THE IMPACT OF GOVERNMENT SIZE ON REGIONAL ECONOMIC GROWTH IN INDONESIA: TESTING THE NON-MONOTONIC RELATIONSHIP

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ABSTRACT

Previous studies have illustrated a non-monotonic relationship between government size and economic growth. In this non-monotonic relationship, the increase in government size is beneficial until a certain threshold. However, above that threshold, it has a deleterious effect on economic growth. Using panel data from 30 provinces in Indonesia for the 2001–2015 period, this study applies a threshold analysis to investigate the non-monotonic relationship between government size and regional economic growth. After the estimated threshold has been identified and proven to be statistically significant, the estimated threshold is interacted with government size. The effect of government size, below and above the threshold, is then estimated by the fixed effects estimation and the generalized method of moments (GMM) estimation using Arellano and Bond's (1991) instrument type. The GMM is applied to account for the possibility of reverse causality and endogeneity. Both estimation methods can weakly support the non-monotonic hypothesis in the relationship between government size and regional economic growth, which illustrates changes in the slope of the coefficient around the threshold value.

INTRODUCTION

The role of government size on the growth of an economy is an important economic topic of debate. Different arguments have arisen on the discussion of the role of government size on economic growth. Some studies argue that government size has a positive impact on economic growth. More specifically, Rubinson (1977) and Ram (1986) argued that government size plays an influential role in stimulating economic growth, because the government administers public goods and services and raises the capacity of private sector inputs that will increase total output. Other studies argue that government size depresses economic growth, due to government inefficiencies or unproductive economic activities (Landau, 1983; Peden and Bradley, 1989). In the meanwhile, some researchers argue that government size has a positive impact on growth when the share of government economic activity is small, but an adverse effect when the relative size of the government increases. The initial positive impact occurs because the government provides essential public goods that contribute to

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economic growth, but as a government expands its scope, an adverse effect is created by unproductive activities, such as a reduced efficiency in the provision of goods and services and increased tax rates that harm and reduce the growth rate (Grossman, 1988; Sheehey, 1993; Gwartney et al., 1998).

Empirical studies demonstrating the link between government size and economic growth have also produced ambiguous results. Some studies illustrate a positive relationship (Rubinson, 1977; Ram, 1986), while others indicate that government size has a negative impact on growth (Landau, 1983; Grier and Tullock, 1989). Some studies are inconclusive (Saunders, 1985; Kormendi and Meguire, 1985; Bairam, 1990). According to Mittnik and Neumann (2003), an explanation of the failure of empirical studies in resolving this issue is that government size and economic growth might have a non-monotonic relationship, as proposed by Barro (1990). Barro (1990) argued that a small government is likely to have a positive correlation with economic growth. However, beyond the optimal level of government size, which is the level of government size that maximizes economic growth, it would have an adverse impact on economic growth.

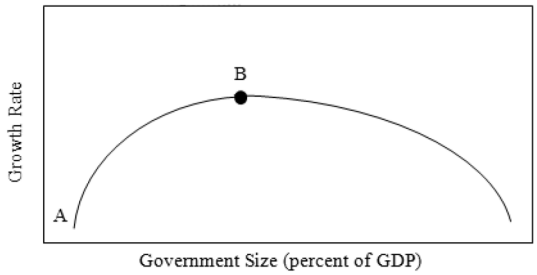
Recent studies on the relationship between the size of the government and the growth of the economy describe a non-monotonic relationship between these variables (Chen and Lee, 2005; Facchini and Melki, 2013; Christie, 2014; Asimakopoulos and Karavias, 2016). The relationship is positive when the government size is small, but in a larger government, the relationship becomes negative. This reverse in sign has been explained by several researchers.

Barro (1990) pointed out that, when a government is of a relatively small size, the provision of public goods creates increases in government services and taxation that would encourage economic growth. However, beyond a certain level, higher taxes on investments and savings could have a harmful effect on the economy and reduce the growth rate, as higher taxation leads to a lower motivation to participate in investment activities and lower productivity in the economy.

Sheehey (1993) explained that the government contributes to economic growth through a basic public goods provision. However, as the government raises its scope, its activities tend to cause a lower impact on the growth of the economy, because the public goods provision does not provide many contributions in raising private sector productivity and efficiency. Additional government functions or programs mean that more government officials than decision makers in private sectors are involved in making expenditure decisions with less of an incentive to act efficiently. Furthermore, as the government grows larger, it would lead to an increase in producing profit decisions made by groups with special or certain interests, which will reduce market efficiency. Moreover, larger amounts of government spending require more revenue from an increased tax rate. This would reduce work incentives and decrease productivity in the economy.

According to Gwartney et al. (1998), a government can promote economic growth by providing efficient infrastructure and public goods. Government participation is needed to solve problems in markets, because it is not easy or costly to provide the goods. However, as the government grows and more resources are allocated in the economy by political forces, rather than market forces, three factors cause the increasing effect of government size on economic growth is expected to decline. First, higher taxation and government borrowing decrease incentives to invest. As a government increases its expenditures, it requires higher taxes or revenue, as well as additional borrowing, to finance the expenditures. Higher taxes will reduce workers' or the private sector's income, thereby

Figure 1. The BARS Curve



reducing their incentives to participate in investments and decrease their productivity in the economy. Second, a diminishing return exists in government expenditures. As expenditures increase, the diminishing return on government expenditures will suppress its increasing impacts on economic growth. Third, the process of politics is less dynamic than the process of markets, because the adjustment timing to new opportunities and better technologies in the public sector is much slower than in the private sector.

The non-monotonic relationship between government size and economic growth indicates the existence of an optimal government size, which can be depicted by an inverted U-shaped curve. Several researchers, such as Barro (1990), Armey (1995), Rahn and Fox (1996), and Scully (1995), have generalized the existence of an optimal government size, as shown by an inverted U-shaped curve that later became known as the BARS curve[1] (Chobanov and Mladenova, 2009; Asimakopoulos and Karavias, 2016).

Figure 1 illustrates the BARS curve. The horizontal axis describes the government size (percent of GDP), while the vertical axis illustrates the economic growth rate. As the government increases its size from a low level to a higher one (A to B), economic growth increases. However, as a government grows further (from B to the right side of B), increased government spending leads to a less efficient economy and a decline in the rate of economic growth.

