

How Significant is the Difference of Own Source Revenue and Intergovernmental Transfer Impact on Local Education Spending in Java and Papua Island?

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Abstract: *This paper examines the impact of intergovernmental transfer towards the local government education spending in Indonesia. In the analysis, unlike most previous literature conducted in Indonesia, we try to figure whether there is a significant difference between two regions namely Java and Papua Island in determining the local education spending. By using Random Effect model, the result captures that the highest marginal effect on the local government education spending is the binary variable. The result emphasizes that statistically, local governments in Java Island allocate 23 percent more for the share of education spending than in Papua Island. On the other hand, variables such as general allocation grant, specific allocation fund, and own source revenue have significant impact as well but with less coefficient. This paper also uses GMM system to estimate the result. Following the previous literatures, the GMM model is used to overcome the endogeneity problem in the regression as we suspect that most explanatory variables in the model are endogenous or predetermined. The result however found no difference with the RE model used.*

Keywords: *intergovernmental transfer, binary variable, education spending, random effect, GMM*

1. Introduction

In the context of local government in Indonesia, the main source of funding comes from the intergovernmental transfer. This is shown by Lewis [1] that the intergovernmental fiscal transfers from central government to local government have the largest shares reaching 88.4 percent. On the other hand, own source revenue (PAD) has a smallest share in generating the local government revenue. Lewis [1] also finds that intergovernmental transfer in Indonesia can give impact on local government capital spending for infrastructure as well as health and education. His finding shows that there is a statistically significant impact of intergovernmental fiscal transfer towards local government capital spending.

This paper examines the impact of intergovernmental transfer towards the local government education spending in Indonesia. In the analysis, unlike most previous literature conducted in Indonesia, with a similar nature, author distinguishes the islands into Java and Papua Islands for the following reasons.

First, the existence of decentralization in Indonesia is due to the disparity in developing between regions centralizing mostly in Java. Second, the share from Java Island to the national GDP reaches more than 60 percent in 2010. On the other hand, Papua Island has only a share of 1.43 percent in the same year. Third, Papua Island only spent around 17.93 percent of their local education spending from their total expenditure in 2012. On the other hand, the average in Java Island had around 45.26 percent in the same year.

The approach of methodology used in this paper is static and dynamic panel data. This methodology has been used by numerous studies before. As for the static panel data, Craig and Inman [2] used pooled time series and cross-section to figure out the impact of Federal funding for public education in the state and local level in the USA. Moreover, Levaggi and Zanola [3] used pooled time series and cross-section as well to analyze the impact of intergovernmental grants towards regional health care spending in Italy.

On the other hand, the GMM system and Dynamic Panel Data (DPD) have been used for most recent studies. The endogeneity problem found in the most fiscal variables should be overcome. Hence, the GMM system is the best approach to overcome such problem in this context [1]. Moreover, the data used in this paper are for 138 cities/districts in Papua Island and Java Island with a series of year 2007-2012.

The main contribution of this paper is distinguishing between regions which might be different from previous studies. The disparity between developing regions has become serious matters in regional issue. Hence, this paper tries to figure whether there is a significant difference between Java and Papua Island in determining local education spending. Moreover, this qualitative indicator can also be used in the future analysis for other islands in Indonesia to see the difference. This paper also might be relevant for other developing countries using intergovernmental fiscal transfer as the main source for regional government revenue.

The rest of the paper is organized as follow. Section 2 is literature review where it describes theory and previous empirical studies having the same nature with this paper regarding the impact of intergovernmental fiscal transfer towards local government spending. Section 3 discusses the characteristic of intergovernmental transfer in the Indonesia and social economy of Java and Papua Island. Section 4 is exploring the data and methodology used in this paper. Section 5 will explain the result and analysis from statistical testing, as well as the linkage with the theoretical framework. Section 6 is the conclusion.

