

Panel Analysis on the Association of Fiscal Decentralisation and the Size of Government in Indonesia

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Abstract—This paper uses panel data of 33 provinces in Indonesia to examine the association of the size of government and fiscal decentralisation. Empirical results show that the channels through which fiscal decentralisation are mostly found to have an association with the size of government is: (1) revenue decentralisation; (2) expenditure decentralisation; (3) flypaper effect and (4) vertical imbalance. Overall, panel regression results provide evidence in support of the association of fiscal decentralization and the size of government as predicted in Leviathan Hypothesis. The results also present evidence that socio-economic variables are found to significantly alter the association between fiscal decentralisation and the size of government. These variables include per capita Gross Domestic Regional Product, the size of population, dependency ratio and density as well as the number of districts and cities in provinces.

Index Terms—Federalism, size of government, decentralisation.

I. INTRODUCTION

Many developing countries have enacted decentralisation as an important public management reform by transferring some combination of political, administrative and fiscal powers from central government to actors and institutions at local government levels [1]. Among many countries which undertake decentralisation, Indonesia has been perceived as an ambitious country in implementing decentralization by transferring policymaking autonomy in areas including revenue and expenditure functions to local governments since the country introduced decentralisation in 1999 [2], [3].

Literature on fiscal federalism provides shed light that transfer of fiscal authority and responsibility to local governments will alter the size of revenue and expenditure of local governments. The ideas on how decentralisation affects the size of the government frequently build on the work of Brennan and Buchanan [4]. Brennan and Buchanan argue that government is a Leviathan that maximises its income size by exploiting tax revenues. Fiscal decentralisation puts local governments into intense fiscal competition making it more difficult for local governments to exercise Leviathan behaviour. Consequently, the size of local governments should decrease under a greater degree of fiscal decentralisation. On the other hand, John Wallis as quoted in (as quoted in [5], [6]), contends that the more decentralised local governments, the larger the local public sector should

be. This view is based on the roles of individuals who are more effective in controlling and influencing policies at local level. In addition, decentralised government enables a better match between individuals' tastes and preferences for public services thereby leading to increased trust and support, enabling local governments to acquire more tax resources from the individuals since they know that the tax resources will be spent and tailored according to the tastes and preferences of the public [7], [8], p. 265). Under these circumstances, decentralisation would empower the local public sector due to an increase in the demand for public spending that encourages local governments to increase public expenditure thereby leading to an increase in the size of local government (see, among others, [7]-[10]).

While studies of fiscal decentralisation and the size of government are quite abundant, empirical and theoretical analyses of the association between fiscal decentralisation and the size of government at provincial level in Indonesia are rare. One previous study on the size of government in Indonesia by Syahrial [11] examined only the expenditure size of government at provincial level in Indonesia. Most studies on other countries have also only focused on the expenditure size of government, these include [12]-[15]. Their studies fail to establish meaningful comparisons of three major economic functions of government, as suggested by Musgrave and Musgrave [16]. According to Musgrave and Musgrave, government is responsible for allocating public goods and services, redistributing income and wealth to society and attaining economic stability. In performing these functions, government has to raise money through fiscal policies such as taxation or borrowing, and the government spends the revenue collected to provide public goods and services. Based on this, a study on the size of government incorporating both the expenditure and revenue size of government is very powerful. In addition, most previous studies on the size of government have not considered all pillars of fiscal decentralisation when addressing the association between fiscal decentralisation and the size of government. As a result, findings from these studies lack comprehensive analysis on the pillars of fiscal decentralisation which are associated with the size of government.

The broad objective of study is to investigate the three hypotheses on the association between fiscal decentralization and the size of government on the case of provinces in Indonesia by using panel regression analysis. This study fills the gap in the previous studies by including three of the four pillars of fiscal decentralisation into regression analysis, namely, revenue assignment, expenditure assignment and intergovernmental transfers. Thus, empirical findings from

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the panel analysis in this study are more comprehensive in scope than the previous ones.

II. REVIEW OF THE LITERATURE

In this study, the standpoint in investigating the mechanism through which fiscal decentralisation is associated with the size of government was developed upon the classical theory of fiscal federalism in Wallis and Oates' hypothesis [17], Brennan and Buchanan's Leviathan hypothesis, and the collusion hypothesis [4]. However, this study does not aim to examine the validity of the three hypotheses as above, but rather to examine whether there is evidence to be found supporting the hypotheses in the existing circumstances in all provinces and across Indonesia during the study period.