Numerous cross-country and a country studies exist on the non-monotonic relationship between government size and economic growth. However, few studies have provided empirical evidence on the non-monotonic relationship between government size and economic growth in Indonesia. Sriyana (2016) employed a non-monotonic analysis of the relationship between government size (measured by total government expenditures as a share of real GDP) and economic growth (represented by the growth in real GDP) using time series data for the 1970–2015 period. Sriyana determined the optimal size of the government that maximizes economic growth in Indonesia to be 12.55% of the GDP. However, a non-monotonic analysis of government size and economic growth at the province level has yet to be studied. Hence, this research examines the non-monotonic impact of government size on economic growth in the provinces of Indonesia. This will be conducted by determining the optimal size of the government by analyzing panel data for Indonesia's 30 provinces for the 2001–2015 period.

Over the 2001-2015 period, the Indonesian government increased its spending to maintain economic growth. Over this period, total government expenditures, as a percent of GDP, reached an

1) BARS curve is taken from the name of Barro (1990), Armey (1995), Rahn and Fox (1996) and Scully (1995).

average of 17.9% of the GDP. The total government consumption expenditure, as a share of GDP, rose continuously. It became close to an average of 8.56% of the GDP over the period. In the meanwhile, during this period, the economy experienced significant increases until 2007 and a gradual decline after 2010 (Bank Indonesia, 2017).

The provincial government experienced a similar situation. The government size increased over the 2001-2015 period. In the meanwhile, on average, regional economic growth showed several increases until 2010, but then gradually declined after 2010 (Statistics Indonesia, 2017). This situation raised questions as to whether a larger government size contributes to higher or lower regional economic growth and whether the government size has reached its optimal level in the province.

The contribution of government size on economic growth is an important issue, as an oversized government may have an adverse impact on economic growth by providing funds for increasing government expenditures through increased taxes and/or debts. However, if the contribution of government spending is very little, or nothing, the economy may slow down, since the provision of public goods may be hampered, due to a limited budget (Asimakopoulos and Karavias, 2016).

This study aims to achieve several objectives. First, an investigation of the non-monotonic relationship between government size and regional economic growth will be conducted at the provincial level in Indonesia. Second, the optimal size of the government for the provinces in Indonesia will be determined. The non-monotonic relationship between government size and regional economic growth in the western and eastern provinces of Indonesia will then be examined. And finally, the optimal government size in the western and eastern provinces of Indonesia will be determined.

The rest of this paper proceeds as follows. Section 2 discusses a general overview of economic growth, as well as the size of the government in Indonesia and its provinces. Section 3 presents the data and methodology used in the study. Section 4 provides the results and discussion. Section 5 summarizes the findings and concludes with some recommendations for future research.

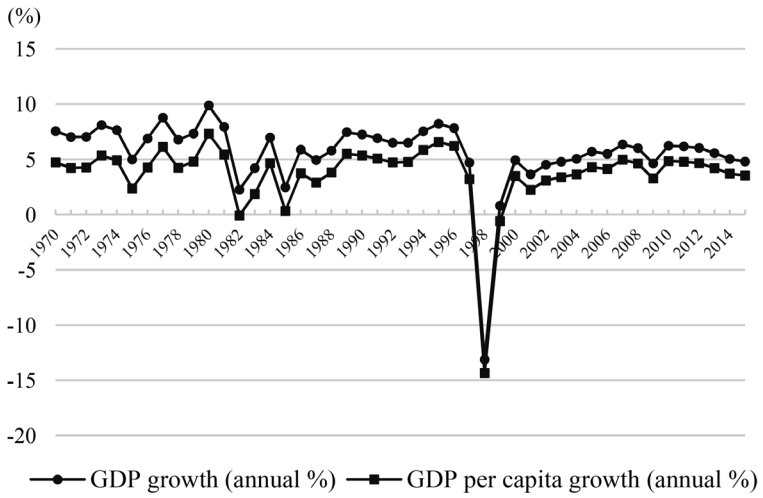
2. GENERAL VIEW OF INDONESIA AND ITS PROVINCES

Indonesia's economic growth grew significantly after the Asian financial crisis in the late 1990s. After experiencing a dramatic drop in the GDP growth rate (-13.13%) in 1998, the country was successful in preventing the impending collapse of the economy and stabilized it. Economic growth then accelerated to 6.35% in 2007. When the global economic crisis occurred in 2008, Indonesia experienced a drop in economic growth, but was able to guarantee a stable economy. During the crisis, Indonesia showed robust (4.63%) GDP growth. However, GDP growth decreased from 6.22% in 2010 to 4.79% in 2015.

The GDP growth per capita illustrated the same pattern as GDP growth. After experiencing a significant drop in 1998 to -14.35%, it grew substantially and peaked in 2007 at 4.96%. After succeeding in maintaining its level, despite the global crisis, it experienced a considerable decline from 4.84% in 2010 to 3.53% in 2015. Figure 2 depicts the annual economic growth (GDP growth and GDP per capita growth) of Indonesia from 1970 to 2015.

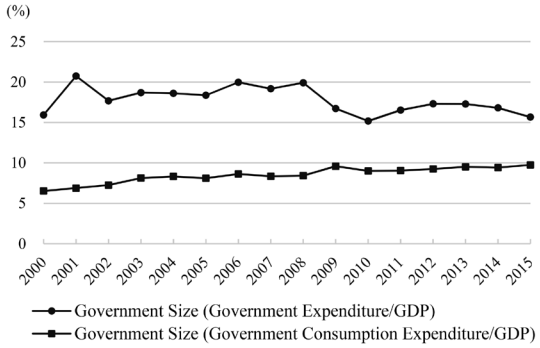
The Indonesian government has undertaken various policies such as a fiscal and monetary policy to maintain the stability of economic growth, especially after the crisis period in 2008. The government increased its fiscal stimulus in the economy by increasing expenditures and lowering taxes, while

Figure 2. GDP growth and GDP per capita growth of Indonesia



Source: World Bank (World Development Index).

