province inequality (PWCV for each province). The population-weighted coefficient of variation is calculated as follows.

$$PWCV = \frac{1}{\bar{y}} [\sum_{i=1}^n p_c (y_c - \bar{y})^2]^{1/2}, \quad (2.4)$$

where $\bar{y} = \sum_{c=1}^n p_c y_c$, y_c and p_c are the GDP per capita and population share of districts c within the province respectively, and n is the number of districts. Here we suppress the subscripts for province and time for notational simplicity.

Tables 2.4 and 2.5 show the results using ethnic fractionalization and polarization index, respectively. The results reconfirm the main findings. They show no significant evidence on the relationship between intra-province regional inequality and local public goods provisions. The results also suggest a positive relationship between ethnic diversity and the provision of local public goods.

Table 2.4: Robustness check results based on ethnic fractionalization index

Variable	
Lag of capital spending	0.528***
Population weighted coefficient of variation	-0.085
Ethnic fractionalization index	0.437**
Log of regional income per capita	-0.072
Log of Population	0.488**
Share of urban population	0.009
Dependency ratio	0.0002
Share of trade to total RGDP	0.0001
Log of transfer per capita	0.544**
Conflicts	-0.078
AR (1) test p-value	0.004
AR (2) test p-value	0.400
Wald statistic p-value	0.000
Hansen J Test p-value	0.108

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

Source: Author's calculations

Table 2.5: Robustness check results based on ethnic polarization index

Variable	
Lag of capital spending	0.588***
PWCV	-0.138
Ethnic polarization index	0.386*
Log of regional income per capita	0.001
Log of Population	0.362**
Share of urban population	0.004
Dependency ratio	-0.0001
Share of trade to total RGDP	0.0001
Log of transfer per capita	0.412**
Conflicts	0.011
AR (1) test p-value	0.004
AR (2) test p-value	0.404
Wald statistic p-value	0.000
Hansen J Test p-value	0.181

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

Source: Author's calculations

2.5. Conclusions

This study examines the effect of regional income distribution and ethnic diversity on the provision of local public goods in Indonesia. Using provincial-level data from 2001 to 2014, the estimation finds that intra-province income inequality has no significant effect on the provision of local public goods. This may be due to the long-run effect of public goods provision on the distribution of income and the set of variables that may affect the relationship between intra-province income inequality and the provision of public goods. The results also show that ethnic diversity is associated with the more extensive provision of local public goods. Different preferences towards public goods provision in a fragmented society are more significant than those in a homogenous society. An ethnically plural society is also prone to conflict and intra-group competition. A vast difference in preferences towards public goods provision in a heterogeneous society pushes the local government to provide a broader mix of public goods in order to meet the greater demand of its local constituents' preferences for maintaining peace within the society and compete with other regions. Furthermore, the political fragmentation within an ethnically heterogeneous society triggers incentives for local politicians to form an inter-ethnic coalition in order to gain the local political access (i.e., consociationalism). This practice is common in Indonesian local politics. Just like any other developing democracies, local Indonesian politicians are also under pressure to bring benefits to their voters in exchange for their political support.

A possible extension from this study is to include other variables such as a different measure of social diversity, intra-province inequality, and other possible variables, and to extend the study period. This is a topic for future research that will provide a new understanding of this study.

Appendix A: Inclusion of both ethnic fractionalization index and ethnic polarization index

Variable	Education	Health	Infrastructure
Lag of education spending	0.924***		
Lag of health spending		0.901***	
Lag of infrastructure expenditure			0.998***
Gini index	-0.066	-0.072	-0.45
Ethnic fractionalization index	0.075	0.113	0.169
Ethnic polarization index	0.14	0.15	0.15
Log of regional income per capita	-0.157**	-0.161**	-0.175
Log of Population	0.103	0.148	0.047
Share of urban population	0.007**	0.007**	0.009
Dependency ratio	-0.0002	-0.0001	0.001***
Share of trade to total RGDP	0.0001**	0.00008	0.00008
Log of transfer per capita	0.168***	0.215**	0.217
Conflicts	-0.046	-0.051	-0.218
AR (1) test p-value	0.018	0.021	0.006
AR (2) test p-value	0.215	0.280	0.622
Wald statistic p-value	0.000	0.000	0.000
Hansen J Test p-value	0.196	0.218	0.287

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

Source: Author's calculations

Chapter 3

Fiscal Decentralization and Regional Income Inequality: Evidence from Indonesia^{*3}

In this chapter, I explain the interaction between intra-province regional income inequality and fiscal decentralization. This chapter employs an expenditure-based fiscal decentralization measure to reflect the features of the Indonesian decentralization policy, which authorizes a significant local government discretion on the expenditure. Using a simultaneous equation method, I find that that fiscal decentralization is associated with lower intra-province income inequality and that intra-province regional inequality has no incidence on fiscal decentralization.

