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The relative efficiency of government revenues: The case of Indonesia

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ABSTRACT

The relationship among government revenue, government spending, and economic growth is a major concern of the economic policy makers and has long been of interest to academics. While voluminous papers devoted to the impact of government spending on economic growth, there is a limited study concerning the government revenue-economic growth nexus. This paper provides empirical evidence on the efficiency of government revenue and its relationship to output in developing country with focus on Indonesia over the period 1998–2013. We use data envelopment analysis to analyze the relative efficiency scores of taxes revenue, non taxes receipt, domestic debt, and foreign debt. The results confirm that the relative efficiency scores of taxes revenue is the lowest and decrease. Interestingly, the relative efficiency scores of foreign debt on the average are higher than those of domestic debt. Furthermore, two-way analysis of variance proves that there is a significant difference among the four types of government revenues. Those findings suggest that political and institutional factors are the main obstacle in the short-run for government to generate taxes and non taxes revenues. In the long-term the prudent fiscal policy management is necessary to avoid possible crowding-out effect induced by expansionary domestic and foreign debts.

Keywords: Deficit, Government Revenues, Efficiency, Economic Growth, DEA

JEL Classification: C14, D24, H50

1. Introduction

The importance of government expenditure has been received much attention by academician and policy makers (see for example: IMF, 2008). The main question is whether government spending (broadly speaking fiscal policy) is really effective to stabilize macroeconomic condition in particular during global financial crisis in the late of 2008. As a result, most country in the world implemented fiscal stimulus packages as counter-cyclical fiscal policy (Christiano, Eichenbaum, and Rebelo, 2011).

Along with world economic recovery and tapering fiscal policy pioneered US recently; the central issue has shifted to the government expenditure productivity. Given the dominant role of the state in the economy, the increase in demand for public and social services, the fiscal costs associated with the resolution of financial crises, and disaster mitigation related spending and revenue constraints have re-enforced the government to run excessive expenditure.

The main debate in the theory and empirics of budget deficits induced by unproductive government spending is whether there is a crowding-out or even crowding-in effects on private expenditure. Accordingly, the budget deficits and unproductive government spending inextricably linked to the issue of how they impacts on economic growth. In fact, there are mixed evidence with respect to the impact of public finance on growth (Aschauer, 1989; Barro, 1990; Easterly and Rebello, 1993; Devarajan *et al*., 1996).

While voluminous papers devoted to the impact of government spending on economic growth, unfortunately, there is a limited study concerning the government revenue-economic growth nexus. According to Blanchard and Perotti (2002), there is a non-mutually exclusive explanation for a successful fiscal stabilization. Expansionary fiscal consolidations are more likely and sustainable if they are relying primarily on spending cuts instead of increasing taxes symmetrically.

Beyond the fiscal consolidation, it is widely accepted that economic growth cannot be separated from government spending and the latter is closely related to government revenue. Basically, the interaction among them depends on (Kuncoro, 2007): (1) how far the government revenues finance the operating and capital expenditures, and (2) how far the government expenditures might generate income that can be re-absorbed in terms of taxes and non taxes revenues. Those eventually determine the pattern of deficit financing in the future.

Indonesia provides a unique opportunity to examine the nature of budget deficits. Given the substantial deficits for a long time relying on the external debt, whether its impacts is a key political and economic issue. It also has been criticized due to excess burden in terms of interest payment (Adiningsih, 2009), persistent inflation (Snyder, 1985), and external imbalance (Adji, 1998). Realizing the adverse impact of the external debt, since 1998/99 Indonesia's government constituted to engage domestic debt and reduce gradually foreign debt along with increase taxes revenue to finance the government expenditures.

Along with the intensive efforts to generate revenues, most government spending by the law is obligatory in nature. For example, the interest rate and amortization payment is about 30 percent of the total outlay. The other important expenditures are subsidies for fertilizer and energy (20 percent) and transfer to the lower-layer governments (26 percent). Those outlays composition above severely limit to the fiscal space (Basri and Rahardja, 2011).