Figure 3. Government size of Indonesia, 2001–2015



Source: Bank Indonesia.

the central bank lowered interest rates. Simorangkir and Adamanti (2010) showed that Indonesia's monetary and fiscal policy after the global financial crisis through the combination of fiscal expansion and monetary expansion were effective in boosting the country's economic growth. The Indonesian government has increased its expenditures to support economic growth stability, which leads to increases in the proportion of public spending to GDP, known as government size (Figure 3). During the 2001-2015 period, total government expenditures, as a percent of GDP, experienced fluctuations and reached an average of 17.9%. In the meanwhile, the total government consumption expenditure, as a share of GDP, increased continuously.

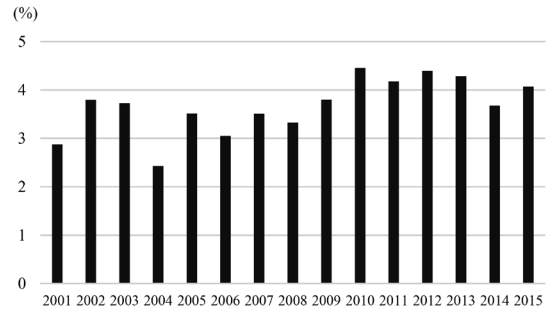
Indonesia is an archipelago country consisting of 13,466 islands (Bakosurtanal, 2014). It is located between Asia, Australia, and the Indian and Pacific Oceans. According to Statistics Indonesia (2016), Indonesia has 34 provinces spreading over five main islands and four archipelagos (Table

Table 1. Provinces in Indonesia, 2016

Island/archipelago	Province
Sumatera Island	Aceh, Sumatera Utara, Sumatera Barat, Riau, Jambi, Sumatera Selatan, Bengkulu, and Lampung
Riau Archipelago	Kepulauan Riau
Bangka Belitung Archipelago	Kepulauan Bangka Belitung
Jawa Island	DKI Jakarta, Jawa Barat, Banten, Jawa Tengah, DI Yogyakarta, and Jawa Timur
Nusa Tenggara Archipelago	Bali, Nusa Tenggara Barat, and Nusa Tenggara Timur
Kalimantan Island	Kalimantan Barat, Kalimantan Tengah, Kalimantan Selatan, Kalimantan Timur and Kalimantan Utara
Sulawesi Island	Sulawesi Utara, Gorontalo, Sulawesi Tengah, Sulawesi Selatan, Sulawesi Barat, and Sulawesi Tenggara
Maluku Archipelago	Maluku and Maluku Utara
Papua Island	Papua and Papua Barat

Source: Statistics Indonesia.

Figure 4. Average economic growth of Indonesian provinces, 2001–2015



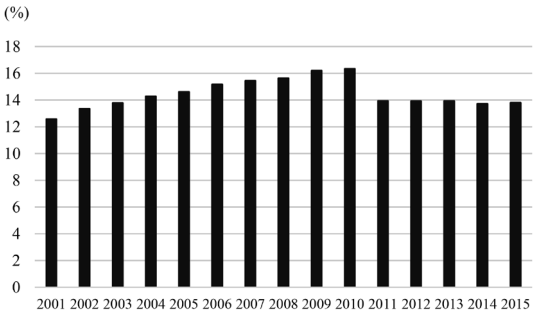
Source: Statistics Indonesia.

1). Eight of the 34 provinces were established after 1998: Maluku Utara, Banten, Kepulauan Bangka Belitung, Gorontalo, Papua Barat, Sulawesi Barat, Kepulauan Riau, and Kalimantan Utara.

As the main constitution in the country, the government is stratified from the central to the local government. The highest tier of the local government is the provinces (Level I region), which are further divided into regencies and cities (Level II regions); these are, in turn, further divided into sub-districts (*kecamatan*).

The process of regional autonomy and fiscal decentralization in Indonesia, which has been ongoing since 2001, has brought significant change for the governance of public finance in Indonesia. It has resulted in a transfer of fiscal authorization from the central to the local governments. This authorization transfer resulted in the increase in the local government authority to run their government and provide public services for their people. This was followed by increased funding transfers from the central to the local governments. Local governments now have much more freedom to make plans and priorities to spend the money, due to the implementation of their roles and responsibility.

Figure 5. Average government size of Indonesian provinces, 2001–2015



Source: Statistics Indonesia.

Local governments have increased their role in the economy by increasing their spending to stimulate the regional economy. They also improve the welfare of the local communities in their region. Figure 4 illustrates the average regional economic growth of the 30 provinces in Indonesia. The average regional economic growth has fluctuated. A slight increase was experienced between 2004 and 2010. However, increases in local government expenditures have created a larger government. Figure 5 shows a substantial increase in the average government size in the Indonesian provinces since 2001, reaching a peak in 2010. However, it gradually declined after 2010.

3. DATA AND METHODOLOGY

In assessing the non-monotonic relationship between government size and economic growth, this study incorporates a threshold analysis into a standard growth equation. As established in the growth literature (Levine and Renelt, 1992; Barro and Sala-i-Martin, 1995), this study uses the growth of real output per capita as a function of government size and the control variables. In this regional study, the control variables used were obtained from the sub-national data.

Vidyattama (2010) listed several important Indonesian regional economic growth determinant variables: investment, population growth, infrastructure, human capital, trade or openness, government spending, financial institutions, and economic structure. This investigation uses some variables listed in Vidyattama (2010) such as government spending, investment (proxied by gross capital formation), trade or openness, population growth, human capital (proxied by mean years of schooling) and financial as the independent variables. This study also includes inflation rate as the independent variable. In the meanwhile, the growth rate of the gross regional domestic product (GRDP) per capita is used as the dependent variable. Variable descriptions are presented in Table 2.

Panel data from 30 of the 34 provinces in Indonesia, for the years of 2001 to 2015, were obtained from Statistics Indonesia[2]. Data for four provinces were excluded from the study, due to incomplete data. These provinces lack data, since they were established after 2002 (i.e., Papua Barat, Kepulauan Riau, Sulawesi Barat, Kalimantan Utara)[3].

This study applies a threshold analysis to investigate the non-monotonic relationship between

2) Statistics Indonesia is known in Indonesia as Badan Pusat Statistik or BPS.

