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Fiscal Efficiency of Malaysian State Governments: Effects of Inter-governmental Grants

Ahmad Zafurullah Abdul Jalil*
Universiti Utara Malaysia

Abstract: The main objective of this paper is to examine the relationship between the fiscal performance of the state governments in Malaysia with the political and institutional environment within which they evolve. The focus of our analysis is the inter-governmental transfer system which constitutes an essential part of any inter-governmental and decentralised system. More particularly, we analysed the impact of federal grants on state governments' fiscal efficiency. Indeed, the general observation of a continuous deterioration in the financial situation in Malaysia bring us to question if the state governments are making sufficient efforts to exploit all the revenue sources that are in their hands. And one may wonder if the inter-governmental grants system is one of the causes of state governments slackening in their tax efforts. Fiscal effort is measured by the amount of taxes collected by the state government and the impact of federal grants on fiscal efforts is assessed by using the stochastic frontier analysis methodology. The advantage of using this method is that it allows us to obtain estimates of both efficiency level as well as the determinants of the efficiency level.

Keywords: Fiscal behaviour, inter-governmental relations, state governments
JEL classification: H11, H72, H77

1. Introduction

Lately, some of the state governments in Malaysia have been identified as having serious difficulties in meeting their financial needs to the extent of qualifying for being on the verge of bankruptcy. In this paper, we will try to relate the financial difficulties faced by the state governments to the institutional and political environment currently in place in the country. Our main assumption is that the dire financial situation of some state governments in Malaysia is the direct result of the way the inter-governmental system is organised within this country. More precisely, there are two hypotheses that we attempt to test here. First, federal transfers may stimulate more spending by state governments leading them to increase their spending beyond their means. Second, the financial problem may be the consequence of the state governments' capability in using their tax capacity to the fullest which in turn, may be explained by the disincentive effects that are embedded – whether intended or not – within the transfer system. Though the level of dependency of the state governments in Malaysia on federal transfers can be considered relatively low as it stood at less than 30 per cent of their total revenue, this cannot be interpreted as a sign that the country is free from problems usually associated with countries which are highly dependant on federal transfers.

* Economics Building, College of Arts and Sciences, Universiti Utara Malaysia, 06010 Sintok, Kedah Darul Aman, Malaysia
Email: *zafar@uum.edu.my*

According to Bird (1994), it does not matter whether the transfer constitutes 90 or 10 per cent of the sub-national governments' revenue but what is important is whether the transfer system is properly designed in the sense that it makes the sub-national governments accountable for their actions both to the citizens and to the federal governments. In our case, we are concerned with the issue of whether the transfer system in Malaysia is designed in such a way that it renders the state governments to be less efficient in their fiscal behaviour.

The paper is organised as follows. In the next section, we will briefly review the studies on the impact of intergovernmental relations on sub-national governments. Our empirical methodology will be presented in Section 3 and the results will be analysed in Section 4. Section 5 concludes.

2. Literature Review

Though it is common place in fiscal decentralisation literature to consider the existence of a relationship between transfers and fiscal effort, there is still no consensus regarding its direction or magnitude. The available empirical evidence is not conclusive and in some cases, it is contradictory (Litvack *et al*. 1998). Most of the analyses on the effect of transfers on fiscal efforts are based on descriptive statistics such as comparing evolution of tax collection and inter-governmental transfers (Cabrero and Orihuela 2000). On the other hand, the use of econometric models has been limited by data availability and has been concentrated in developed countries such as United States, Canada and Germany (Gramlich 1987; Bird 1994).