A. Wallis' Decentralisation Hypothesis

John Wallis hypothesized the possibility of a positive relationship between decentralisation and the size of government. Wallis bases his argument on the premise that some governmental functions and responsibilities can be transferred from central to local governments. If this premise holds, once central government decentralises responsibility over the provision of public goods to local government, the central government will spend less as local governments spend more, the size of local governments will increase [8], [18]. In the centralised government, the public expenditures are set centrally resulting in the uniformity of their allocation to public goods and services that do not reflect the taste, interests and preference of the public. In contrast, under a decentralised system, the local provision of public goods is tailored to meet the public's tastes and preferences [17]. As described in the theory of Federalism, i.e. the principle of subsidiarity, the performance of the local public sector will continue to increase under decentralisation because public decision-making, including decisions in the public goods and services provision, always considers culture, environment, and natural resources, as well as social, economic and local demographic indicators [5], p.749).

This will drive the provision of public goods and services that match to the local community's preferences and needs. As a consequence, the increase of local spending and wider range of expenditure functions and fiscal responsibility will be the matters that the local governments have to consider [8], [10]). This subsequently enlarges the size of the local government and local public sectors [17], [18]. If the provision of public goods and services at the local level meets the local preferences, especially those of taxpayers, then fiscal decentralisation will promote increased demand for local public goods and services, which in turn promotes increases in public spending at the local government level — government size is increased, see, [8]. Another reason for the increase in government size as suggested by [19] is the bureaucratic structure and management of the local government, especially as regards local taxation management. Fiscal decentralisation brings changes to the local taxation and management systems; taxation management changes are likely to be followed by increased administration and government employment at the local level, and this in turn will increase public spending at the local government level. In

addition, to promote better public-spending management at the local level, local governments will need to improve the performance of the public sector in their regions, which of course is anticipated as it increases local-budget spending.

Wallis also hypothesized that in a decentralised system, local governments obtain extensive responsibilities as well as bureaucracy and administrative function, and while at the same time the local communities and taxpayers also have extensive control over local public policy. The combination of these two effects will strengthen and expand the local public sector — the more decentralised the governance and decision-making systems, the greater the size of local government, see Oates, [5], [9], [19]. However, the main factor that causes an increase in government size is the capacity of local governments to modify the taxation system in accordance to their fiscal needs.

B. Brennan and Buchanan's Leviathan Hypothesis

Their idea is addressed extensively in *The Power to Tax: Analytical Foundations of a Fiscal Constitution* written by Brennan and Buchanan [4]. The Leviathan hypothesis is formulated like this: 'Total government intrusion in the economy should be smaller, ceteris paribus, the greater the extent to which taxes and expenditures are decentralised' (p.185). The hypothesis was based on the idea that the government will maximise revenues by imposing excessive tax-pricing for the public goods and services that it supplies to tax-payers; this is what they termed the leviathan behavior of government.

Brennan and Buchanan considered that government is a monolithic entity which acts as the sole provider of public goods having the authority to set taxation, and is always trying to maximise its own profits by exploiting the citizenry through the establishment of higher taxes, a phenomenon called fiscal exploitation. The government behavior which always seeks power maximisation through fiscal exploitation is called Leviathan (power-maximising) behavior which systematically aims to maximise revenue by legally determining various sources of taxation for governmental self-interest, as opposed to the taxpayers' interests. The government's Leviathan behavior becomes easier and more excessive in a centralised system as this enables government to have greater monopoly power, making it more difficult to prevent Leviathan behavior [12], [20], while in a decentralised governance system, government monopoly behavior will decrease significantly due to increasing intergovernmental competition. Brennan and Buchanan predict when the level of decentralization is higher, the competition will be tougher among local governments and this will lessen government monopoly power.

According to Brennan and Buchanan, fiscal decentralisation is a mechanism for introducing an effective means to control the leviathan behaviour through competition among jurisdictions. Such competition breaks the monopoly power of government, resulting in a constraint on leviathan behaviour. Through fiscal decentralization — both revenue and expenditure decentralization — a government's leviathan abilities will be significantly reduced. The Leviathan Hypothesis assumes mobile citizens and resources, and thus there are many local governments that have strong abilities to

tax and spend their revenue [20]. If citizens and resources are mobile, then government leviathan behavior will not succeed because the citizens and resources will move from areas that have high tax rates to those that have lower tax rates [21]. As assumed, citizens and resources will find areas providing them a high return while governments will compete with one another to get these mobile citizens and resources; such high competition will ultimately limit the government's fiscal exploitation abilities.

Brennan and Buchanan stated that there is a division of intergovernmental power and responsibilities in decentralisation. This division will encourage each government to become regions providing attractive jurisdiction to their citizens, taxpayers and other resources—in this way, interjurisdictional competition occurs. Taxpayers will choose regions that have fiscal arrangements best suited to their preferences for public goods. Interjurisdictional competition will eventually hamper a government's leviathan behavior and reduce public sector and government growth. According to Brennan and Buchanan, interjurisdictional competition is one of the most influential (and powerful) ideas limiting a government's ability to maximise revenue (the power of the revenue maximising Leviathan). Thus, through fiscal decentralisation, decentralisation of taxing power will encourage tax competition among regions, which in turn restrain public sector growth.