This chapter is structured as follows. Section 1 provides the introduction. Section 2 reviews the research methods and materials. Section 3 presents results and discussion before concluding in Section 4.

3.1. Introduction

Fiscal decentralization is said to suit better local demands of public goods since local authorities are more knowledgeable on what people need in their regions than the central government. This view has been supported by several researchers, both theoretically (Oates, 1972; Ezcurra & Pascual, 2008) and empirically (Rodriguez-Pose & Ezcurra, 2010; Tarzwell, 1998).

However, fiscal decentralization has not necessarily improved intra-province income inequality across a country. Due to imbalanced regional distributions of natural resources,

³ This chapter is an outgrowth of the paper published on Applied Economic Letters published online October 24th, 2019. <https://doi.org/10.1080/13504851.2019.1683139>

human capital, and infrastructure, decentralization can increase income gaps among regions. Liu *et al.* (2016), Prud'homme (1995), Sacchi and Salotti (2014) confirm this point. Therefore, the effects of fiscal centralization on economic equality vary, depending on a country's socio-economic situation.

How fiscal decentralization influences the local economy is of importance to Indonesia because it has lately empowered public finance. Since 2001, the Indonesian government has decentralized control over expenditure on public goods to the local governments and give them full financial autonomy (Nasution, 2016). Before 2001, the central government limited local political and economic control over state resources and required them to act as its agent (Bertrand, 2004; Pal and Wahaaj, 2017). Geographically, Indonesia consists of about 17,000 islands with three time zones. Indonesia also is characterized by its enormous diversity in many aspects, such as economy and ethnicity (Hill, 2014). Due to those differences, effects of fiscal decentralization in Indonesia are inconclusive a priori, and it should be tested whether decentralization improves economic inequality. The country comprises multi-ethnic groups and thus needs to meet various local demands. Moreover, natural resources, educational level of residents, and infrastructure tremendously vary across the regions. Consequently, fiscal decentralization is reasonable to meet local needs better. However, this does not necessarily imply that the decentralization has reduced economic inequality among provinces. The main purpose of this chapter is to examine the effects of fiscal decentralization on income inequality based on Indonesian province-level data from 2001 to 2014.

Decentralization is entangled with other variables, such as income inequality. Thus, it is hard to isolate its effects on other variables (Martinez-Vazquez et al., 2017). To obtain unbiased estimates, we need to consider the potential interdependence between fiscal decentralization and intra-province regional inequality. Different regional preferences for redistribution policies on the one hand and dissatisfaction regarding the central government's

ability to reduce poverty, income inequalities and conflicting interests between poor and rich regions on the other hand force the central government to resort to decentralization (Bolton and Roland, 1997; Sepulveda & Martinez-Vazquez, 2011). The possibility of interdependence between fiscal decentralization and income inequality has been discussed by several researchers (Lessmann, 2009; Sacchi & Salotti, 2014; Kyriacou et al., 2017). To handle interdependence, we use a simultaneous equation model (SEM) with the generalized method of moment using a heteroskedasticity and autocorrelation consistent (GMM HAC) estimate of the covariance matrix.

3.2. Research methods and materials

To handle potential dependency among key variables, we apply the following SEM to Indonesian province-level data from 2001 to 2014 obtained from Statistics Indonesia and Ministry of Finance

$$FD_{it} = \gamma_0 + \gamma_1 RI_{it} + \gamma_2 X_{1,it} + \varepsilon_{1,it} , \quad (3.1)$$

$$RI_{it} = \beta_0 + \beta_1 FD_{it} + \beta_2 Y_{2,it} + \varepsilon_{2,it} , \quad (3.2)$$

where subscript i and t refer to province and year, respectively; FD_{it} and RI_{it} refer to the dependent variables of fiscal decentralization and intra-province income inequality, respectively; β_1 and γ_1 are the parameters associated with the endogenous variables; β_2 and γ_2 are the parameters associated with the control variables $X_{1,it}$ and $Y_{2,it}$, respectively; β_0 and γ_0 are the constant terms; and $\varepsilon_{1,it}$ and $\varepsilon_{2,it}$ are the error terms for equations (3.1) and (3.2), respectively.