2. Literature Review

One of the basic ideas of the fiscal transfer from the central government is to achieve vertical fiscal balance where the income and the expenditure in local governments are converged [4]. However, according to Bird and Smart [4], this condition could be satisfied if the services are efficiently provided, a clear mandate in receiving the transfers, and sufficient flexibility to make decisions.

In the context of decentralization, most of local government's expenditure is financed by the intergovernmental transfer. The local government might find limitation in financing the expenditure where there is an imbalance of own-source revenue and expenditure, hence the need of the intergovernmental transfers [5]. Yet, several studies shows different approaches in estimating the local expenditure as a response of intergovernmental revenue. Recent year studies indicate that local government behavior is dynamic rather than static where it seems to be considerable dynamic relationship between local government revenues and expenditures [6].

Lewis [1] has conducted study in Indonesia and shows that all intergovernmental fiscal transfer categories have a significant marginal effect to the local capital spending by dynamic panel data (DPD) and system Generalized Method of Moment (GMM). Lewis [1] found that the largest marginal effect towards local expenditure spending in infrastructure was for a specific allocation fund. This is due to specific allocation fund which has more both income and the substitution effect whereas other type of grants only income effects [1].

3. Data and Methodology

Data used in this study concern 138 local governments in Java and Papua Island from the period 2007-2012. Meanwhile, Jakarta as a capital city which is located in Java Island has been excluded in the analysis as it has special treatment in terms of intergovernmental transfer. The year 2007 is set as the initial year as there is a change in naming the local government spending by function for education from previous years. The changes in name have also given a change in grouping the function of spending where spending for education is combined with the tourism and culture. This might be irrelevant if used in analyzing this paper. The end of the year 2012 is the latest data accessible.

The local government spending in education data is available from the Ministry of Finance (MoF) which is reported in the website. Other fiscal variables such as intergovernmental transfer and own-source revenue are obtained directly from the Directorate of Regional Autonomy, Ministry of National Planning and Developing. Moreover, the socio-economic variables including gross regional domestic product (GRDP), population, and poverty rate are provided from World Bank website.

This paper is trying to investigate the significant determination for local government education spending in Indonesia. The variables used are various local government revenues and other social-economic variables as control variables.

This paper is mainly following Lewis [1] and Levaggi and Zanola [3] where they try to figure out the impact of intergovernmental fiscal transfer towards the regional government spending for capital spending in Indonesia and health in Italy respectively. This paper uses two models. The models can be shown below:

$$EDUSHARE_{it} = \alpha + \beta_1 OSR_{it} + \beta_2 IGT_{it} + \beta_3 JAVA_i + \beta_4 Z_{it} + v_i + \varepsilon_{it} \quad (1)$$

$$EDUSHARE_{it} = \sum_{j=1}^2 \alpha_j EDUSHARE_{i,t-j} + \beta_1 OSR_{it} + \beta_2 IGT_{it} + \beta_3 Z_{it} + v_i + \varepsilon_{it} \quad (2)$$

In model (1) we use Random Effect (RE) for the regression. The reason behind this is that this paper wants to capture the effect of region term (Papua and Java island) therefore dummy region variable is required in the regression. This has been emphasized by Wooldridge [7] that the regressors which do not vary across t will not be identified or may not be estimated precisely (large standard errors) under Fixed Effect (FE) model. Hence, RE approach is required in this model.

The binary variable explained as $JAVA=1$ is set if the city/districts are located in Java Island. Otherwise, $JAVA=0$ if it is in Papua Island. This paper tries to answer the question whether cities/districts in Java Island have significant difference to Papua in determining local education spending.

In model (2), we use GMM system to overcome the endogeneity problem. Wooldridge [7] mentioned that when the predetermined is present as a regressor, we will have $E(\varepsilon_{it}x_{it}) \neq 0$ where it tells us that there is a correlation between the regressor and the error term. This however will give us the endogeneity problem which could not be solved by OLS regression [7].