C. Brennan and Buchanan's Collusion Hypothesis

Another important idea from Brennan and Buchanan is the collusive behavior among governments in response to the consequences of fiscal decentralisation. According to Brennan and Buchanan, the beneficial effects of fiscal decentralisation may be hindered by collusion among governments. They predicted that local governments under a decentralised fiscal structure would try to circumvent competitive pressures of fiscal decentralisation by colluding among themselves or with the national government. Since fiscal decentralisation increases the pressure of fiscal competition in a decentralised system, governments tend to increase their collusive behaviour in order to gain a larger share of intergovernmental transfers. Intergovernmental transfer as one of the four pillars of fiscal decentralisation enables government collusion, either by vertical or horizontal transfers; vertical transfers occur between the central and local governments, whereas horizontal transfers take place between local governments. In most decentralised countries, collusive behaviour happens between central government and local government. Such collusions occur because, in practice, intergovernmental transfers from the central government are not purely based on the goodwill (benevolence) of the central government, but intergovernmental transfers are determined by strategic politicians [22].

One of the forms of collusion that is common in practice is agreements. As an example, local governments cede taxing powers to the national government while national government establishes a revenue-maximising uniform tax system across all jurisdictions [8], p.4). Tax collusion normally takes the form of intergovernmental transfers such as vertical grants [23], [24]. Certainly such agreements are not expected

because they worsen the purpose of fiscal decentralization [4]. Another form of collusion between central government and local governments occurs in the form of homogeneous systems of taxation in all regions which aims at reducing the pressure of local competition. Thus, through intergovernmental transfers, the central government maintains the power of monopoly [20]. Similarly, local governments can work together and set homogeneous taxation systems and cartel public expenditures to minimize competition resulting from fiscal decentralization [23]. As a result of such behavior, intergovernmental transfers are often considered cartel-like collusions among local governments in order to avoid competition, especially tax competition. According to Brennan and Buchanan [4], intergovernmental collusion will alleviate the impact of competition between regions and reduce the pressure of fiscal decentralisation on government size since intergovernmental collusion would actually damage the main objectives of fiscal decentralisation or Federalism, that is, to encourage competition between regions (p. 183). As described previously, Brennan and Buchanan hypothesis is based on the normative theory of public finance which assumes that the government is a revenue maximiser. Given the increased competition between governments, and also the mobility of resources, between the central and local governments (or even among local governments) collusion will occur in order to maintain revenue maximising behaviors. The effect of collusion among local governments on the size of government relies on the degree of intergovernmental transfers. Fiscal decentralisation could reduce the size of government Fiscal decentralisation could reduce or increase the size of government depending on the low or high degree of the vertical imbalance [7], [13].

III. EMPIRICAL ANALYSIS

Panel data modelling was employed to examine the association between fiscal decentralisation and the size of government. Panel data modelling has become an alternative with on-going discussions highlighting the advantages of panel data methods over cross-sectional method and also time-series method. Some scholars identify numerous advantages of panel data and mostly argue that one of them is the ability to accommodate the possibility of the impact or influence of other variables excluded in the analysis (i.e. a difference across cross-sectional units) [25]-[28], among others). This study utilises the advantages of panel data, which are accounting for unobserved individual (provincial) heterogeneity, reducing collinearity, improving efficiency, reliability and stability of econometrics estimates, and identifying and measuring effects not detectable in a cross-sectional method. Failure to use panel models when appropriate is a model misspecification error resulting in biased estimates and unreliable diagnostic statistics [26], [29], [30].

The basic framework of the panel model used throughout the panel estimation is modeled as follows (see e.g., [26], [31], [32]):

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_j X_{jit} + \epsilon_{it} \quad (1)$$

where

$$\varepsilon_{it} = a_i + \mu_{it} \tag{2}$$

From (1) and (2), the panel model is written as:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_j X_{jit} + a_i + \mu_{it} \tag{3}$$

where *i* represents province (33 provinces), *t* represents time (2001-2008). β_0 is the common intercept, β represents parameters to be estimated, a_i corresponds to the unobserved heterogeneity in provinces, and ε is idiosyncratic errors (individual provinces and time variant). *Y* denotes dependent variable (the Revenue Size of Government, and the Expenditure Size of Government). Three measures of the revenue size of government were estimated: GREVTOTAL, GREVOWN, and GREVSHARE. The expenditure size of government was GEXPTOTAL. As such, there were four panel regression models for which estimates were attempted. *X* represents independent variables (measures of fiscal decentralisation and a number of control variables). Measures of fiscal decentralisation were the measures of fiscal decentralisation including revenue decentralization (REVDEC), expenditure decentralization (EXPDEC), vertical imbalance (GIMB, SIMB), flypaper effect (FLYPAPER), fiscal capacity (FISCAP), and non revenue autonomy (NONREVAUTO). Whereas control variables consisted of real per-capita Gross Domestic Regional Product (GDRPCAP), economic growth (GROWTH), unemployment (UNEMP), dependency ratio (DEPRATIO), population (POP), density (DENSITY), and fragmentation (FRAGMENT). The inclusion of such variables was to account for socio-economic characteristics in each province between 2001 and 2008. All variables used in the panel regression analysis were in the log-log functional form and defined more in Table I.