Table 2. Description of the variables

Variables	Mnemonic	Description
Dependent		
Regional economic growth	*Growth*	Annual growth rate of GRDP per capita, based on the 2010 constant price.
Independent		
Government size	*GovtSize*	The share of total government final consumption expenditures to GRDP, based on the 2010 constant price.
Capital formation	*Capform*	The share of gross capital formation to GRDP, based on the 2010 constant price.
Trade or openness	*Trade*	The share of trade (sum of exports and imports) to GRDP, based on the 2010 constant price.
Population growth	*Population*	The growth of the population.
Inflation rate	*Inflation*	The rate of inflation, based on the annual percentage change in the consumer price index.
Mean years of schooling	*MYRS*	The average year of formal schooling received.
Financial	*Finance*	The share of total deposits and credits in commercial banks to GRDP (to represent the size of the financial institution).

government size and economic growth. Following Christie (2014), the general form of the threshold regression applied in this study takes the following form:

$$Growth_{it}=\mu_i+\beta_0 X_{it}+\beta_1 GovtSize_{it}^{*}\, I\,(GovtSize_{it}\leq\lambda)+\beta_2 GovtSize_{it}^{*}\, I\,(GovtSize_{it}>\lambda)+\theta_t+\varepsilon_{it} \quad (1)$$

where X_{it} is the vector of control variables, μ_i is a province-specific fixed effect, θ_t is a time fixed effect, and ε_{it} is a normally distributed error term. $I\,(\cdot)$ is an indicator function that takes the value of one when the condition inside parentheses is satisfied and zero otherwise. *GovtSize* is used as the threshold variable that divides the observation into two groups: $GovtSize_{it}\leq\lambda$, low government size-regime, and $GovtSize_{it}>\lambda$, high government size-regime. λ is the threshold value to be determined within the model.

The estimation strategy tests for the presence of inflection points or thresholds in the relationship between economic growth and government size. The optimal threshold is found by estimating equation (1) for all values of government size in the range that allows a minimal percentage of the observations to fall within each regime, as recommended by Hansen (1999). Here, values of λ that fall within the top and bottom 5th percentiles of *GovtSize* are excluded. Defining $S(\lambda)=\hat{u}(\lambda)'\,\hat{u}(\lambda)$ as the residual sum of squares of the model in equation (1), estimated for a threshold level λ, the optimal threshold is then:

$$\hat{\lambda}=\arg_{\lambda}\min S(\lambda) \quad (2)$$

3) Papua Barat province was officially established in 27 January 2003, based on the Law 45/1999 and Inpres 1/2003. Kepulauan Riau was established in 25 October 2002, based on the Law 25/2002. Sulawesi Barat was established in 5 October 2004, based on the Law 26/2004. The last one, Kalimantan Utara, was established in 16 November 2012, based on the Law 20/2012 (Ministry of Home Affairs, 2017).

After a potential threshold has been identified, the significance of the threshold effect is examined. From equation (1), testing for the threshold effect is the same as testing the null hypothesis $H_0 : \beta_1 = \beta_2$ or whether the coefficients are the same in each regime. However, under H_0, the threshold λ is not identified using the standard inference method. Hansen (1999) suggested a bootstrap method in simulating the asymptotic distribution of the likelihood ratio (LR) test of H_0. The LR statistic is constructed as:

$$LR_0 = \frac{(S_0 - S_1(\hat{\lambda}))}{\hat{\sigma}^2} \tag{3}$$

where S_0 denotes the residual sum of squares for the model without the threshold, $S_1(\hat{\lambda})$ is the residual sum of squares for the model with the threshold, and $\hat{\sigma}^2$ denotes the estimated residual variance in the presence of the threshold. The asymptotic distribution of LR_0 is non-standard and strictly dominates the x^2 distribution. Hansen (1999) illustrated that the p-values constructed from the bootstrap method are asymptotically valid. If the p-value is smaller than the desired critical value, then the null hypothesis of no threshold is rejected.

After the threshold has been identified and the estimated threshold value, $\hat{\lambda}$, proved to be statistically significant, equation (1) is estimated using standard econometric techniques (Christie, 2014).

The model used in this study is described as follows:

$$\begin{aligned} Growth_{it} = {} & \mu_i + \beta_0 Growth_{i,t-1} + \beta_1 GovtSize_{it}^{*} \, I(GovtSize_{it} \leq \lambda) \\ & + \beta_2 GovtSize_{it}^{*} \, I(GovtSize_{it} > \lambda) + \beta_3 Capform_{it} + \beta_4 Trade_{it} + \beta_5 Population_{it} \\ & + \beta_6 Inflation_{it} + \beta_7 MYRS_{it} + \beta_8 Finance_{it} + \theta_t + \varepsilon_{it} \end{aligned} \tag{4}$$

This study will employ the fixed effects estimation and the GMM estimation using Arellano and Bond's (1991) instrument type. The GMM is applied to account for the possibility of reverse causality and endogeneity. When the main variable of interest, government size, may not be strictly exogenous, causality may run in both directions, from government size to economic growth and vice versa. The government size variable may be correlated with the error term. In addition, as in equation (4), $Growth_{i,t-1}$ is the lag value of the dependent variable $Growth_{it}$. The presence of the lagged dependent variable gives rise to autocorrelation.

In the Arellano and Bond method, the first difference of the original model (4) was taken to eliminate the fixed effects:

$$\begin{aligned} \Delta Growth_{it} = {} & \beta_0 \Delta Growth_{i,t-1} + \beta_1 \Delta GovtSize_{it}^{*} \, I(GovtSize_{it} \leq \lambda) \\ & + \beta_2 \Delta GovtSize_{it}^{*} \, I(GovtSize_{it} > \lambda) + \beta_3 \Delta Capform_{it} + \beta_4 \Delta Trade_{it} \\ & + \beta_5 \Delta Population_{it} + \beta_6 \Delta Inflation_{it} + \beta_7 \Delta MYRS_{it} + \beta_8 \Delta Finance_{it} + \varepsilon_{it} \end{aligned} \tag{5}$$

There is still a correlation between the differenced lagged dependent variable and the disturbance process. However, since the individual FE is removed, deeper lags (the second and/or third lag) of the dependent variable can be used as instruments for the differenced lags of the dependent variable (which are endogenous).