Broadway et al [8] explain that most recent studies of intergovernmental fiscal transfer tried to overcome the endogeneity problem. This occurs as it seems that most of intergovernmental transfers including the economic variables have causality impact with the local government spending. Moreover, the GMM system is also used to capture the cyclical trends of education spending from the local government where in the second model author uses lagged of two years education share spending as an explanatory variable which gives the specification in dynamic terms. Hence, this model uses Dynamic Panel Data (DPD) and GMM system¹.

However, the GMM model wipes the binary variable which is used in this model. The reason is that in DPD model through system GMM technique, the model will turn into first difference [7].

$$\Delta EDUSHARE_{it} = \Delta EDUSHARE_{i,t-2}\alpha + \Delta\beta_1 IGT_{it} + \Delta\beta_2 JAVA_i + \Delta\beta_3 Z_{it} + \Delta v_i + \Delta\varepsilon_{it}$$

Model above is the actual form of model (2) before Java variable is being wiped. As binary variable is time invariant where the observation is constant over time, therefore it will be wiped after the first difference implied.

In general, the two models are using the common variables and will explain as follow. The dependent variable used in this model is the share of education spending to the total spending. We use this since there is high disparity between fiscal capacity in in Java and Papua hence it might be misleading if we use the absolute number of education spending. Moreover, the education spending itself in the model is determined by four main components namely own source revenue (OSR), intergovernmental fiscal transfer (IGT), and control variables (Z). In addition, α , β , v , and ε are respectively coefficient for constant, coefficient for independent variables, panel effects, and the standard error term.

The intergovernmental fiscal transfer is then classified into four items namely general allocation grant, shared tax revenue, shared natural resource revenue, and specific allocation fund. The specific allocation fund used in this paper is specifically merely for education. The social variables such as poverty rate, GRDP per capita, and population are set as a control variable.

¹ We use `xtdpd` command in Stata

4. Result Estimation

The objective of this paper is to find whether there is a significant different impact of own source revenue and intergovernmental transfer in Java and Papua Island. We use two models namely GMM and Random Effect. In the GMM model estimated below, most of the explanatory variables are taken to be endogenous or predetermined variables. Only shared natural resource revenue is set in exogenous variable. There is a logical explanation for this as also explained by Lewis [1].

General specific grant is allocated by the central government based on the formula² that general allocation grant is the difference of fiscal needs and capacity fiscal. In addition, local government spending in education as part of fiscal needs might determine the amount of general specific grant. Hence general allocation grant is set as endogenous.

One of the reasons that specific allocation fund was conducted is to encourage local governments together with central government to achieve the national priorities. One of national objectives as it is mentioned previously that constitution mandates the local government to spend minimum 20 percent for education. Thus, there is a causality effect between education spending and specific allocation fund. Therefore, we treat specific allocation fund as endogenous variable as well. This might explain to shared tax revenue because local government may decide to increase or decrease some types of taxes such as property tax.

Although our main interest variables are significant, the marginal effect however seems to be smaller in GMM model. This also occurred in Lewis [1] findings where by using GMM technique, the main interest variables have less impact in stimulating the local spending. This could be happened as our most variables are endogenous or predetermined thus the GMM has overcome the problem and showing more precise for the marginal effect.

The control variables are all set as predetermined variables where the explanation is as follow. Education spending in the long term might push growth as explained previously [9]. The growth however may influence the level of GRDP and poverty in the long run. This should be related to the population through household decisions about fertility, migrations, and others [1]. On the other hand, shared natural resource revenue is specified as exogenous where natural resources are not in the control of local government [1].

Table below presents the estimation result. The table shows the comparison regression result using random effect and GMM.