Inequality measure is measured by the population weighted coefficient of variation computed by (2.4) showing the intra-province income inequality. The advantage of this inequality measure compared to others is that it is independent of scale, population size, and the number of regions, and satisfies the Pigou-Dalton principle (Firebaugh, 2003).

An expenditure-based decentralization measure is suitable here because Indonesian decentralization provides local governments with discretion in expenditure. The Indonesian fiscal decentralization law authorizes local governments to use substantial discretion to arrange their expenditure priorities, but the primary taxing right remains with the central government. Following Lessmann (2009) and Liu *et al.* (2016), we define decentralization as the ratio of local government spending to the total government spending. The local government spending covers operational, capital, and extraordinary spending. The total government spending is the sum of total local government spending and central government spending (including intergovernmental spending).

We select several control variables based on previous works to circumvent spurious correlations. We employ ethnic polarization index, regional GDP per capita, regional population, and the share of regional trade (total export and import) to regional GDP as the measurement for ethnic diversity, regional income, population, and openness to international trade, respectively. The fiscal decentralization equation controls the geographic size of the region and the share of the urban population. Years of schooling and unemployment are controlled when estimating regional inequalities.

SEMs can accommodate the potential interdependence between variables of interest to obtain consistent and more efficient estimates than a single equation approach (Kyriacou *et al.*, 2017; Wooldridge, 2010). To gain efficiency from the correlation of the disturbances and the possibility of interdependence, SEM is estimated through system instrumental variables (SIV). It is a special case of GMM. To be specific, GMM HAC is applied to safeguard

heteroskedasticity and autocorrelation (Baum, 2006; Baum et al., 2007). The rank condition for identification in both equations holds since there is at least one nonzero coefficient of the excluded exogenous variable from the other equation (Wooldridge, 2010).

To handle unbalanced panel data, we use FOD (see chapter 2). To accommodate the establishment of new provinces in 2002, this chapter using clustering of panel identifier.

3.3. Results and Discussion

The empirical result (Table 3.1) reveals that (higher) ratio of local fiscal spending out of total fiscal spending can explain (lower) intra-province inequality, but the latter does not significantly explain the former. When fiscal decentralization increases by one point, the regional disparity decreases by 0.272 points. Decentralization granted the local governments with substantial political and economic power to govern their regions in designing a customized development program that matches the unique characteristics of each region and distributing more balanced resources across the regions compared to the centralization system. Decentralization also provides more efficient public services that may offset the deteriorating effect of decentralization on income distributions. This result coincides with Hoffman & Guerra (2007) that conclude that the design of Indonesian intragovernmental transfer has mitigated the regional inequality and region rivalry. Another possible explanation is the motives of a local politician to gain power. Indonesian decentralization allows a direct election of regional heads. This system provides a strong incentive for each regional head to use their significant expenditure decision to deliver better services and to achieve a certain standard of economic development that match more developed regions to persuade local people to vote for them again. Therefore, the local governments now compete with each other to provide public goods more efficiently and to level the living standard across the regions.

The ethnic polarization index shows a positive and significant coefficient in fiscal decentralization equations, which implies that ethnic polarization related to more demand for fiscal decentralization. An ethnically heterogeneous society is characterized by broader preference variety, which will be more efficient to handle by a lower level of government (Oates, 1972; Shah, 1998). The local government is more responsive to the local preference of public goods compare to the central government. Production efficiency of the provision of the public good by the local government implies a production efficiency, which is the ability of the local government to deliver an optimum mix of public goods that matches local preferences at minimum cost. Furthermore, an ethnically fragmented society with significant preferences of public goods associated with the political division which different across the regions. Different political interest in this particular region requires a local political institution to represent the local political interest at the national level. The decentralization ensures that each region's interest fairly represents at the national level, which may not be possible in the centralization system.

The results also confirm that factors such as, urban population, regional income, and share of trade are related to decentralization. A lower-tier government which possesses local knowledge can handle differences in social and economic performance across regions in Indonesia. Table 3.1 shows that a larger share of urban population and higher regional income lead to larger intra-province income inequality.