Knowing efficiency of each component of government revenues is important for governments. In its most basic form, the fiscal efficiency corresponds to the change in revenue for a change in output. Basically, if the efficiency is high, the revenue side of fiscal policy has a little effect on the real economy; it means that the design of revenue generating policy will not disturb the economy. Moreover, given the expenditures are pre-determined before the revenues availability, the efficiency of government revenues is a crucial point to maintain the fiscal sustainability.

The aim of this paper is to analyze the efficiency of government financial sources to finance government outlays in order to achieve the fiscal sustainability in the short-term and economic growth in the long-term. The rest of this paper is organized as follows. Section 2 highlights the existing literature as well as previous results. The methodology is described in the next section. This is followed by reporting the main empirical results. Finally, some concluding remarks are drawn.

2. Literature review

The interaction between government revenue and economic growth could be analyzed by three ways. Since the main government revenue is taxes, most analysis in the literature is focused on the taxes. The simplest one is tax ratio that is tax revenue divided by the GDP. It measures how much money generated by tax policy design flows to government from the overall economic activity. Therefore, the higher the tax ratio implies the higher efficiency of the tax collection.

The second one is tax multiplier. It represents how the increase in taxes revenue with respects to the increase in the GDP (Chinn, 2012). According to economic principles, the magnitude of the tax multiplier depends on the size of the marginal propensity to consume, marginal propensity to invest, marginal propensity to import, and the marginal tax rate, etc. Different multipliers result in different realizations of tax collection.

The third measure is tax elasticity. Similar with the tax multiplier, it offers how much the relative increase in tax revenue associated with the percentage increase in GDP as the tax base. One could expect that the efficiency of tax collection will be achieved when the tax elasticity is unity by meant that the increase in tax revenue is proportional with respect to the economic growth.

The simple theoretical models above assume that the main government revenue is only taxes and economic growth is exogenous variable. The model will be complicated when we incorporate other revenues, i.e. non taxes receipt, domestic and foreign debts, or even seigniorage. Also, one can argue that economic growth is not exogenous variable anymore. However, they remain being a useful analytical model as starting point.

In the opposite direction, a key channel through which government revenue could be expected to have an impact on long-term economic activity, for instance, can also be analyzed by several ways. The earliest work on the growth effect of taxes is by Harberger (1964) who observed that the degree of effect of indirect tax on investment is insufficient to stimulate economic growth. In a broader sense, literature of public economics categorizes taxes which have a positive impact on prices classified as non-distortionary taxes and distortionary taxes classified as those which have a negative impact on prices.

The other way of assessing the productivity of government revenue is to determine whether they are growth-enhancing or not. In the growth literature,

neoclassical and endogenous theories employ growth models that discuss over the influence of taxes on economic growth. This has been conducted from a quite different perspective for the two strands of growth theory, with regard to the causes and the time dimension of the relationship between growth and taxes.

In neoclassical growth models, there are exogenous forces, such as technological progress and population dynamics that cause steady state growth. Taxes may exert only a temporary influence on the growth rate of income in the transition to successive equilibrium growth paths. On the contrary, in the endogenous growth models, steady state growth is determined by the agencies of the economy. Therefore, in both theories, there is an implied negative relationship between taxes and growth which has not been conclusively supported from the empirical findings.

Several studies provide mixed evidences of the taxes–growth nexus. Koester and Kormendi (1989), Levine and Renelt (1992), Easterly and Rebelo (1993), Slemrod *et al.* (1995), Mendoza *et al.* (1997), and Kneller *et al.* (1999) conclude that there is either a positive or in most cases an insignificant correlation, between the average level of taxation and output dynamics both in the short and the long run. On the other hand, King and Rebelo (1990), Barro (1991), Plosser (1992), Engen and Skinner (1992), Kormendi and Meguire (1995), Wright (1996), and Leibfritz *et al.* (1997) find a negative correlation.

Regarding the debt financing, Koeda (2006) outlined three channels through which large fiscal deficits and debt could be expected to have an impact on the long-term economic growth. The first channel is based on the aggregate production function connecting GDP to debts, capital accumulation, and human resources. In this view, debt is considered as one of required inputs to produce national output. The impact of debt on economic growth could be inferred from marginal product of debt and substitutability, complementarily, or even independently among inputs.