TABLE 1: Impact of Own Source Revenue and Intergovernmental Transfer on Local Government Education Spending in Java and Papua Island³

Independent Variable	(1)		(2)	
	Coef.	z stat	Coef.	z stat
Java Island and Papua Island (binary variable)	0.23	5.99*	-	-
First lag local government education spending	-	-	-0.34	-6.29*
Second lag local government education spending	-	-	0.22	3.88*
Own-source revenue	0.07	2.88*	0.019	10.80*
Shared tax revenue	-0.001	-1.34	0.009	1.41
Shared natural resource revenue	0.005	2.34*	0.016	4.49*
General allocation grant	0.103	4.82*	0.058	3.15*
Specific allocation fund	0.030	9.28*	0.019	4.14*
Gross regional domestic product	-0.02	-2.75*	-0.22	-0.90
Population	0.11	7.24*	0.065	1.72*
Percent population that is poor	-0.001	-1.20	-0.003	-1.76*
Constant	-2.73	-5.46*	-1.504	-1.60*
R ²	0.74		-	

² Stated in Law number 33 in 2004 and Government Regulation number 55 in 2005

³ The dependent variable is the share of local government education spending to total local government spending set by function. All other fiscal and economic variables are in real per capita and are in log linearization except for poverty rate.

From the result, we found nine points which can be highlighted to discuss further. First, all variables together in both models can explain the local education spending. Moreover, the R^2 for RE model is 74 percent which explains that the independent variables have strong correlation with the variable explained. The Sargan test in GMM is indicating that the instruments are valid⁴.

Secondly, we find that our interest variables show significance impact to local education spending. However, the marginal effect however seems to be smaller in GMM model. This also occurred in Lewis [1] findings where by using GMM technique, the main interest variables have less impact in stimulating the local spending. This could happen as our most variables are endogenous or predetermined thus the GMM has overcome the problem and showing relatively more precise for the marginal effect results.

Third is that the most highlighted variable in this paper can explain the local government spending very well. It seems that statistically, Java Island allocates more in local education spending compared to Papua Island. Java Island allocates 23 percent more share to total spending for education than in Papua Island. This can prove the hypothesis that the allocation for spending was higher in Java Island than in Papua Island as the marginal effect shows the highest impact in model (1).

This should be reasonable where most of local government spending in Papua Island has been allocated for public service (excluding health and education sector). In 2011, the local governments in Papua Island allocate 41.82 percent for public service whereas education only spent for 17.82 percent in the same year. On the other hand, the local governments in Java Island allocate 44.33 percent for education in the same year. Besides, the government allocates only 24.81 percent from total spending.

The local government in Java Island seems to be more aware in investing education relative to Papua Island. Therefore, according to Kaganovich and Zilcha [3], Java Island generates more in human capital accumulation than in Papua Island. Thus, there should be a higher wage in Java Island [10]. This of course could lead to the high rate of poverty in Papua Island where it has a rate above the national average where the local government has less awareness to invest in education. This might due to other priorities in Papua such as developing infrastructure for transportation, health issues, and enhancing the public service together with good governance implementation. Therefore, the local government tends to allocate more budgets to those sectors.

Fourth is that 2 lag periods of local government spending have significant impact both for lag 1 and lag 2. The increase of 1 percent allocation share of education spending in the previous year might reduce allocation local spending in the current period for 34 percent. This is obviously reasonable where for most expenditure there should be a difference between the actual and allocation of expenditure. This tells us that the local government tends to overrate the allocation and failed to assess the real fiscal need. For example, in 2011 the actual spending for education is only 90.10 percent from its allocation. This also implies to other expenditure such as health and social protection expenditure where the actual spending are only 87.96 percent and 84.02 percent respectively in the same year from the allocation.

However, in the long run the government already able to match the allocation with the actual fiscal need. Thus, there is no difference in the allocation and actual budget. In two prior years the coefficient is positive that the increase of 1 percent share of education spending might raise the budget allocation in the current year for 22 percent.

Fifth is that own source revenue might generates significantly the local government spending in education. The increase of 1 percent in own source revenue might increase 7 percent share of education to total local government spending. As the significance impact implies also to GMM model as well where the marginal effect is for 2 percent. The marginal effect however seems to be relatively small compare to other variables in both models as own source revenue for most of the regional government still could not generate revenues that much. Moreover, this is similar to the previous studies in first generation theory of intergovernmental transfer where own source revenue does not affect much on local spending although it is significant.