Table 3.1: Estimation results

Variables	FD	RI
	(1)	(2)
Regional inequality (RI)	-0.118	
Fiscal Decentralization (FD)		-0.272***
Ethnic polarization index	0.093*	0.006
Log of population	0.01	0.023***
Log of regional GDP per capita	0.069***	0.03***
Share of trade	0.044	0.013
Log of regional area	0.002	
Urban population	0.005***	
Unemployment		-0.0009
Years of schooling		0.034***
Wald statistic p-value	0.000	0.000
Hansen J Test p-value	0.116	0.270

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

Source: Author's calculations.

As a robustness check (Table 3.2), we try using a revenue decentralization measure, Gini index, and ethnic fractionalization index as a substitute to measure fiscal decentralization, intra-province inequality, and ethnic diversity, respectively. The result confirms that decentralization leads to lower intra-province inequality. Ethnic diversity shows an insignificant sign of both decentralization and intra-province income inequality equations.

Table 3.2: Robustness check

Variables	FD	RI
	(1)	(2)
Regional inequality (RI)	-0.016	
Fiscal Decentralization (FD)		-0.483**
Ethnic fractionalization index	-0.045	0.038
Log of population	0.039**	0.136***
Log of regional GDP per capita	0.02**	0.036
Share of trade	-0.009	0.912
Log of regional area	-0.014	
Urban population	0.003*	
Unemployment		-0.004
Years of schooling		-0.012
Wald statistic p-value	0.000	0.000
Hansen J Test p-value	0.106	0.422

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

Source: Author's calculations.

3.4. Conclusion

We investigate the effects of fiscal decentralization on intra-province income inequality to conclude that the former reduces the latter and that no statistical evidence is obtained that the latter causes the former.

Decentralization enables the regions to distribute more balanced resources to design a customized development program that matches the local needs. The customized resource allocation is shown to mitigate, not accelerate, the regional income gap. This result is possibly explained by Indonesia's newly introduced democratic election system, where politicians compete with each other to be re-elected by better meeting local needs. The estimation result indicates that a more ethnically fragmented society is related to decentralization. A wider variety of preferences in a heterogeneous society requires a local government to provide an optimum bundle of public goods that matches local preferences. The importance of representing a local political interest at the national level may also be a reason that a fragmented society prefers a decentralized system.

Chapter 4

Fiscal Decentralization, Regional Income Inequality, and the Provision of Local Public Goods: A Case Study in Indonesia*⁴

In this chapter, I investigate the relationship between the provision of local public goods, intra-province income inequality, and fiscal decentralization. By way of the simultaneous equation method, I find that fiscal decentralization is related to lower regional income disparity but does not support the idea that income inequalities influence fiscal decentralization. The result confirms that intra-province 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.

This chapter is organized as follows. Section 1 provides the introduction. Section 2 reviews those findings that relate to the variables studied in this chapter. Section 3 describes the data, the key variables, and the empirical methodology used. Section 4 reports on the results and a sensitivity check and then discusses the findings. Section 5 concludes the study and presents policy implications.

4.1. Introduction

In recent years, several theoretical and empirical studies have focused on the relationship between fiscal decentralization, regional income inequality, and the provision of

⁴ This chapter is an outgrowth of the paper submitted to Journal of Economic Development and currently under review.

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, some scholars insist that existing income inequalities possibly cause fiscal decentralization. In other words, to reduce economic disparities across regions, the government chose decentralization to boost local economies by suitably meeting regional demands. 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 society within a large regional income inequality scenario often demands the government to deliver a more significant 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. The current study indicates that any of these variables can be influenced to a certain degree by the other two.

The main objective of this chapter is to clarify the potential joint determination between fiscal decentralization, intra-province 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 solve this limitation, we accommodate the possibility of interdependence between fiscal decentralization, intra-province inequality, and the provision of local public goods by applying a simultaneous equation model (SEM). A SEM can provide consistent and efficient estimators and produce a more efficient estimation than the single equation approach and help us 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 income inequalities for an extended 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 potential joint determination among the provision of public goods, intra-province income inequality, and fiscal decentralization by applying a SEM, which directly addresses interdependence between the key variables. Based on the estimation results, this chapter conveys policy implications as final remarks to assist the Indonesian central and local governments in dealing with the interaction between the variables of interest.