TABLE I: VARIABLES AND OPERATIONAL DEFINITIONS

Name	Definition
GREVTOTAL	Ratio of the total revenues to GDRP
GREVOWN	Ratio of the own-source revenues to GDRP
GREVSHARE	Ratio of the balancing funds to GDRP
GEXPTOTAL	Ratio of the total expenditures to GDRP
REVDEC	Ratio of own-source revenues of province <i>j</i> to total revenues
EXPDEC	Ratio of total expenditures of province <i>j</i> to total expenditure of all regions
TOTAL	
GIMB	Ratio of general allocation funds of province <i>j</i> to total expenditures
SIMB	Ratio of specific allocation funds of province <i>j</i> to total expenditures
FLYPAPER	Ratio of balancing funds of province <i>j</i> to total revenues
FISCAP	Ratio of own-source revenues + revenue sharing of province <i>j</i> to total expenditures
REVAUTO	Ratio of taxes + levies of province <i>j</i> to total revenue
NONREVAUTO	Ratio of own-source revenues of province <i>j</i> to total revenues
GDRPCAP	Per capita GDRP in constant term of province <i>j</i>
GROWTH	Economic growth of province <i>j</i> (%)
UNEMP	Unemployment rate of province <i>j</i> (%)
POP	The number of total population of province <i>j</i>
DENSITY	Total population of province <i>j</i> divided by land area
FRAGMENT	The number of district of province <i>j</i>

Panel data for 33 provinces in Indonesia over the 2001–2008 periods is used in this study. For some provinces,

measures of fiscal decentralisation are not available for the entire period of the study. Consequently, the models are unbalanced panel models estimated to examine the association between fiscal decentralisation and the size of government. The proxy variables of fiscal decentralisation as the measure of expenditure and revenue decentralisation was retrieved from government financial statistics, intergovernmental transfer among levels of government, and socio economic factors that are incorporated in the determination of the association between fiscal decentralisation and the size of government.

One important step in using panel regression is to determine whether to use Fixed Effect Model (FEM) or Random Effect Model (REM). FEM and REM are potentially valid in panel models with unobserved individual heterogeneity. In some cases, REM may be a valid model to be used and may produce consistent parameters. However, for the data used in model for fiscal decentralisation and the size of government it is unlikely that the individual-specific effects are uncorrelated with the relevant covariates, and this indicates the FEM is preferred to the REM. More formally, to test the appropriateness of the REM vs. FEM, the Hausman Specification Test [33] (hereafter, Hausman test) is performed. The Hausman test is commonly used to choose between the fixed and random effect models by testing the correlation between the individual effects and the independent variables in a panel regression analysis [26]. In this study, the Hausman test was applied for all panel models in order to check whether the unobserved provinces' effects are correlated with the independent variables. The hypothesis used in the Hausman test is as follows: H0: Individual effects and independent variables are not correlated; H1: Individual effects and independent variables are correlated. If the Hausman test statistic is significant, then the null hypothesis — that the random-effect estimator is consistent is favour over the fixed-effect model — is rejected. If the test statistic is insignificant, the null hypothesis cannot be rejected, and the fixed effects estimators should be used. Results of the Hausman test are reported in Table II.

TABLE II: SUMMARY OF THE HAUSMAN TEST RESULT

Model	Test	χ^2	Prob>Chi Square	Result
1	Fixed-Effects vs. Random-Effects	359.747	0.000	Rejects H ₀
2	Fixed-Effects vs. Random-Effects	343.105	0.000	Rejects H ₀
3	Fixed-Effects vs. Random-Effects	380.011	0.000	Rejects H ₀
4	Fixed-Effects vs. Random-Effects	22.634	0.046	Rejects H ₀

From the Chi-Squared and p-value, it can be inferred that the null hypothesis can be rejected. As such, fixed effects estimators were used in the panel models. It can be concluded that the results from the Hausman test support a theoretical justification to employ fixed effects models in the study. That is, the provincial effects are modeled as fixed to represent conditional inferences on the effects of particular cross-section unit in the sample (see, [34], p. 43). For the fixed effects, the inferences drawn are specific to those

particular units, and, in this study, the observed units constitute the entire population of provinces. In addition, from a modelling perspective there are no time-invariant

independent variables in the model and so using the FEM model does not exclude important variables (since time-invariant variables are differenced out of the FEM).