Table 3. Summary statistics for the full sample, western provinces and eastern provinces

Variable	Full sample				Western provinces				Eastern provinces			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Regional Economic Growth	3.48	3.85	-27.66	32.10	3.36	2.88	-10.51	18.40	3.61	4.72	-27.66	32.10
Government Size	14.29	8.74	2.36	42.60	11.86	8.00	2.36	28.24	17.07	8.74	2.47	42.60
Capital Formation	31.22	12.00	-49.86	103.89	32.29	11.83	10.16	103.89	30.00	12.11	-49.86	66.54
Trade or Openness	88.26	34.99	9.52	198.54	95.74	30.31	44.96	198.54	79.71	37.98	9.52	188.69
Population Growth	1.89	0.91	0.29	5.51	1.71	0.80	0.29	3.64	2.10	0.98	0.84	5.51
Inflation Rate	9.12	3.57	2.49	21.45	9.11	3.60	2.57	19.83	9.13	3.54	2.49	21.45
Mean years of schooling	7.61	1.00	5.34	13.28	7.87	0.97	5.95	13.28	7.32	0.96	5.34	10.45
Financial	54.24	28.85	16.84	196.31	58.88	35.12	19.76	196.31	48.94	18.03	16.84	117.42

Table 4. Threshold identification and inference

Sample	Threshold Estimate	LR0	p-values
Full provinces	7.20**	22.58	0.0300
Western Provinces	7.20	12.48	0.2833
Eastern Provinces	6.51**	35.86	0.0267

***p<0.01, **p<0.05, *p<0.1

4. RESULTS

Table 3 presents the statistical summary of the variables. For the full sample, the overall regional economic growth average is 3.48% annually. In the meanwhile, the eastern provinces have a higher regional economic growth average, as compared to Indonesia's western provinces. The average size of the government is 14.29% for all of Indonesia's provinces, but is lower in the western provinces (11.86%) and higher in the eastern provinces (17.07%). Similarly, the population growth and inflation rate are higher in the eastern provinces. However, capital formation, trade, mean years of schooling and financial are higher in the western provinces than the eastern provinces. The reason for this result is because the western provinces have experienced more development than the eastern provinces of Indonesia.

This study splits the sample into the western and eastern provinces of Indonesia. The development of provinces is used as a basis of the division of the sample. As stated previously, Indonesia's western provinces are more highly developed than the eastern provinces.

The presence of thresholds in the relationship between government size and economic growth are presented in Table 4. Regarding the full sample and eastern provinces, the study finds strong evidence of the existence of the threshold. The threshold estimation for the full sample and eastern provinces are 7.20% and 6.51%, respectively. The null hypothesis of no threshold effects for the full sample and the eastern provinces can be rejected at the 5% significance level. However, Table 4 weakly indicates the presence of the threshold effect at 7.20% for the western provinces.

The threshold value for the western provinces is higher than that for the eastern provinces. In this study, we assume that the provinces in the western part of Indonesia are developed regions, which

tend to have larger governments. The eastern provinces are considered to be developing regions with smaller governments. However, the threshold results for both the western and eastern provinces are not in line with the related literature, which showed that countries with greater government spending, as a share of GDP, have a lower threshold estimation, as compared to countries with a smaller government (Asimakopoulos and Karavias, 2016; Christie, 2014). According to Gray et al. (2007), larger governments tend to spend more on unproductive economic activities. Therefore, they have a smaller optimal government size that maximizes economic growth, due to the increasing tax revenue to finance the larger government.

The level threshold of government size for the panel data of all provinces in Indonesia is different from the result for the time series data of the Indonesian level, which suggests that the optimal level of government spending for Indonesia is 12.55% of the GDP (Sriyana, 2016). One explanation for this result could be due to the different types of government size measurements and the exclusion of central government expenditures in the analysis of the province level. This study uses the government consumption expenditure per output as a measure of government size, while Sriyana (2016) uses total government expenditures per output.

Furthermore, this study finds that the optimal level of the government size for Indonesia's provinces of 7.20% is much lower than the average of the government size in Indonesia's provinces, which is 14.29% of the GDP. This result remains valid for the western provinces and eastern provinces, with threshold results equal to 7.20% and 6.51%, respectively. These thresholds are smaller, compared to the average of the government size in the western provinces at 11.86% and the eastern provinces at 17.07%. This reflects that the government size of Indonesia's provinces has already passed its optimal government size level.

Table 5 presents the results from the estimation of the fixed effects model. Column (3) illustrates the results for the full sample, taking into account the thresholds identified, whereas columns (4) and (5) present the results for the western and eastern provinces of Indonesia, respectively. Table 5 also provides the results of the linear and quadratic model for the full sample, without accounting for the threshold, for comparison purposes.

The linear model (without a threshold) result shows no statistically significant effect of government size on regional economic growth, although the coefficient of government size is negative. In the meanwhile, when entering the quadratic specification, the model fails to capture the possibility of a non-monotonic relationship between government size and regional economic growth.
On the other hand, the non-monotonic model with a threshold finds weak evidence of the non-monotonic impact of the government size on regional economic growth in the full sample of Indonesian provinces. The coefficient below and above the threshold level is positive. However, the positive impact of government size on regional economic growth is only statistically significant for a government size smaller than 7.20%.