4.2. Literature Review

The channel links fiscal decentralization, intra-province inequality, and the provision of local public goods as described in Figure 6 in chapter 1, which is explained in the sub-sections below.

4.2.1. 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 and 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). The incompetence of the central government in the reduction of poverty and income disparity has triggered a stronger demand for a decentralized fiscal system in the hope that a local government can meet local demands efficiently has triggered a 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).

4.2.2. 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 bureaucratic 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). However, a local government is not necessarily capable of gathering useful information for successful provision of public goods, since gathering effective information involves experienced human resources, reliable assessment, and technological infrastructure, all of which are rarely available for a local government, especially in a developing country. Therefore, there may be a reduction in the supply of public goods (Prud'homme 1995; Rodriguez-Pose & Gill 2004).

4.2.3. Income inequality and public goods

Regarding the impact of income inequality on the provision public goods, the results of the literature on the effect of the provision of public goods on income inequality are inconclusive. The classical public choice model proposed by Romer (1975), Roberts (1977) and Meltzer & Richard (1981) suggests that broadening income inequality leads to a more substantial demand of public goods because it imposes political pressure on the government to redistribute income. Large regional income inequality results in a demand for public goods on education, health, childcare, and infrastructure sectors to mitigate the income gap (Alesina & Perotti 1996; Alesina & Rodrik 1994). Benabou (2000) yields that larger income inequality is associated with less provision of public goods because the declining support for redistributive policies as inequality is alleviated. Several studies find no statistically significant correlation between income inequality and public goods provision (Shelton, 2007; Larcinese, 2007; Lupu and Pontunson, 2011). A more recent literatures reveal that there is a possibility that government's redistributive policy which manifested on the provision of public goods and the level of inequality are jointly determined (Aristei and Perugini, 2014; Doerrenberg and Peichl, 2014; Guzi and Kahanec, 2018).

4.3. Key variables and empirical analysis

4.3.1. Data and 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). Among the key variables in this analysis are the measure of the local provision of public goods, intra-province inequality, and fiscal decentralization. Regional capital expenditure is used as a proxy for the provision of local public goods (see Lewis, 2013). Capital expenditure is defined as an expenditure that is used to obtain capital stock in terms of physical assets, which covers land, buildings, roads, irrigation, and others owned by local government (Indonesian Ministry of Finance 2016).

In this chapter, we use the population-weighted coefficient of variation as a measure of intra-province income inequality. It offers preferable properties that are not found in other inequality measures. For instance, it is independent of scale, population size, and the number of regions. Also, it is known to satisfy the Pigou-Dalton transfer principle (Cowell, 1995; Firebaugh, 2011). The population-weighted coefficient of variation is defined in equation (3.3) in chapter 3. In this chapter, expenditure-based fiscal decentralization measure is employed, since Indonesia has empowered expenditure decisions, not revenue collections. In this chapter, expenditure-based fiscal decentralization measure is employed, since Indonesia has empowered expenditure decisions, not revenue collections. The Indonesian fiscal decentralization law authorizes a substantial expenditure discretion to the local government in prioritizing expenditures, but the primary taxing right remains with the central government (Ahmad and Mansoor, 2002; Nasution 2016). Therefore, the expenditure-based fiscal decentralization measure is appropriate in the Indonesian context. To be specific, the expenditure-based fiscal decentralization measure is defined as the ratio of local government

spending to total government spending. The local government spending includes operational, capital, and extraordinary spending. The total government spending is the sum of local government spending and central government spending (including intergovernmental 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).

4.3.2. Empirical analysis

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

$$FD_{kt} = \alpha_0 + \alpha_1 PG_{kt} + \alpha_2 RI_{kt} + \alpha_3 X_{1,kt} + \mu_{1,kt} , \quad (4.1)$$

$$RI_{kt} = \beta_0 + \beta_1 PG_{kt} + \beta_2 FD_{kt} + \beta_3 Y_{2,kt} + \mu_{2,kt} , \quad (4.2)$$

$$PG_{kt} = \gamma_0 + \gamma_1 FD_{kt} + \gamma_2 RI_{kt} + \gamma_3 Z_{3,kt} + \mu_{3,kt} , \quad (4.3)$$

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, intra-province 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.