The second one is based on the indirect impact on interest rates, national savings, and then aggregate demand. In the standard neoclassical model, fiscal deficits (other things given) create an excess supply of government debt, leading to higher real interest rates (Bernheim 1989). The yield curve is also expected to become positively sloped in anticipation of continuing large fiscal deficits. In the Keynesian view, however, this will increase the quality of private investment so that the interest rates should not lead to be higher and then economic growth remains increasing (Wray 1989). Ricardian paradigm, on the other hand, proposed that the public debt is considered as deferred-tax. In the long-term, the impact of deficit on interest rates, national savings, and then aggregate demand will be unchanged (Barro, 1989).

The third channel is based on the consequence of debt. It works through a liquidity constraint where debt service obligations reduce export earnings available for expenditures and so impacts negatively on growth. One of the theories connecting external debt and economic development is the debt overhang theory. Krugman (1989) sees debt overhang as a situation in which the expected repayment on foreign debt falls short of the contractual value of the debt and showed that there is a limit at which accumulated debt stimulates investment and growth. In the same way, Borenszten (1990) argued that the debt overhang crisis is a situation in which the debtor country benefits very little from the returns on any additional investment because of the debt service obligation.

These three channels produce a debt-Laffer curve, which shows that there is a limit at which debt accumulation stimulates growth. When this limit is reached, further

debt accumulation impacts negatively on growth. For internal debt, Lerner's model postulates that internal debt creates no burden for the future generation members as the future generation simply owes it to each other. When the debt is paid off, there is a transfer of income from one group of citizens to another. However, the future generation as a whole is not worse off in the sense that its consumption level is the same as it would have been. Reinhart and Rogoff (2010) noted that the relationship between government debt and real GDP growth is weak for debt/GDP ratios below a threshold of 90 percent of GDP.

While those studies above analyze the growth impact of taxes and debt partially, Miller and Russek (1997) provide a detailed discussion over the relative importance of tax financed and debt financed increases in government expenditure in terms of economic growth. Overall, they report that in developing countries tax financed increases in public expenditure lead to higher growth while debt financed increases retard economic growth. For developed countries, debt financed increases in public expenditure does not affect growth while tax financed increases lead to lower growth.

Similarly, Bose, Holman, and Neanidis (2007) focus on tax and seigniorage. They suggest that in high income countries tax financed government expenditure retard economic growth than if it were financed through seigniorage while for low income countries increases in government expenditure financed with seigniorage retard growth more as compared to if it were financed through taxes.

In the case of Indonesia, the related studies concerning the government revenue-growth nexus are relatively limited. Basri and Rahardja (2011) that tax cut also remains being effective to stimulate short-term economic growth particularly in the recession periods. In contrast, Surjaningsih, *et al.* (2012) concluded that government spending is more effective to stimulate economic growth especially in times of recession, compared to taxation policies.

With regard to the debt financing, Kuncoro (2011a) concluded that efficiency of domestic debt is higher than foreign debt. Constructing a regression model connecting domestic debt and foreign debt to economic growth, he found that the coefficient of regression of domestic debt is higher than that of foreign debt.

Kuncoro (2011b) analyze the cost of public debt services. He concludes that the cost of domestic debt services is more expensive than that of foreign debt. However, the usage efficiency of domestic debt is higher than the latter. In order to maintain fiscal sustainability, it is therefore recommended that the country should rely on internal loans and borrow externally, when necessary only for real productive projects.

3. Methodology

The brief empirical studies above emphasize the importance of government revenue vis-à-vis to support the economic growth. In fact, however, there are no pure efficiency-based studies in Indonesia. Our approach is in the same spirit, although it has a significant difference. We employ non parametric-data envelopment analysis (DEA) to access the relative efficiency of government revenues in the case of Indonesia. More specifically, we test whether there is a possibility of budget sustainability and crowding out effect holds for that country.

The principles of DEA date back to Farrel's (1957) definitions of technological efficiency and economic efficiency. The recent series of discussions on this topic started with the article by Charnes *et al.* (1978) and was extended to the variable-returns-to-scale version by Banker *et al*. (1984). DEA is a methodology based upon an interesting

application of linear programming (see for example: Amiri and Afridi, 2013). It was originally developed for performance measurement of organizational units which are termed Decision-Making Units (DMUs). The ultimate goal is to assess the relative performance of a set of DMUs that use a variety of identical inputs to produce a variety of identical outputs.