A weak non-monotonic effect remains valid, even when the sample is divided into the western provinces and eastern provinces. In the western province, the result illustrates a considerable change in the slope coefficients around the threshold value. The coefficient of government size is positive below the threshold and negative above the threshold. However, only the side below the threshold exhibits statistical significance. When observations fall in the lower regime, a 1% increase

Table 5. Results of the fixed effects estimation

Variables	Full Sample			Western Provinces	Eastern Provinces
	Linear	Quadratic	$\lambda=7.20$	$\lambda=7.20$	$\lambda=6.51$
	(1)	(2)	(3)	(4)	(5)
Govtsize	-0.038	-0.162			
	(0.042)	(0.119)			
$Govtsize^2$		0.004			
		(0.003)			
Govtsize * I (*Govtsize* $\leq \lambda$)			0.752***	0.460**	3.353***
			(0.213)	(0.180)	(0.607)
Govtsize * I (*Govtsize* $> \lambda$)			0.034	-0.005	0.446**
			(0.045)	(0.036)	(0.183)
$Growth_{i,t-1}$	-0.340***	-0.340***	-0.316***	-0.015	-0.342***
	(0.048)	(0.048)	(0.047)	(0.065)	(0.065)
Capform	0.030	0.028	0.018	-0.033	0.065*
	(0.023)	(0.023)	(0.023)	(0.024)	(0.038)
Trade	-0.006	-0.006	-0.0002	0.006	-0.018
	(0.009)	(0.009)	(0.009)	(0.009)	(0.017)
Population	-0.988**	-0.956**	-1.020***	0.625	-1.102
	(0.390)	(0.391)	(0.384)	(0.583)	(0.679)
Inflation	-0.141***	-0.143***	-0.144***	-0.010	-0.209***
	(0.046)	(0.046)	(0.045)	(0.044)	(0.078)
MYRS	1.468***	1.445***	1.311***	1.872***	0.216
	(0.362)	(0.362)	(0.358)	(0.425)	(0.570)
Finance	-0.001	0.004	0.009	-0.003	0.012
	(0.016)	(0.017)	(0.016)	(0.021)	(0.023)
Constant	-3.183	-2.347	-4.467	-12.280***	-2.424
	(3.274)	(3.355)	(3.236)	(4.168)	(5.364)
Observations	420	420	420	224	196
Provinces	30	30	30	16	14
R^2 within	0.188	0.191	0.217	0.159	0.387
R^2 between	0.000	0.000	0.009	0.102	0.105
R^2 overall	0.076	0.067	0.050	0.000	0.065

Note: Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1.

in government size will increase regional economic growth by 0.46%. When the government size is above the threshold, the growth effect is negligible. In the eastern provinces, the effect of government size is positive and significant, below and above the threshold. However, the positive impact is higher when the government size is below the estimated threshold. Below the threshold, a 1% increase in government expenditures, as a share of GRDP, will increase regional economic growth by 3.35%. Above the threshold, a 1% increase in government size will increase regional economic growth by 0.45%.

Regarding the control variables, the fixed effects estimation finds that the mean years of schooling is positive and statistically significant for the full sample and the western provinces of Indonesia. This result is in line with the related literature that says the mean years of schooling, which represents the stock of human capital, has a positive impact on economic growth. The capital formation is statistically significant, but only for the eastern provinces, with a small positive coefficient. Unexpectedly, trade

Table 6. Results of the GMM estimation (larger number of instruments)

Estimation technique: one-step difference GMM					
Instrument variable: lag (2) *Growth*, lag (2) *Govtsize*					
		Full Sample		Western Provinces	Eastern Provinces
Variable	Linear	Quadratic	$\lambda=7.20$	$\lambda=7.20$	$\lambda=6.51$
	(1)	(2)	(3)	(4)	(5)
Govtsize	-0.245**	-4.148***			
	(0.120)	(1.087)			
$Govtsize^2$		0.098***			
		(0.027)			
Govtsize * I (*Govtsize* $\leq \lambda$)			3.168***	1.456***	4.008**
			(0.489)	(0.347)	(1.673)
Govtsize * I (*Govtsize* $> \lambda$)			0.037	-0.109**	-0.474
			(0.117)	(0.054)	(0.432)
$Growth_{i,t-1}$	-0.335***	-0.353***	-0.281***	-0.234***	-0.433***
	(0.054)	(0.063)	(0.050)	(0.089)	(0.074)
Capform	0.066*	0.035	0.029	-0.056	0.181***
	(0.035)	(0.042)	(0.033)	(0.034)	(0.057)
Trade	-0.055***	-0.056**	-0.012	-0.022	-0.022
	(0.019)	(0.022)	(0.018)	(0.017)	(0.036)
Population	1.856**	3.243***	2.567***	4.018***	0.696
	(0.785)	(0.986)	(0.727)	(0.886)	(1.239)
Inflation	-0.190***	-0.151**	-0.115**	-0.030	-0.187**
	(0.049)	(0.058)	(0.046)	(0.042)	(0.090)
MYRS	2.183***	1.071	2.610***	2.196***	2.773***
	(0.523)	(0.679)	(0.483)	(0.540)	(0.796)
Finance	0.012	0.021	0.020	0.041	0.009
	(0.024)	(0.027)	(0.022)	(0.028)	(0.028)
Observations	390	390	390	208	182
Provinces	30	30	30	16	14
Instruments	32	32	32	32	32
AR(2) test (p-value)	0.622	0.903	0.667	0.789	0.001
Sargan test (p-value)	0.000	0.004	0.012	0.098	0.000

Note: Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1.

and financial appear to have no impact on regional economic growth. The population growth has a negative impact on regional economic growth for the full sample, whereas it has no impact on the western and eastern province. Finally, the coefficient of inflation is negative and significant for the full sample and eastern provinces, but it is insignificant for the western provinces.

As previously discussed, the main variable of interest, government size, may not be strictly exogenous. The variable may be correlated with the error term and may cause the coefficients to be biased. This possibility is dealt with by applying dynamic panel GMM techniques. The results for the GMM regression for the full sample, western provinces, and eastern provinces, with the instrument variables, the second lag of growth and the second lag of government size, are presented in Table 6. The results for the linear and quadratic models are also provided, for comparison purposes.

The results of the GMM estimation include the Sargan test of over-identifying restrictions and the Arellano-Bond test for autocorrelation. The Sargan test has a null hypothesis of "the instruments,

as a group, are exogenous". Therefore, it is expected to not reject the null hypothesis or get a higher p-value of the Sargan statistic. In the meanwhile, the Arellano-Bond test for autocorrelation has a null hypothesis of "no autocorrelation". The higher the p-value of the Arellano-Bond test for autocorrelation, the better.

The results of the linear model (without a threshold) with a GMM estimation yields a significant negative effect of government size on regional economic growth. When using the quadratic specification, the model captures the possibility of a non-monotonic relationship between government size and regional economic growth.