The instrumental variables method is used in most previous studies. However, this method offers insufficient solutions due to the difficulty in finding the proper instruments (Martinez-Vazquez, Lago-Penas, & Sacchi 2017). In this chapter, we explicitly handle potential simultaneity through a SEM. The SEM approach produces consistent estimates and

identifies joint determination among the three key variables (Wooldridge 2010). The SEM approach is also known to be more efficient than the single equation model approach. Another point to make is that some variables are persistent during the observation period. To cope with persistency, we use the system instrumental variable (SIV) method implemented by the GMM (Baltagi 2013; Greene 2017). Heteroskedasticity and contemporaneous correlation in the error terms are accounted for by the GMM-HAC (Baum, 2006; Baum, Schaffer, & Stillman 2007). The order condition is satisfied by each of (4.1), (4.2), and (4.3). The system is identifiable 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 control for ethnic heterogeneity (ethnic polarization index), 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). For instance, a rich region is more proficient in reducing the income disparity compared to a poor region (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, affect the amount of public goods provided by the government (Alesina, Baqir, & Easterly 1999; Shonchoy 2010). The regional population controls 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 the 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.

Second, in equation (4.1), population density, the geographic size of the region (area), and intragovernmental transfer per capita are controlled. A small and sparsely populated 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 used to measure the geographic region size. The intragovernmental transfer also contributes to the determination of the autonomy of the local government. The intragovernmental 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 intragovernmental per capita is used in this study to represent intragovernmental transfer.

Third, in estimating equation (4.2), this study uses 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 are also applied as a proxy for human capital.

Fourth, equation (4.3) controls for the share of the urban population and the dependency ratio. A greater share of the urban population, combined with a high dependency ratio, triggers a greater demand for the public good from the local government (Gisselquist, 2015; Coady &

Dizioli, 2017). The dependency ratio is measured as the number of people aged under 15 or over 64 against the number of people aged from 15 to 64.

The choice of control variables in all three equations is based on previous researches. The intragovernmental variable is not included in intra-province inequality and public goods equation since, in both equations, an expenditure-based decentralization measure (FD) is already included. The intragovernmental transfer per capita variable is highly correlated with the FD variable. The inclusion of highly correlated variables will result in a multicollinearity problem in the equation, which will undermine the statistical significance of an independent variable.

To handle unbalanced panel data and to accommodate the establishment of two new provinces we use FOD approach and clustering panel identifier, respectively (see chapter 2).

4.4. Estimation results and robustness check

4.4.1. Estimation results

Table 4.1 presents the estimation results. For all of the estimations, the p-values of the Hansen J statistics in all the estimations fail to reject the null hypothesis, which indicates that the overidentifying restrictions are valid (Baum et al., 2007; Roodman, 2009; Cameron and Trivedi, 2010).

Table 4.1: Estimation results

Variables	FD	RI	PG
Fiscal decentralization (FD)		-0.227***	-0.0224
Regional inequality (RI)	-0.394		0.439**
Public goods (PG)	0.001	0.023*	
Ethnic polarization index	0.061	-0.02	-0.23
Income per capita	0.089**	0.014	0.064**
Population	0.009	0.003	0.654***
Share of trade	0.126***	0.011	0.247**
Area	0.004		
Population density	0.00001		
Intragovernmental transfer per capita	-0.04		
Unemployment		0.0005	
Years of schooling		0.028***	
Urban population			-0.016
Dependency ratio			-0.007
Wald statistic p-value	0.000	0.000	0.000
Hansen J Test p-value	0.367	0.108	0.644

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

Source: Author's estimation

Next, we focused on the economic significance of the results. Beginning with the relationship between 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 intra-province income inequality, the result reveals that (higher) ratio of local fiscal spending out of total fiscal spending can explain (lower) intra-province inequality, but the latter does not significantly explain the former. When the fiscal decentralization index increases by one point, intra-province inequality decreases by 0.227 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 that were 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 intragovernmental 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 the income distribution. The design of Indonesian intragovernmental transfer has reduced the intra-province inequality and region rivalry triggered by decentralization (Hoffman & Guerra 2007).