The performance of DMUs is assessed in DEA using the concept of efficiency or productivity, which is the ratio of total outputs to total inputs. Efficiencies estimated using DEA are *relative*, that is, relative to the best performing DMU (or DMUs if there is more than one best-performing DMU). The best-performing DMU is assigned an efficiency score of unity or 100 percent, and the performance of other DMUs vary, between 0 and 100 percent relative to this best performance.

To explain further the DEA method, we follow Ramanathan (2003). Let us use x and y to represent inputs and outputs, respectively. Let the subscripts i and j to represent particular inputs and outputs respectively. Thus x_i represents the ith input, and y_j represent the jth output of a decision-making unit. Let the total number of inputs and outputs be represented by I and J respectively, where $I, J > 0$.

The multiple inputs and outputs are linearly aggregated using weights. Thus, the *virtual input* of a DMU is obtained as the linear weighted sum of all its inputs. Similarly, the *virtual output* of a DMU is obtained as the linear weighted sum of all its outputs.

$$\text{Virtual Input:} \quad \Sigma\, u_i\, x_i \tag{1}$$

$$\text{Virtual Output:} \quad \Sigma\, v_j\, y_j \tag{2}$$

where u_i and v_j are the weight assigned to input x_i and output y_j respectively during the aggregation, u_i and $v_j \geq 0$.

Given these virtual inputs and outputs, the *efficiency* of the DMU in converting the inputs to outputs can be defined as the ratio of outputs to inputs.

$$\text{Efficiency} = \frac{\text{Virtual Output: } \Sigma\, v_j\, y_j}{\text{Virtual Input: } \Sigma\, u_i\, x_i} \tag{3}$$

The most crucial issue in the application of DEA is the choice of inputs and output used. A common practice with DEA is to derive efficiency scores using only the direct inputs, which are under the control of the DMUs, and then to use information on the non-included inputs to assess their impacts. Of the two major types of DEA models are input-oriented DEA (reducing inputs proportionately without changing output) and output-oriented DEA (expanding output quantities without altering inputs).

The other important issue at this stage is the assessment of weights. The weights assigned should be flexible and reflect the requirement (performance) of the individual DMUs. This issue of assigning weights is tackled in DEA by assigning a unique set of weights for each DMU. The weights for a DMU are determined using mathematical programming as those weights which will maximize its efficiency subject to the condition that the efficiencies of other DMUs (calculated using the same set of weights) are restricted to values between 0 and 1. The DMU for which the efficiency is maximized is normally termed as the *reference* or *base* DMU or the DMU under the assessment.

The mathematical program now is:

$$\text{Max: } E_m = \frac{\Sigma\, v_{jm}\, y_{jm}}{\Sigma\, u_{im}\, x_{im}} \tag{4}$$

Subject to:

$$0 \leq \frac{\Sigma\, v_{jm}\, y_{jm}}{\Sigma\, u_{im}\, x_{im}} \leq 1 \qquad (5a)$$

$$u_{im} \text{ and } v_{jm} \geq 0 \qquad (5b)$$

where
E_m is the efficiency of the mth DMU,
y_{jm} is jth output of the mth DMU,
v_{jm} is the weight of that output,
x_{im} is ith input of the mth DMU,
u_{im} is the weight of that input, and
y_{jn} and x_{in} are jth output and ith input, respectively, of the nth DMU, $n = 1, 2, \ldots, N$.
Note that here n includes m.

The above mathematical program, when solved, will give the values of weights u and v that will maximize the efficiency of a particular DMU. If the efficiency is unity, then the firm is said to be efficient, and will lie on the frontier. Otherwise, the firm is said to be *relatively* inefficient. Note that the above mathematical program gives the efficiency of only one DMU (the reference DMU). To get the efficiency scores of the other DMUs, more such mathematical programs have to be solved, considering each of them as the reference DMU.

As the objective function is the weighted sum of outputs that has to be maximized, this formulation is referred to as the *output maximization* DEA program. An analogous linear programming formulation is possible by minimizing the weighted sum of inputs, setting the weighted sum of outputs equal to unity. That is the *input minimization* DEA program. To do those, we impose variable return to scales.