⁴ We accept H_0 where overidentifying restrictions are valid as $\text{prob} > \chi^2 = 0.136$.

Sixth, general allocation grant has a significant impact on local government spending in both models. This is in line with the theory and previous studies mentioned before. Although the marginal effect in both models are relatively higher compared to other variables (exclude binary variable), there is a slightly different coefficient between the two models. In RE, the increase of 1 percent in general allocation grant might increase 10.3 percent share of local education spending while in GMM is only for 5.8 percent.

However, the general allocation grant has the largest coefficient compare to other fiscal variables. This is not surprising as the largest share of local government's revenue is from it. Almost 60 percent in average of total local spending is financed by this type of intergovernmental transfer in Indonesia. Besides, this is in line with Heyndels [11] findings that Flemish municipalities tend to spend more for its public expenditure as the increase of unconditional grants. Although the result can explain the flypaper effect, Heyndels [11] also figures that the decrease of unconditional grants may not affect the reduction of local government spending where it could be compensated by local own source revenue. This could be an expansion for the analysis in the future relating the context of Indonesia.

Seventh, the specific allocation fund has also significant impact; this should not be surprising as a lot of studies have proven that. However, Lewis [1] found that specific allocation fund has a greater marginal effect compare to general allocation grant while the estimation in this paper finds different result. Lewis [1] believes that the specific allocation fund has more both income and substitution effect whereas other type of grants have only income effects. Hence, the specific allocation fund has a larger effect compare to others.

However, our estimation finds different result where specific allocation fund for education has only marginal effects for 3.0 percent (RE model) and 1.9 percent (GMM) to local government spending which are less than general allocation grant. This shows that the increase of local education allocation is more influenced by general allocation grant than specific allocation fund for education itself.

Eighth, shared tax revenue seems to have no impact on local education spending using both models. On the other hand, shared natural resource revenue statistically has an impact although the coefficients show less impact if compare to general resource revenue and specific allocation fund. The increase of 1 percent of shared natural resource revenue will only increase 0.5 percent and 1.6 percent to share of local education spending for both models. This result however could not tell much for the impact.

Ninth, the various control variables seem to have a different impact between two models. In RE model, GRDP is statistically significant, yet it has a small marginal effect which is only for 2 percent. This however has a weak argument as most theories prove that GRDP should increase local spending. After we overcome the endogeneity problem by using GMM technique, the result changes into insignificant impact for GRDP towards local spending.

As for the poverty rate, the impact is shown only in the GMM model where the increase of 1 percent in poverty rate could lower the share of local education spending for 0.3 percent. Although the marginal effect is not large, the negative coefficient seems reasonable as higher rate of poverty in one region might encourage the government to allocate the spending into other spending which is directly benefit the beneficiaries such as social protection. Last variable control is population where in both RE and GMM, the increase in population tends to increase the share of education spending for 11 percent and 6.5 percent.

Moreover, we use an extension model to deepen the analysis of the significance regional impact in Java and Papua Island by interacting own source revenue and intergovernmental transfer with the dummy variable as it is summarized in model (3) below.

$$EDUSHARE_{it} = \alpha + \beta_1 OSR_{it} * Java + \beta_2 IGT_{it} * Java + \beta_3 Z_{it} + v_i + \varepsilon_{it} \quad (3)$$

TABLE 2: The Impact of Own Source Revenue and Intergovernmental Transfer with Dummy Interaction⁵

⁵ According to the Hausman test, the OLS regression in this model uses Fixed Effect Model. Own source revenue, shared tax revenue, shared natural resource revenue, general allocation grant, and specific allocation fund are taken to be interacted with binary variable (1=Java and 0=Papua)