The GMM estimation (with threshold) for the full sample indicates a considerable change in the coefficients around the threshold, where the coefficient is positive below the threshold and almost zero above the threshold. Only the side below the threshold exhibits statistical significance. In the meanwhile, in the western provinces, the GMM estimation yields a significant positive effect of government size on regional economic growth when the observations fall in the lower regime and significant negative effect for the higher regime. For the eastern provinces, the GMM estimation yields a positive and significant coefficient below the threshold. However, for observations falling in the high regime, further increases in government spending do not impact regional economic growth.

Not all control variables have the expected sign and are statistically significant under the GMM estimation. For the full sample (with the threshold), as expected, the mean years of schooling has a significant positive impact. Inflation has a significant negative impact on regional economic growth. However, population growth has an unexpected sign, although the effect is significant. In the western provinces, only the lagged growth, population growth and mean years of schooling have a significant effect on regional economic growth. In the meanwhile, in the eastern provinces, the capital formation and mean years of schooling positively affect the growth, whereas the lagged growth and inflation have a negative impact on regional economic growth.

Notably, not all Sargan tests and Arellano-Bond tests for autocorrelation in each regression have the expected p-value. The Arellano-Bond test for autocorrelation in the eastern provinces has a very small p-value, which means there is autocorrelation in the model. Furthermore, the Sargan tests with a small p-value weakly support the model's validity in the regression. One explanation for this result could be due to the small number of provinces in the sample. Hence, a large number of instruments can cause the Sargan test to be weak, as noted by Roodman (2009), who stated that numerous instruments can overfit endogenous variables and weaken the test of instrument validity. To cope with this problem, this study tries to re-estimate the model in equation (5) using GMM with a smaller number of instruments. The second lag of the government size variable is used as the instrument in the estimation.

The GMM estimation for the full sample, western provinces, and eastern provinces with the instrument variable, the second lag of government size, is given in Table 7. The results of the Sargan and Arellano-Bond tests for autocorrelation show that the tests support the model's validity in each regression. The results for the linear model (without a threshold) suggests no significant effect of government size on regional economic growth. The quadratic model also fails to capture the possibility of a non-monotonic relationship between government size and regional economic growth.

Focusing on the non-monotonic model, the GMM estimation (with a smaller instrument number)

Table 7. Results of the GMM estimation (smaller number of instruments)

Estimation technique: one-step difference GMM					
Instrument variable: lag (2) *Govtsize*					
Variable	Full Sample			Western Provinces	Eastern Provinces
	Linear	Quadratic	$\lambda=7.20$	$\lambda=7.20$	$\lambda=6.51$
	(1)	(2)	(3)	(4)	(5)
Govtsize	-0.095	-0.321			
	(0.126)	(1.495)			
$Govtsize^2$		0.006			
		(0.037)			
Govtsize * I (*Govtsize* $\leq \lambda$)			3.337*	-2.296	12.150**
			(1.923)	(1.985)	(5.004)
Govtsize * I (*Govtsize* $> \lambda$)			0.004	-0.189	1.336
			(0.137)	(0.163)	(1.026)
$Growth_{i,t-1}$	-0.529***	-0.539***	-0.202	-0.423**	-0.942***
	(0.182)	(0.193)	(0.257)	(0.182)	(0.166)
Capform	0.063*	0.061	0.020	0.016	0.064
	(0.035)	(0.038)	(0.042)	(0.083)	(0.106)
Trade	-0.017	-0.017	-0.022	-0.011	0.021
	(0.029)	(0.030)	(0.029)	(0.016)	(0.049)
Population	1.354	1.436	2.797**	-0.072	2.234
	(0.826)	(0.986)	(1.152)	(0.710)	(3.227)
Inflation	-0.168***	-0.166***	-0.098	-0.115	-0.045
	(0.048)	(0.049)	(0.062)	(0.079)	(0.104)
MYRS	2.062***	1.990***	3.092***	0.040	1.629**
	(0.563)	(0.733)	(0.804)	(1.462)	(0.739)
Finance	0.0001	0.002	0.021	-0.011	0.053
	(0.024)	(0.026)	(0.027)	(0.038)	(0.035)
Observations	390	390	390	208	182
Provinces	30	30	30	16	14
Instruments	19	19	19	19	19
AR(2) test (p-value)	0.193	0.187	0.723	0.179	0.214
Sargan test (p-value)	0.210	0.148	0.333	0.823	0.812

Note: Standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1.

for the full sample illustrates a change in the coefficients around the threshold value. However, only one side exhibits statistical significance. Under the full sample of Indonesia's provinces, for a government size below 7.20%, the government size impact on regional economic growth is positive and significant. A 1% rise in government size will increase regional economic growth by 3.34%. However, for observations falling in the high regime, further increases in government spending do not impact regional economic growth. Similarly, in the eastern provinces, the coefficient of government size is positive, below and above the threshold value. However, only the effect of government size below the threshold is significant. In the meanwhile, for the western provinces, the coefficient of government size is negative in both regimes around the threshold, but the GMM estimation fails to find a significant negative effect of government size on growth.

A small number of control variables has the expected sign and is statistically significant under the GMM estimation (with a smaller instrument number), especially for the non-monotonic models in the

western and eastern provinces. For the full sample (with the threshold), the mean years of schooling and population growth have a significant positive impact on regional economic growth. This result is consistent with the GMM estimation (with a larger instrument number). For the western provinces, only the lagged growth has a significant effect on regional economic growth. In the meanwhile, in the eastern provinces, the lagged growth and mean years of schooling are statistically significant. Other variables (e.g., capital formation, trade, population growth, inflation, financial) do not have any significant effect on regional economic growth in the eastern provinces.

Overall, the estimation with GMM is relatively consistent with the fixed effects model. Both estimations can weakly support the non-monotonic hypothesis in the relationship between government size and economic growth. In these estimations, the slope of the coefficient around the threshold value changes. The significant positive coefficients below the threshold for the full sample and eastern provinces are consistent with the fixed effects model, but the GMM estimation yields larger standard errors. In the meanwhile, the GMM estimation result for the western provinces yields a different result from that of the fixed effects estimation. When the model is estimated by GMM, the government size does not have a significant effect on regional economic growth below and above the threshold, while it yields a positive effect below the threshold in the fixed effects estimation.