Beyond the most commonly used in analyzing the efficiency, however, there are some caveats associated with the DEA method. The first problem with DEA is its heavy reliance on the accuracy of the data; there is no allowance for measurement errors. Second, DEA assumes that at least one DMU is technically efficient so that the efficiency frontier can be defined. That is, at least (some observations of) some DMUs will be given a score of one, while in reality even the best-performing DMUs may not be operating perfectly efficiently. Obviously this does not rule out the feasibility of achieving greater efficiency than that found on the estimated boundary. Third, it is difficult to include the exogenous variables that could affect the efficiency scores in the DEA model.

This paper draws an analogy between the government's macro management and the concept of production. We employ GDP, taxes, non taxes revenue, domestic debt, and foreign debt. The earlier is used as input and others are the output. The GDP data are available in quarter basis. Unfortunately, the quarterly data of taxes and non taxes revenue are publicly unavailable. Data on monthly or quarterly taxes receipt has never been released by Ministry of Finance to the public. In addition, the quality of interpolated annual data into quarterly data that was used by some researchers is quite questionable. With regard to the limitation, we analyze the annual data on each component of government receipts and then confronted to quarterly GDP for each year. Accordingly, given the disaggregated GDP the objective function is to obtain maximum each component of the annual government revenues. Similarly, given the government revenues, we formulate the maximum GDP can be achieved.

The sample periods chosen for this study extend from 1998 to 2013. The total observation is 16 sample points and 64 for quarterly GDP. All of the variables of interest are presented in 2000 constant price using implicit GDP deflator, the GDP in the current price divided by GDP in the constant price. All of the data are taken from the central bank of Indonesia (www.bi.go.id), Debt Management Office Ministry of Finance (www.djpu.kemenkeu.go.id), and Central Board of Statistics (www.bps.go.id). Most of the results are calculated in computer program DEA for Windows.

4. Results and discussion

Table 1 presents the elementary statistics of all variables of interest covering mean, median, and extreme (maximum and minimum) values. We can see that each the median value is not too far from the respective mean. The closeness of median to the mean value preliminary indicates that all of the variables of interest are normally distributed.

The symmetric distribution of almost variables is confirmed by the moderate value of skewness. Skewness measures the symmetric or normal distribution which the value is expected to be zero. Except the tax revenue relative efficiency scores, all the skewness values are positive. The lower tail of the distribution is thicker than the lower tail. However, the Jarque-Bera test ensures that the distribution of non tax, domestic debt, and foreign debt is symmetric.

TABLE 1. Descriptive statistics of relative efficiency of government revenues

	TAX	NTAX	DD	FD
Mean	0.4103	0.5944	0.4683	0.4796
Median	0.3547	0.5834	0.4842	0.3915
Maximum	1.0000	1.0000	1.0000	1.0000
Minimum	0.3166	0.4057	0.2126	0.1812
Std. Dev.	0.1664	0.1513	0.2027	0.2933
CV	0.4056	0.2546	0.4329	0.6116
Skewness	3.0344	1.0227	0.8860	0.6277
Kurtosis	11.2481	4.2418	3.9319	1.9000
Jarque-Bera	69.9080	3.8173	2.6722	1.8574
Probability	0.0000	0.1483	0.2629	0.3951

Furthermore, the range (distance from minimum to maximum) values considerably vary. The range value of foreign debt relative efficiency scores is the highest implying the high variability of the data set. They are consistent with the configuration of standard deviation and consequently those of CV (coefficient of variance, standard deviation to its mean ratio). It seems that foreign debt should be paid much attention as one of the main government financial sources.

Tax revenue relative efficiency scores have the largest value of kurtosis followed by non tax revenue. The kurtosis measures the peakedness or flatness of the distribution with an expected value of 3.0. The result shows that none of the four government financial sources efficiency scores satisfies the expected condition. It implies that the tails of the distribution of three earlier series are thicker than the normal (indicated by the kurtosis coefficient much greater than 3, i.e. leptokurtic). In contrast, the relative efficiency scores of foreign debt distribution are quite flat.