TABLE III: RESULT ON BREUSCH-PAGAN-GODFREY TEST

Model					Decision
1	F-statistic	5.4996	Prob. F(52,192)	0.0000	Heteroskedastic
	Obs*R-squared	146.5857	Prob. Chi-Square(52)	0.0000	
2	F-statistic	4.6176	Prob. F(52,191)	0.0000	Heteroskedastic
	Obs*R-squared	135.8993	Prob. Chi-Square(52)	0.0000	
3	F-statistic	5.6044	Prob. F(52,191)	0.0000	Heteroskedastic
	Obs*R-squared	147.3967	Prob. Chi-Square(52)	0.0000	
4	F-statistic	1.4505	Prob. F(52,126)	0.0480	Heteroskedastic
	Obs*R-squared	67.0293	Prob. Chi-Square(52)	0.0780	

TABLE IV: RESULT ON BREUSCH-GODFREY LM TEST

Model					Decision
1	F-statistic	0.0224	Prob. F(2,190)	0.978	No Serial Correlation
	Obs*R ²	0.0577	Prob. Chi-Square(2)	0.972	
2	F-statistic	0.6559	Prob. F(2,189)	0.52	No Serial Correlation
	Obs*R ²	1.682	Prob. Chi-Square(2)	0.431	
3	F-statistic	2.7039	Prob. F(2,196)	0.069	No Serial Correlation
	Obs*R ²	6.5514	Prob. Chi-Square(2)	0.038	
4	F-statistic	6.2021	Prob. F(2,189)	0.003	Serial Correlation
	Obs*R ²	15.028	Prob. Chi-Square(2)	5E-04	

Due to the nature of time-series-cross-sectional data, panel data models commonly encounter heteroskedasticity and serial correlation and Beck [35], p. 275) discussed some causes of such problems: (1) each province may have their own error variance due to the unique characteristics of each province; (2) errors for one province are likely to be correlated with errors for other provinces in the same year (i.e. serial correlation or so-called contemporaneous correlation) — for example, serial correlation is possible because shocks in one province affects neighbouring provinces; and (3) the errors for a given province are correlated with previous errors of that province (see also, [13]-[15]). Thus, before discussing and interpreting the results of the panel models, heteroskedasticity test on the panel models was undertaken on FEM estimation results and the results are presented in the table below. According to the F-statistics in all models, the null hypothesis of no heteroskedasticity used in the test cannot be rejected; indicating heteroskedasticity in all models (See Table III). In addition, as to [29], panel data is likely to have serial correlations either due to time or cross-sectional dimensions. As such, the dynamic effect of the dependent variable is generally distributed over several time periods. The tests include Breusch-Pagan-Godfrey test to check the heteroskedasticity problem and Breusch-Godfrey LM Test to check the serial correlation across the panel models. Results from Breusch-Godfrey LM Test conclude the existence of serial correlation in the error terms of the panel models and summary of the result are shown in Table IV.

IV. RESULTS AND INTERPRETATION

The Newey-West HAC estimator was used throughout the panel estimations to cope with the heteroskedasticity and serial correlation in the panel regression models. This technique is strongly recommended to account of heteroskedasticity and serial correlation in panel data (see for example, [36], pp. 18-19). Table V shows the regression

results for the Newey-West HAC estimators and reports the coefficients and t-statistics for every model in the panel analysis (Column 1 reports the results for Model 1, and so on).

The coefficient of revenue decentralisation is positive, but not significant. A similar result to one obtained by [14] is found for expenditure decentralisation, where expenditure decentralisation is likely to accelerate the growth of the revenue size of government, indicated by a positive and significant coefficient at the 1% level. This suggests that a 1% change in expenditure decentralisation causes a 0.46% change in the revenue size of government.

The indicator of vertical imbalance, GIMB, defined as a ratio of general allocation funds to total government expenditures, in Model 1 is significant but the sign is at odds with expectations because this implies GIMB is associated with a relatively smaller size of government; GIMB should have a positive association with the size of government, a higher GIMB leads to larger size of government. Possible explanations established in the literature for the contradictive result is that intergovernmental transfers from national to local government did not induce excessive expenditures and revenues at local levels [37]. In the case of Indonesia, this seems plausible since provincial governments in Indonesia received less autonomy power compared to district governments.

However, when all components of balancing funds are measured, it is found that the balancing funds are positive and significant at the 1% level. This can be termed as: a 1% change in flypaper effect causes a 0.73% change in the revenue size of government. Thus provinces which have relatively high vertical imbalances will likely have larger government. Fiscal capacities of provinces had no significant association with the revenue size of government. This is also found in NONREVAUTO; although having a positively signed coefficient, non-taxes and levies of provincial government do not appear to significantly affect the revenue size of government—consistent with the view that provinces do not highly rely upon these sources of revenues.