Regarding the relationship between intra-province income inequality and the provision of local public goods, the result confirms that these two variables are simultaneously determined. When the measure of intra-province inequality increases by one point, the provision of public goods increases by 0.439 points. Since the decentralization, the financial and political powers of the local governments have significantly increased along with their responsibility. Significant 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 (especially in the education, health, and infrastructure sectors) to offer equal opportunity for all provide opportunities for a good start in life (World Bank 2007). To cope with serious intra-province 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 implementation of both of the laws, 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 one-point, intra-province income inequality increases by 0.023 points. One possible explanation for this positive estimate is as follows. At the outset, the development stages of the local economies are different. Combined with the uneven resource distribution, deregulated public goods provision widens the income gap across regions. The intragovernmental 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. Besides, rich regions had more advanced public goods than poor regions: modern public clinics, well-equipped public schools, bridges, roads, and stable electricity, among others. These public goods attract skilled workers and consequently enable the rich regions to provide quality goods and services. The poor regions, on the other hand, had to concentrate on supplying essential public goods and hire unskilled workers in attempting to catch up with the developed regions. In summary, local public goods provision can exacerbate regional income disparity if the central government does not intervene to reallocate resources among regions.

The result provides no evidence on the influence of ethnic diversity in all equations. The result indicates that when we consider decentralization, intra-province inequality, and provision of public goods in a SEM, the ethnic diversity variable has no significant impact. With a larger sample size, such as extending the study coverage period, we may possibly detect a significant effect of ethnic diversity variable on the three key variables in this chapter.

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 intra-province income inequality shows that ethnic diversity, trade, and unemployment positively correlated with intra-province income inequality, while the years of schooling contributes negatively to the distribution of income. The regional income per capita and population are associated with a more substantial provision of public goods.

4.4.2. Robustness check

The robustness of the results can be evaluated by employing an alternative measure of fiscal decentralization, intra-province income inequality, the provision of public goods, and ethnic diversity index. This paper employs a revenue decentralization measure, the Gini index, regional infrastructure expenditures, and the ethnic fractionalization index as a substitute to measure fiscal decentralization, intra-province income inequality, and the provision of public goods. The revenue decentralization measure is defined as the ratio of the local government revenue to total government revenue. Table 4.2 summarizes the results of the sensitivity check with the alternative measures of the key variables. Overall, the results are robust to the changes of important variables.

Table 4.2: Robustness check

Variables	FD	RI	PG
Fiscal decentralization (FD)		-0.073**	0.117
Regional inequality (RI)	-0.013		0.049**
Public goods (PG)	-0.0001	0.012*	
Ethnic fractionalization index	-0.0005	-0.02	0.047
Income per capita	0.001**	0.019*	0.092***
Population	0.002	0.022&	0.049**
Share of trade	0.002**		
Area	0.0007		
Population density	0.000001***		
Intragovernmental transfer per capita	0.0002		
Unemployment		0.0004	
Years of schooling		0.025***	
Urban population			-0.028
Dependency ratio			-0.007
Wald statistic p-value	0.000	0.000	0.000
Hansen J Test p-value			

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

Source: Author's estimation

4.5. Conclusions

In this chapter, we used a SEM to handle potential interdependence among fiscal decentralization, regional income disparities, and public goods provision. The results revealed the relation of the three key variables as follows.

- 1) Fiscal decentralization lowers regional income disparity. However, regional income disparity does not trigger fiscal decentralization.
- 2) Intra-province income inequality and public goods provision depend on each other.
- 3) No significant dependence is observed between fiscal decentralization and public goods provision.
- 4) Ethnic diversity has no significant impact on the three equations.

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 intra-province income inequality. To address the broad income gap, Indonesian local governments provide a significant amount of local public goods to their constituents, especially in productive sectors such as education and health. At the same time, the provision of local public goods seems to worsen regional disparity. The different states of initial economic development and the uneven distribution of resources among regions may affect the impact of the provision of public goods on intra-province regional inequality.

Chapter 5

Summary

This dissertation investigates the interaction among fiscal decentralization, intra-province income inequality, and the provision of public goods in Indonesia. In chapter 2, the estimation explains the effect of social diversity and intra-province income inequality on the provision of local public goods. The interaction between intra-province income inequality and fiscal decentralization is examined in chapter 3. Chapter 4 explains the relationship between the provision of local public goods, intra-province income inequality, and fiscal decentralization.