It is important to note that the average scores of relative efficiency of taxes revenue is the lowest (0.41) during the period 1998-2013. Taxes revenue consists of two

main sources; income tax and value added tax. The earlier is direct tax and its magnitude is always larger than the value added tax especially since income tax cut implemented in 2008. Hence, the value added tax -- that is indirect tax -- seems to be the source of the lowest relative inefficiency scores.

In contrast with taxes revenue, the average scores of relative efficiency of non taxes revenue is the highest (0.59). The result is reasonable since non taxes government revenue mainly is contributed by oil, gas, and other natural resource products. Therefore, the collected non taxes revenue is not far from the expected one.

Meanwhile, the average of relative efficiency scores of foreign debt (0.48) is slightly higher than that of domestic debt (0.47). This statistical finding is contradictive to the study of Kuncoro (2011a and 2011b). While Kuncoro (2011a) focused on the technical efficiency and Kuncoro (2011b) emphasized on the economic efficiency, the current study presents both efficiencies. We will check it again later using inferential statistics whether the difference is substantially significant.

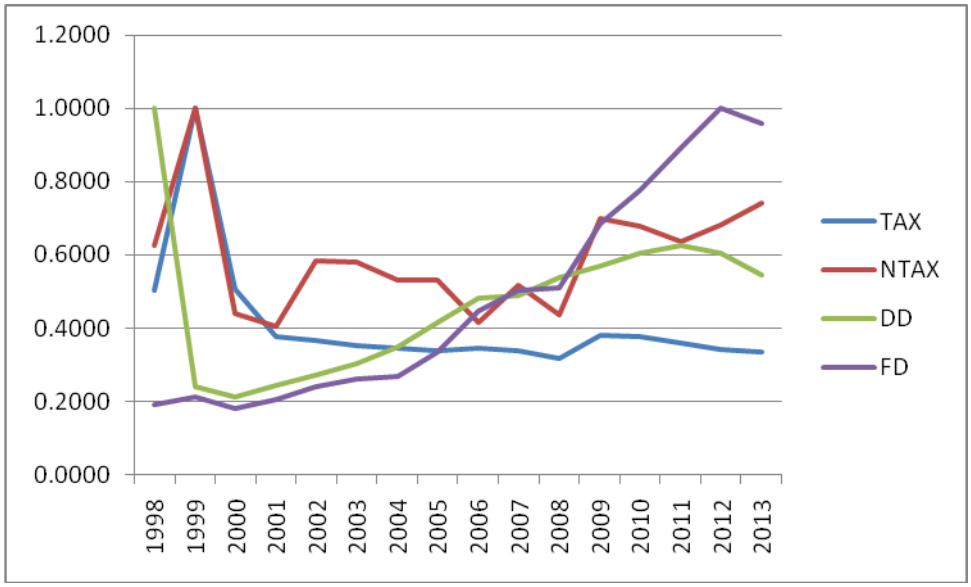

FIGURE 1. DEA efficiency score of government revenue sources

Figure 1 visualizes the dynamics of the four types of government financial sources revenues. As required by DEA, there is at least one relative efficient score for each component of government revenue. Taxes and non taxes revenues reached the relative efficiency score in 1999. The domestic debt, in one hand, has the most relative efficient in the starting year (1998), on the other hand, the foreign debt has the highest efficiency score in the end period particularly in 2012.

Therefore, it is noticeable that there is a clear synchronized pattern between the relative efficiency scores of domestic debt and those of foreign debt. In contrast, it seems that the relative efficiency scores of taxes revenue tend to decrease consistently over the observation period. The non taxes revenue tends to be remarkably fluctuated.

In order to quantify the relation pattern among the four variables, Table 2 provides the pair-wise correlation among the variables of interest. The coefficient of correlation of the relative efficiency scores of taxes revenue and non taxes receipt is highly positive and statistically significant. The similar result is obtained when we relate

the relative efficiency scores of domestic debt and those of foreign debt. The coefficient of correlation is moderately positive and statistically significant.