TABLE V: REGRESSION RESULTS BASED ON NEWEY-WEST HAC STANDARD ERRORS & COVARIANCE

Channel	Model 1	Model 2	Model 3	Model 4
REVDEC	0.295 (1.392)	0.719 (4.878) ***	0.013 (0.552)	0.080 (0.875)
EXPDEC	0.455 (3.845) ***	0.321 (1.686) *	0.986 (54.812) ***	0.876 (14.579) ***
GIMB	-0.290 (-2.026) **	0.028 (0.770)	-0.011 (-1.267)	-0.014 (-0.309)
FLYPAPER	0.728 (4.270) ***	0.065 (1.872) *	1.010 (52.297) ***	-0.072 (-0.698)
FISCAP	0.022 (0.187)	0.105 (0.505)	-0.025 (-2.433) ***	0.001 (0.016)
NONREVAUTO	0.125 (1.515)	0.037 (1.221)	0.001 (0.145)	-0.012 (-0.451)
GDRPCAP	2.814 (60.670) ***	-1.036 (-3.249) ***	-0.828 (-9.343) ***	-0.950 (-16.086) ***
GROWTH	-0.008 (-2.781) ***	0.0003 (-0.258)	0.0001 (-0.490)	-0.006 (-2.486) ***
UNEMP	-0.013 (-1.827) *	-0.001 (-0.239)	0.0005 (-0.464)	0.002 (0.509)
POP	3.445 (4.600) ***	-0.939 (-3.214) ***	-0.881 (-10.029) ***	-0.957 (-19.278) ***
DEPRATIO	-0.673 (-1.577)	-0.039 (-0.226)	-0.019 (-0.410)	-0.013 (-0.083)
DENSITY	0.224 (1.230)	-0.213 (-1.952) *	0.029 (0.946)	0.011 (0.781)
FRAGMENT	0.217 (2.281) ***	0.085 (1.146)	-0.008 (-0.556)	-0.024 (-0.654)
Time and Year dummies	Yes	Yes	Yes	Yes
Observation	245	244	244	244

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels; numbers in parenthesis are the t-statistics.
 Dependent Variables: Model 1: GREVTOTAL, Model 2: GREVOWN, Model 3: GREVSHARE, Model 4: GEXPTOTAL.

With respect to the control variables, there are five variables that have significant coefficients: per-capita GDRP, economic growth, unemployment, the size of population, and fragmentation. The coefficient of GDRP is positive and significant at the 1% level; this finding is in line with Wagner's Law, predicting a positive relationship between per-capita GDRP and the size of government. As suggested in the literature, higher GDRP per capita is associated with sound local economic development which creates more opportunities for local government to maximise taxation, thus leading to an increase in the revenue size of government. A 1% increase in per-capita GDRP leads 2.81% change in the size of government. The positive association between per-capita GDRP and the size of government in this panel regression is very different from the districts estimation. One possible explanation is that it was due to the structural characteristic of provincial taxes. Provincial taxes are counted as significant revenue for provinces compared to district taxes, which have a small portion in districts and cities revenue. In addition, provincial taxes are more elastic to per-capita GDRP than district taxes.

A positive relation between GDRP per capita on public sector size is also found in some studies, for instance, [15] who found that GDRP per capita positively impacts public sector size. Economic growth is significant, although the magnitude is not big, but economic growth is negatively associated with the revenue size of government of provincial government. This does not support theoretical expectation that economic growth has a positive association with the revenue size of government, but it is possibly due to low level of efficiency of provincial economy and also distortion of market and incentives system [38].

As expected, unemployment is significant and negatively related with the revenue size of government. A 1% change in the employment rate causes a 0.01% change in the revenue

size of government. It is quite straightforward: decreasing unemployment rate indicates additional tax contribution to the government and vice versa. The coefficient of population is also positive and significant at the 1% level, implying that causes a 1% change in population is associated with 0.46% change in the revenue size of government. The coefficient of fragmentation is positive and statistically significant, indicating that a larger number of districts and cities within a province increase the revenue size of government in such a province. The coefficient can be perceived as a 1% change in the fragmentation causes 0.21% change in the revenue size of government.

As for Model 2 where the revenue size of government is obtained from the ratio of own-source revenues to GDRP, both revenue decentralisation and expenditure decentralisation are significant at the 1% and 10% levels, respectively. The coefficient of revenue decentralisation is positive: a 1% increase in revenue decentralisation causes a 0.72% change in the revenue size of government. The coefficient of expenditure decentralisation is also positive, where a 1% increase in expenditure decentralisation causes a 0.33% change in revenue size of government. The coefficient of GIMB is positive, but GIMB was not found significantly associated with the revenue size of government. The coefficient of FLYPAPER is positive and significant at the 10% level. Provinces with higher degrees of dependence on transfers from the national level are positively associated with their revenue sizes. A 1% changes in the FLYPAPER causes a 0.07% change in the revenue size of government. Fiscal capacity and non-tax/levy revenue are not significant, but, as expected, both are positively associated with the revenue size of government.