This dissertation provides several findings regarding the relationship between the variable of interest, as described in Figure 7. Firstly, decentralization is associated with lower intra-province income (indicated by the negative sign from decentralization to intra-province inequality), but does not support the idea that income inequalities have an influence on fiscal decentralization (chapters 3 and 4). Secondly, the estimation in chapter 4 shows that intra-province income inequality and the provision of public goods are simultaneously determined (indicated by the positive signs from intra-province inequality to public goods provision and vice versa). And finally, regarding the impact of ethnic diversity on the key variables, this research finds that ethnic diversity is related with more provision of public goods (shown by the positive sign from ethnic diversity to provision of public goods) using a single estimation method (chapter 2) and positively related to decentralization (shown by the positive sign from ethnic diversity to decentralization) using a SEM including intra-province inequality and decentralization (chapter 3). In the SEM estimation vis-à-vis the relationship between inequality, decentralization, and public goods provision (chapter 4), the estimated coefficients

for ethnic diversity are all insignificant in the model. Possibly, this is due to the limited sample size in this study.

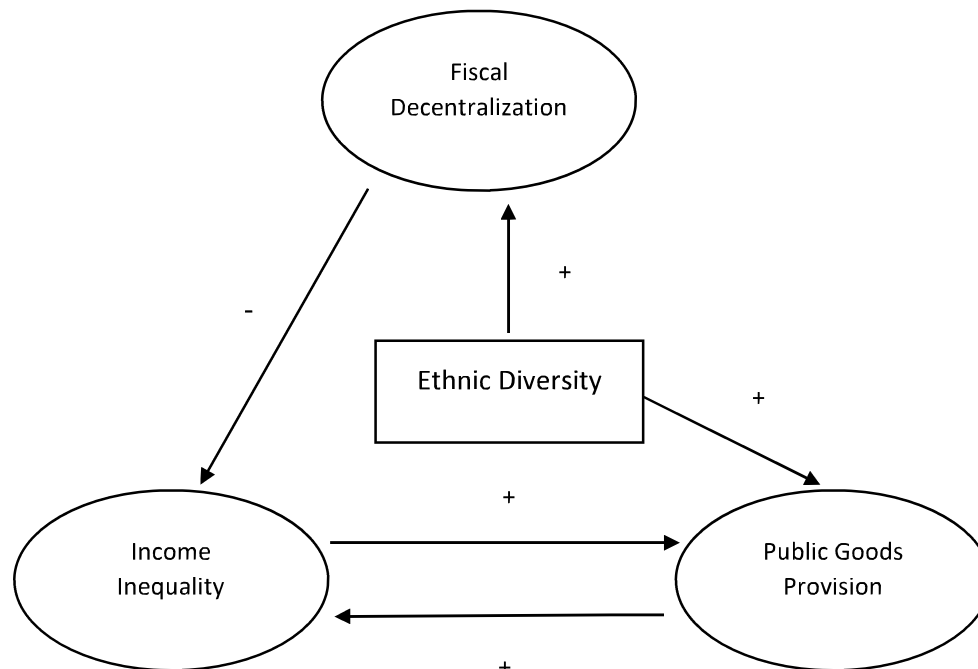


Figure 7. Estimation result

Notes:

- (a) ○ endogenous variables;
- (b) □ exogenous variables;
- (c) → effects of the independent variables on the dependent variables;

The estimation results of this dissertation provide a set of policy recommendations for both central and local government. Although the ethnic diversity variable was not significant when we used SEM to estimate the link between intra-province inequality, decentralization, and public goods provision, ethnic diversity is still an important variable in chapters 2 and 3. Intuitively, the presence of ethnic diversity pressures the local government to provide public goods that match the local preferences to avoid conflicts. Simultaneously, the provision of

local public goods is related to the broadening of inequality within the region. To mitigate the detrimental effect of the provision of public goods on intra-province inequality, the central government should set a minimum standard of local public goods provision which applies to all local governments to guarantee that all citizens regardless of their ethnicity to have an equal opportunity to access essential public goods (especially productive public goods such as education, health, and infrastructure) in order to improve their well-being. To mitigate the potentially harmful effect of local public goods provision on the intra-province inequality, the central government should establish a set of criteria to measure the impact of local public goods provision on the regional and national level by leading a joint coordination between the central government and local governments as well as between all local governments. A stick and carrot approach may motivate local governments to participate in the central government's program regarding the local public goods provision. An additional (reduced) amount of intergovernmental transfer may work as an incentive (punishment) to motivate the local government to partake in this program.

This dissertation limits its analyses on the provincial-level data set from 2001 to 2014 (the latest complete data available). Future research on this topic may include different variables and extend the coverage period to provide an additional understanding of this study.

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