TABLE 2. Correlation of relative efficiency scores of government revenues

	TAX	NTAX	DD	FD
TAX	1.0000	0.6642	-0.2219	-0.3638
NTAX	0.6642	1.0000	0.1237	0.2775
DD	-0.2219	0.1237	1.0000	0.4456
FD	-0.3638	0.2775	0.4456	1.0000

The negative correlation is found in the case of taxes revenue associated with both the relative efficiency scores of domestic and foreign debts. But, as we know, correlation does not imply causality. Therefore, we cannot say that the high efficiency scores of domestic and foreign debts causes the decrease in taxes revenue relative efficiency scores. So far, we can only say that the increase in domestic and foreign debts efficiency is associated with the decrease in the efficiency of taxes revenue consistent with the past experience in 1980s as outlined in the previous section.

Table 3 breaks down the comparison of the relative efficiency scores across the four government revenue sources for each year. Employing two-way analysis of variance, the test proves that there is no significant difference of relative efficiency scores across year consistent with visual inspection onto Figure 1.

In contrast, there is evidence that the difference of relative efficiency scores across tax-non tax revenue, domestic debt, and foreign debt exists at 90 percent confidence level. To accept the null hypothesis that there is no difference of the three sources of government revenue, we need at least 7.6 percent type error II. This suggests that the mean values of each variable presented in Table 1 are different from each others. Therefore, we now convincingly conclude that the relative efficiency scores of foreign debt are marginally higher than those of domestic debt in terms of technical and economic efficiencies.

TABLE 3. Two-way anova test of relative efficiency scores of government revenues

Dependent variable: DEA scores		Sum of squares	df	Mean square	F	Sig.
Financial Sources	Hypothesis	0.285	3	0.095	2.452	0.076
	Error	1.744	45	0.039		
Year	Hypothesis	0.922	15	0.061	1.586	0.116
	Error	1.744	45	0.039		

Based on Table 3, we argue that since taxes revenue has the lowest efficiency score, the government might increases it without any change in input. In other words, given the GDP remains unchanged, the taxes revenue can be increased substantially to reduce deficit since it will not hurt the economic activity. In principle, this is in line with Blanchard and Perroti (2002) and Basri and Rahardja (2011) findings.

In contrast, since the relative efficiency scores of non-taxes revenue on the average is the highest; the government might induce the economic growth holding the non-taxes revenue remains constant. Meanwhile, in the case of the domestic debt and foreign debt, the government could either keep the two debts being equal to increase economic growth or decrease the debts (consequently decrease government spending)

without disturbing the economic growth. This analysis is consistent with Surjaningsih *et al*. (2012).

It is notable also that the moderate relative efficiency scores of domestic debt and foreign debt may induce the usage the extensively to finance government spending in order to promote economic growth. In such a case, the possibility of crowding out effect will exist in the long-run. Therefore, holding the domestic debt and foreign debt remain constant is the reasonable way to maintain fiscal sustainability in the short-run and stable economic growth in the long-run.

So far, we have discussed the relative efficiency of the four government financial sources individually. Next, we apply the DEA method to identify the relative efficiency of the four government financial sources simultaneously. We specify GDP as input and government revenues as output to be maximized (output-oriented DEA). As comparison, we also estimate the relative efficiency to maximize GDP subject to the given government revenues (input-oriented DEA).

Figure 2 offers the profile of relative efficiency score of the four government revenues simultaneously calculated for each year. Overall, the relative efficiency scores based on the output approach tends to increase since 2000 and consistently achieves the efficient levels particularly after 2008. It seems that the decrease in total relative efficiency scores in the beginning periods is probably associated with the decrease in tax and non tax revenue efficiency scores as presented in Figure 1.