Independent Variable	Coeff.	Robust St.dev	t Stat
Own-source revenue	0.01	0.003	3.97*
Shared tax revenue	0.007	0.008	0.85
Shared natural resource revenue	0.002	0.001	1.62
General allocation grant	0.113	0.025	4.55*
Specific allocation fund	0.023	0.003	6.81*
Gross regional domestic product	0.011	0.008	1.44
Independent Variable	Coeff.	Robust St.dev	t Stat
Population	0.019	0.012	1.72**
Percent population that is poor	-0.004	0.0007	-4.63*
Constant	-1.58	0.356	-4.42*
R^2	0.6313		
Number of observations	808		

From the result, we found four points which can be highlighted to discuss further. First, all variables together in both models can explain the local education spending. Moreover, the R^2 for RE model is 63.13 percent which explains that the independent variables have strong correlation with the variable explained.

First, we can see that three sources of local government income which are own source revenue, general allocation grant, and specific allocation fund have the significant impact on local education spending. Java Island allocates 11.3 percent higher than in Papua Island after the central government increases the transfers of general allocation grant for 1 percent. This emphasizes the estimation in previous model that local governments in Java Island are more concern in investing in education than in Papua Island. Regardless the marginal effects are smaller, specific allocation fund and own source revenue also show that the increase in both variables affect to the higher on education spending in Java Island for 2 percent and 1 percent respectively compare to Papua Island.

However, after interacting the dummy variable with share tax revenue and shared natural resource revenue, it seems that the both variables have no impact on local education spending. This tells us that there is significant different impact for both shared revenues between Java and Papua Island. This also implies to GRDP where the increase of GRDP couldn't explain the changes of local education spending. For other control variables such as population, statistically both have significant impact to the changes of local education spending. The increase of 1 percent in population and poverty rate might increase 1.9 percent and decrease 0.4 percent to local education spending respectively. This however has the similar with the result in GMM model.

In conclusion, the result could answer our research question statistically that there is a difference impact on education spending for both local government in Papua and Java Island. The results emphasize that grants (general purpose grand and specific allocation fund) together with own source revenue generate more local government spending for education in Java Island than in Papua Island.

5. Conclusion

This paper focuses on estimating the result of own source revenue and various kinds of intergovernmental transfers on local government education spending in Java Island and Papua Island over period 2007 - 2012. We conduct RE model and systems GMM technique in estimating the result. The RE model is used to capture the binary variable which becomes our main interest variable. On the other hand, GMM is used to overcome the endogeneity problem whereas we suspect the most explanatory variables are endogenous.

The examination using RE model shows the significance of the binary variable in stimulating local education spending. The marginal effect for the binary variable is 23 percent to the share of local spending. This is telling us that with this model, Java Island allocate 23 percent more than in Papua Island.

Comparing to model (2) which we used GMM technique, the result is similar with RE model whereas own source revenue, general allocation grant, and specific allocation fund can stimulate local education spending. This paper also has been extended to other model where we interact the binary variable with own source revenue

and intergovernmental transfer. The result tells us that only own source revenue, general allocation grant, and specific allocation fund are significant. This tells us that the three fiscal variables namely own source revenue, general allocation grant, and specific allocation fund might encourage Java Island to spend more in the share of education spending compare to Papua Island.

Therefore, the result could answer our research question statistically that there is a difference impact on education spending for both local governments in Papua and Java Island. The results emphasize that grants (general purpose grand and specific allocation fund) together with own source revenue generate more local government spending for education in Java Island than in Papua Island.

However, this paper has a limitation which could be an evaluation and discussion for further paper. The significant result of the difference between Java and Papua Island is probably because these two regions are not comparable. Although we already removed the capital city in our regression, cities or districts which are located in Java Island have much more industrialization activities. Therefore, spending in education is much more required in this region while Papua Island prefers to build infrastructure for transportation as it has high cost economy. Comparing Java Island and Non-Java Islands for the analysis might be more precise as Java has half share of GDP in Indonesia and other six big islands have the other half. On the other hand, Papua has only 2 percent share of the national GDP. However, author has limitation to access the data.

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