A set of control variables used in Model 1 is also included in Model 2. The interaction term between the revenue size of government and per-capita GDRP was expected to be positive

because, *ceteris paribus*, a larger per-capita GDRP should increase the benefits of fiscal decentralisation. Regression results of Model 2 do not, however, confirm this expectation. The coefficient of GDRP per capita is negative and significant at the 1% level. A 1% change in GDRP per capita causes a 1.03% change in the revenue size of government. The coefficient of population is also negative and significant at the 1% level. The negative association between population and the revenue size of government could be explained as due to tax evasion and also poor tax collection in some provinces.

Density is in some respects favorable to revenue size due to economies of scale enhancing efficiencies in the provision of public goods and services. Economies of scale, particularly in urban areas, could save the government revenue because of decreased spending [5]. The coefficient obtained on density however contradicted to the theoretical expectation. Density is negatively associated with revenue size of government where a 1% change in population is associated, when controlling for area, with a 0.21% change in the revenue size of government, other things remaining constant. In this respect, it can be said the negative coefficient of density to revenue size of government may be due to the revenue efficiency as a result of an inverse relationship between the cost of providing public goods and services and density. The average cost of providing public goods and services is lower in more densely populated areas due to economies-of-scale, but higher in areas with a more dispersed population.

Column 3 reports the results for Model 3 where the dependent variable is the revenue size of government, defined as the ratio of balancing funds of the provincial government to GDRP. The coefficient of revenue decentralisation is positive, as expected, but not significant. The coefficient of expenditure decentralisation remains positive and significant at 1% in Model 3. Such encouraging effects on the revenue size of government of expenditure decentralisation in this estimation shows that a 1% change in expenditure decentralisation causes a 0.98% change in the revenue size of government. This finding provides evidence that provinces having fiscally more decentralised expenditures enjoy revenue expansion.

The flypaper effect, as one of vertical imbalance measures in the model, has a positive and significant coefficient. This could be explained as every addition share of provincial balancing funds will expand the revenue size of government by about 1.01%. This finding confirms that, if a province is relatively dependent on intergovernmental transfers, the province would have a larger size of government.

Fiscal capacity is also significant, but the coefficient is negative. The coefficient of GDRP per capita is negative and statistically significant at the 1% level. In this respect, the result does not provide evidence to the presence of Wagner's Law in the case of Indonesia's provinces. Holding everything else constant, a 1% change in per-capita GDRP is associated with a 0.82% change in government revenue-size. The population coefficient is negative and significant at the 1% level. Holding other things constant, a 1% change in population is associated with a 0.09% change in the revenue size of government. Thus providing support for the view that the size of population can benefit revenue collection — due to amongst other things, efficiencies of economies of scale.

Expenditure decentralisation is not significant and negatively associated with the revenue size of government in Model 4. This finding is contradicted in several other models which reveal a positive association between expenditure decentralization and the size of government. The negative sign of expenditure decentralisation could imply that the degree of expenditure decentralization at provincial level does not have immediate effects on the revenue size of provincial government calculated as other provincial revenues relative to GDRP. Again, this indicates that other provincial revenues are too low to impact on size. In addition, the negative sign of the coefficient of expenditure decentralisation could, firstly, also be associated with the inability of provincial governments to utilise advantages from fiscal competition among those provincial governments as posited in the Leviathan theory on government behavior and, secondly, indicate an absence of taxing power at the provincial level such that the provincial government cannot exert leviathan behavior [32], p. 176). Again, GIMB and Non-tax revenue autonomy have no significant association with the revenue size of government. FLYPAPER has a negative and significant coefficient at the 1% level. Holding everything else constant, a 1% change in flypaper effect causes a 2.41% change in the revenue size of government. Fiscal capacity is positive and significant; hence, the coefficient obtained suggests that a 1% change in fiscal capacity causes a 2.22% in the revenue size of government, assuming other factors to be static.

As found in previous models, the coefficient of per-capita GDRP is significant, but it has a negative sign. This association is contradicted by expectations following from Wagner's Law. However, a possible explanation for the variance could be the decline in per-capita GDRP leading to hard budget constraints which reduce the revenue-size of government cross-provincially. Specifically, the coefficient of GDRP per capita can be interpreted as a 1% change in GDRP per capita causes a 7.75% change in the revenue size of government. The coefficient the size of population is significant at the 1%. Interestingly, population is negatively associated with the revenue size of government. The coefficient of population can be read as: a 1% change in population is associated with a 9.58% in the revenue size of government. As in Model 1, fragmentation is positive and statistically significant, indicating that a larger number of districts and cities within a province increase the revenue size of government of each province. Economic growth, unemployment, dependency ratio and density were not significant in Model 4.

Models 1 through 3 presented the association between fiscal decentralisation, socio-economic variables and the revenue size of government. In Column 4, Table V, the size of government is measured as the ratio of total expenditure to GDRP as dependent variables, i.e. the expenditure size of government. Using such measure, revenue decentralisation is found to be positive, but insignificant. In accordance with the Leviathan Hypothesis, expenditure decentralisation is positive at the 1% providing strong support to theoretical arguments holding that decentralised expenditures at local levels lead to larger government size in localities. The expenditure decentralisation coefficient can be defined as,

ceteris paribus, a 1% change in expenditure decentralisation causes a 0.87% change in the expenditure size of government. It is surprising that all other fiscal decentralisation variables were not significant in this model indicating that the model revenue decentralisation has a better position in explaining the association of fiscal decentralisation and the size of government in cases of provinces in Indonesia.