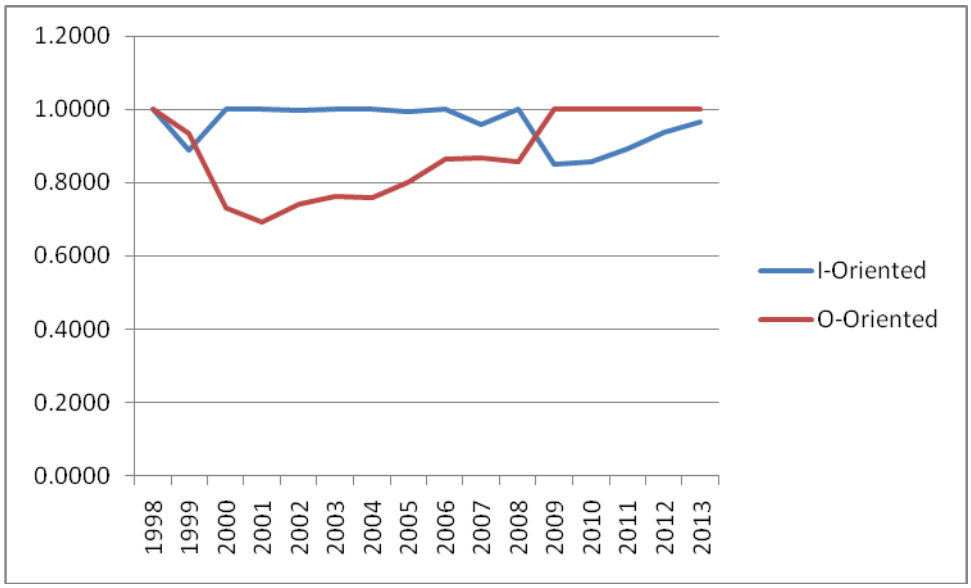

FIGURE 2. Relative efficiency of government revenues

When we use the input-oriented DEA method, the results are quite different. Even, there was a tendency that the total government revenues relative efficiency scores are relatively stable over time. The two-sample independent mean test confirms that the relative efficiency scores based on input-oriented indeed are significantly different from those based on output-oriented (see Table 4). Given those, we can say that the government revenue-economic growth nexus exists in the case of Indonesia.

Since the input-oriented DEA scores on the average higher than the output-oriented, we can infer that government revenues can be boosted. On the contrary, the economic growth could be accelerated without depending heavily on the government

revenues. We also can declare that there is a unidirectional relationship running from economic growth to government revenues. As commonly accepted, Granger (1969) method is widely used to identify the direction of causality (see for example: Kuncoro, 2007). It seems that Granger causality procedure is complement to the output- and input-oriented DEA methods.

TABLE 4. Mean equality test of input- and output-oriented dea efficiency scores

Levene's test for equality of variances			t-test for equality of means		
	F	Sig.	t	df	Sig.
Equal variances assumed	13.697	0.001	2.581	30	0.015
Equal variances not assumed			2.581	21.610	0.017

5. Conclusions

We present empirical analysis of relative efficiency of four types of government revenue sources, i.e. taxes, non taxes, domestic debt, and external debt. Employing 16 fiscal years of government receipt combined by quarterly GDP as input variable, we found that the relative efficiency scores of taxes revenue is the lowest and tends to decrease overtime.

Interestingly, the relative efficiency scores of foreign debt on the average are higher than those of domestic debt. This does not support to the previous empirical studies. The more expensive of domestic debt should cause the use of the corresponding fund is more efficient. In contrast, in the case of foreign debts, the use of them is more efficient in relation to the cheaper interest rate. In such a case, the technological and economic efficiencies implied by DEA provide a clearance to the controversy.

Furthermore, two-way analysis of variance proves that there is a significant difference of the four types of government revenues. Those findings suggest that political and institutional factors are the main obstacle in the short-run for government to generate taxes and non taxes revenues. In the long-term the prudent fiscal policy management is necessary to avoid possible crowding out effect induced by excessive domestic and foreign debts.

Several policy implications emerge from the analysis. First, reduction in deficit is positively associated with economic growth as public expenditure financed through any source retard growth in the sample. Decrease in expenditure holding the revenue constant may be effective to enhance growth. Second, the role of governments in these countries has not been efficient and needs to be redefined. Third, tax finance is the relatively less costly option to finance public expenditure in low income countries as it hurts growth least as compare to its counter parts debt. However, in general fiscal discipline and re-organization of scarce resources can boost economic growth in this country.

The paper is merely based on the comparative static analysis. It means that the conclusion above might change when the sample and/or government revenue items are added in the model. Consequently, the relative efficiency scores of particular government revenue in one period would not efficient anymore as the increase of sample unit to be analyzed. In short, DEA method is sample-sensitive. Therefore, the forthcoming study is advisable to incorporate more detailed government revenues components and compared with other parametric tools.

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