5. CONCLUSIONS

To determine whether an increased government size enhances or harms economic growth, and in view of the literature predicting a non-monotonic relationship between government size and economic growth, this study has attempted to explore the non-monotonic relationship between government size and economic growth at the provincial level in Indonesia using panel data from the provinces for the 2001–2015 time period. In addition to determining the non-monotonic impact of government size on regional economic growth, the optimal level of the provincial government size is estimated.

The empirical strategy applies a threshold regression (Hansen, 1999) in testing the presence and significance effect of inflection points or thresholds in the relationship between economic growth and government size. The estimated threshold is then interacted with the government size, and the effect of the government size, below and above the threshold is estimated. The estimation is done using the fixed effects model and the GMM with Arellano and Bond's (1991) instrument to account for the possibility of reverse causality and endogeneity.

This study finds the threshold values for government size in Indonesia's provinces to be 7.20%, 7.20% and 6.51% of the GDP for the full sample, the western provinces, and the eastern provinces, respectively. The threshold value for the western provinces is not statistically significant.

Both the fixed effects and the GMM estimations find evidence to support the non-monotonic impact of government size on Indonesian regional economic growth for the full sample and the eastern provinces. In the full sample of Indonesian provinces, for a government size below 7.20% of GRDP, the government size has a positive effect on regional economic growth. However, the government size above the threshold does not affect the growth. For the eastern provinces, the government size below the threshold has a positive and significant effect on regional economic growth. However, this positive effect is reduced for the government size above the threshold. This result reflects that the provinces in the eastern area of Indonesia, as developing regions, still benefit from a larger government size for

regional economic growth when the share of the government, in terms of economic activity, is below 6.51% of GRDP. A larger government size does not contribute much to regional economic growth when the relative size of the government is above 6.51% of GRDP.

The results for the developing regions are in line with the results in Christie (2014), who finds that for developing countries in South and East Asia, and the Europe and Central Asia (ECA), a government size below the threshold has a significant positive impact on economic growth. This study also finds that the results for the full sample and the eastern provinces do not suffer from an endogeneity problem and are relatively robust to the different estimation methods.

On the other hand, the findings for the western provinces illustrate that the GMM results are not consistent with the fixed effects specification. The results from fixed effects estimation suggest a weak non-monotonic effect, where the government size has a positive effect on regional economic growth below the threshold, but does not affect economic growth when it is above the threshold. In the meanwhile, the results of the GMM estimation show that the government size does not have a significant effect on regional economic growth below and above the threshold.

This study concludes that the non-monotonic effect of government size is more dominant in the eastern provinces, which are considered to be developing regions with less effective governments, than the western provinces, as developed regions. As noted in Christie (2014), regions with less effective governments tend to have a more non-monotonic relationship between government size and economic growth than the regions with high government effectiveness, which are able to alleviate the negative effects of a larger government size.

Furthermore, this paper finds that the average of the government size in Indonesia's provinces is higher than the optimal level of government size. This reflects that the government size of Indonesia's provinces has already passed its optimal government size.

The findings provided in this study should be considered by local governments to evaluate their budget management process to improve government efficiency in their spending budgets. By improving government efficiency and reforming the unproductive into productive government expenditures, government size will be beneficial to economic growth.

Regarding the results of this study, it is important to consider a longer data period using five years of averaged data to smooth out changes occurring due to cyclical effects. This procedure could eliminate potential econometric biases caused by endogeneity problems arising from short-run cyclical simultaneity (Christie, 2014). Moreover, it is important to examine the relationship between government expenditure efficiency, government size, and economic growth to determine whether government efficiency has an effect on the optimal government size that maximizes economic growth in the Indonesian provinces.

The area of this study only investigates the relationship between government size and economic growth at the provincial level. It is also assumed that the local governments are relatively independent. Therefore, this study cannot generalize that finding the optimum size of government that maximizes the regional economic growth is the same as that to find the optimal government size that maximizes the national economic growth. This is because the national level has a different component of government expenditures compared to the regional/provincial level. Study on the national level should include not only local government expenditures but also the state or central government expenditures

to determine the optimal government size that maximizes the national economic growth. It is also noted that in most countries, the central government has different consideration in transferring funds to local governments. It might be efficient for the central government to transfer the fund more heavily in one or several regions, where the regional productivity is assumed higher than the other regions, in order to support the national growth rate. Hence, the regional government size is partially dependent on the national government's budget constraint and the transfer from the central government. This might have to do with a fact that most existing research focuses on the national growth using the time series data of a nation or a panel data of nations, rather than a panel data of regions within a country. Therefore, in order to reach conclusion whether optimal government size at the regional level leads to maximize national economic growth, more study needs to be done in the future. This remains possible further research.

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THE APPENDIX

List of Indonesian provinces included in the analysis

The Full Sample (30 provinces)	The Western Provinces (16 provinces)	The Eastern Provinces (14 provinces)
Aceh	Aceh	Nusa Tenggara Barat
Sumatera Utara	Sumatera Utara	Nusa Tenggara Timur
Sumatera Barat	Sumatera Barat	Kalimantan Barat
Riau	Riau	Kalimantan Tengah
Jambi	Jambi	Kalimantan Selatan
Sumatera Selatan	Sumatera Selatan	Kalimantan Timur
Bengkulu	Bengkulu	Sulawesi Utara
Lampung	Lampung	Gorontalo
Kepulauan Bangka Belitung	Kepulauan Bangka Belitung	Sulawesi Tengah
DKI Jakarta	DKI Jakarta	Sulawesi Selatan
Jawa Barat	Jawa Barat	Sulawesi Tenggara
Banten	Banten	Maluku
Jawa Tengah	Jawa Tengah	Maluku Utara
DI Yogyakarta	DI Yogyakarta	Papua
Jawa Timur	Jawa Timur	
Bali	Bali	
Nusa Tenggara Barat		
Nusa Tenggara Timur		
Kalimantan Barat		
Kalimantan Tengah		
Kalimantan Selatan		
Kalimantan Timur		
Sulawesi Utara		
Gorontalo		
Sulawesi Tengah		
Sulawesi Selatan		
Sulawesi Tenggara		
Maluku		
Maluku Utara		
Papua		

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