Socio-economic controls have also contributed effectively to the fit of Model 4. GDRP per capita has a negative association with the expenditure size of government and is statistically significant at the 1% level. All else remaining constant, this coefficient can be interpreted as a 1% change in GDRP per capita is associated with a 0.95% change in the expenditure size of government. This association is inconsistent with Wagner's Law which predicts higher income per capita leads to larger government. The coefficient is interpreted as a 1% change in economic growth is associated with a 0.01% change in the expenditure size of government. It was predicted that the extent of government activities in the economy can enhance economic growth through provision of public goods. In this way, the larger size of the public sector would promote economic growth, indicating a positive association between government expenditure and economic growth.

The possible reason why economic growth has a negative association with the expenditure size of government in this model can be seen from two perspectives: political and economic. First, as a government grows and develops, the resources will be allocated more on the basis of political rather than of mechanism and market-forces. This, consequently, results in the failure of the government expenditure in encouraging economic growth and thus leading it to a negative trend [39], p. 41). Secondly, with diminishing economic growth returns from government expenditure are inefficient; thus, although government continues to expand, expenditures are increasingly funneled into less and less productive activities and this retards economic growth [40], pp. 3-4). The size of the population is statistically significant and negatively associated with the expenditure size of government at the 1% level. The coefficients can be translated as a 1% change in population is associated with a .95% change in the expenditure size of government. Based on this finding, one can claim that population size may create pressures for government expenditure in the provision of public goods and services. This has become one of the main threats for fiscal sustainability in respect with the provision of public services in many countries [41].

V. CONCLUSIONS

Overall, panel regression results provide evidence in support of the association of fiscal decentralisation and the size of government as predicted in the Decentralisation and Leviathan Hypotheses, but the association is not straightforward. The panel regression results show notable differences among the panel models allowing for five main conclusions to be raised from the panel regressions based on the thirty-three Indonesia province data for the period

between 2001 and 2008. First, results obtained from Model 1 indicate the association of fiscal decentralisation with the revenue size of government, defined as the ratio of total revenues to GDRP (GREVTOTAL). In this model, three fiscal decentralisation variables are significant, i.e. expenditure decentralization, vertical imbalances (GIMB) and the flypaper effect. Findings from this model present support for the theoretical arguments based on Wallis decentralisation hypothesis that predicts decentralised expenditures to local government leads to larger sized government at local levels. In addition, relatively low vertical imbalances were also found across provinces, leading to smaller government as indicated by the negative association between the flypaper effect and the revenue size of government; thus, the result supports both Leviathan and Brennan and Buchanan's Collusion hypotheses. More importantly, this finding confirms that under fiscal decentralization arrangement in Indonesia, provincial governments have less fiscal authority compared to district/city governments.

Second, slightly different results on the association of fiscal decentralisation and the revenue size of government are found when the revenue size of government is calculated as the ratio of own-source revenues to GDRP (GREVOWN). In this model, revenue decentralisation, expenditure decentralisation and the flypaper effect are statistically significant. The first two variables present evidence in support of Wallis's Decentralisation Hypothesis that fiscal decentralisation leads to larger government. Results from the latter variable provide empirical support for Brennan and Buchanan's Collusion Hypothesis which predicts that fiscal decentralisation leads to smaller government particularly when vertical imbalances are low.

Third, similar results to Model 1 were obtained in Model 3, where the revenue size of government is calculated as the ratio of balancing funds to GDRP (GREVSHARE). Expenditure decentralisation is associated with a larger size of government, thus confirming the Wallis Decentralisation hypothesis. The flypaper effect leads to larger size of government. The positive association of the flypaper effect and the revenue size of government in this model is not surprising as balancing funds serve as the measures of intergovernmental transfers to provinces; when a province is relatively dependent on intergovernmental transfers the revenue size of government will be large.

Five, testing the association of fiscal decentralisation with the size of government in Model 4, where the size of government is defined as the ratio of total government expenditures to GDRP; it is also found that expenditure decentralisation lead to larger expenditure size of government. Thus, Wallis's decentralisation hypothesis and the Leviathan Hypothesis are strongly supported in this model. Surprisingly, intergovernmental transfers from the national level to provinces are found to be negatively associated with the expenditure size of government indicating that such transfers did not induce excessive spending across provinces.

Six, of seven socio-economic variables included in the panel models six appear to be significant throughout Models 1 to 4. These results reinforce that the inclusion of

socio-economic variables into the panel regression models is essential to explain the association between fiscal decentralisation and the size of government.

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