In the case of Latin American countries, Bird (1994) finds evidence of a strong correlation between transfers and local expenditure reduction in Colombian transfer programmes. He concludes that receptor communities reduced their fiscal effort due to transfers. This result is consistent with Correa and Steiner (1999) who find evidence of 'fiscal apathy' at sub-national level in Colombia. Their estimates suggest that 96 per cent of transfers are used to reduce local taxes and only 4 per cent is allocated to increase local expenditure. Nevertheless, these results are not robust to changes of the time span of analysis. For instance, Garzón (1997) examined the period before and after the increase of transfers (1986 and 1996). He does not find evidence of a reduction in general tax collection among Colombian municipalities. Chaparro *et al.* (2004) examined fiscal data for a large number of Colombian municipalities for the 1985-99 period with the objective of describing the effects of the transfer system on horizontal balance among municipalities. According to the authors, the correlation between aggregate taxes and transfers cannot be construed as evidence of a causal relationship between the two, nor can it indicate how local revenues would respond if transfers were reduced in the future. This is due to the fact that local revenues may have increased because of other decentralisation reforms that were contemporaneous with, but otherwise unrelated to, the increase in transfers. Consequently, they used an approach that allows for the possibility that per capita tax revenues vary from year to year in all municipalities, and consistently differ among municipalities, in ways that are unrelated to the effects of the transfers. In effect, their estimate of β, the effect of transfers on revenues, measures the impact of changes in the transfers received by one municipality, relative to the others at a point in time, on the municipality's relative tax revenues. The authors concluded that there is some evidence that transfer growth has discouraged tax effort by the municipalities, even in the case of formula-driven *Participaciones Municipales* (PM) which should not in itself create a soft budget constraint problem. The current system of decentralisation in Colombia, according to the authors, may be acting as an impediment to the mobilisation of local fiscal resources. More recently, Aragon and Gayoso (2005) examined the relationship between inter-governmental transfers and local fiscal effort using an empirical model with data from Peruvian local governments. The paper exploits a quasi-experiment and panel data to address the identification problems due to non random transfer allocation and the presence of omitted variables. Indeed in 2001, an additional transfer ('*asignación adicional*') was conferred on Peruvian local governments receiving a minimum level of Foncomun ('*Fondo de Compensación Municipal*' or Municipal Compensation Fund) regardless of local tax collection or total expenditure. Participation in this programme can be used as an instrumental variable since it explains increases on transfers but is not correlated to local tax collection. Their results confirm the existence of a negative relationship between transfers and local fiscal effort in Peru. They also found that the effect of transfers on local effort decreases with the level of per capita expenditure of the local government. The reduction in fiscal effort is higher among local governments with lower levels of expenditure. As long as expenditure level increases, the effect tends to disappear.

Jha *et al.* (2000) in their studies on the tax efficiency of 15 major states in India argued that in the country, historically tax efficiency has played a relatively minor role in resource transfers from the central to state governments and much of this transfer is made on the basis of need and backwardness characteristics of the recipient states. However, their empirical results show inter-governmental grants to be negatively correlated with tax efficiency. The higher the central grants as a proportion of total state expenditure, the lower the tax efficiency. They also found that this effect works both directly through the variable 'central grants as a proportion of total state expenditure' and indirectly through the interaction of this variable with other variables (namely the state domestic product and the proportion of agricultural income to state domestic product). Rajamaran and Vashista (2000) examined the impact of state-local grants on tax effort of rural local governments (*panchayats*) for Kerala state using data for 1993-94. Their results show a greater and more uniform negative impact on tax effort of lump sum 'untied' grants (which was a lump sum amount of around Rs 2 lakh annually, designed to add to panchayat resources for any purpose of their choosing) that are predictable and unvarying than for a more widely defined grant total that includes components with year-to-year variability. The results show that an increase in the untied grant to *panchayats* by one rupee reduces their own tax revenues in 12 out of 14 districts by more than one rupee, and in eight of these by more than two rupees. Reverse causality is ruled out with the single exception of Malapuram district. The authors conclude that the reduction in own tax revenue observed in the Kerala *panchayat* is mainly the result of selective slackening of tax effort.

It is noteworthy that there is strong interest on this issue in the Latin American world which consequently has led to the publication of a number of studies in the Spanish language. A summary of these studies can be found in Aragon and Gayoso (2005).

3. Econometric Estimations

3.1 Choice of Methodology

The correlation between tax collection (a proxy for fiscal effort) and transfers cannot be construed as evidence of a causal relationship between the two, nor can it indicate how subnational governments would respond in terms of fiscal effort exerted if transfers were reduced in the future. This is because, first, transfer allocations are not a random process and second, local tax collection may have increased because of other relevant but non observable variables that were contemporaneous with, but otherwise unrelated to, the increase in transfers. In any case, simply regressing local tax collection and transfers will produce inconsistent estimates. In order to avoid this problem, some authors have resorted to the use of specific events as instruments for federal transfers. For example, in their study of the effects of federal transfers on fiscal effort in Peru, Aragon and Garyoso (2005) exploited the introduction of a special transfers in 2001.Similarly, Chapparo *et al.* (2004) utilised the 1993 reforms of the Colombian transfer system to examine the causal relationship between transfers and fiscal efforts.

For want of such an event in Malaysia, we propose the use of a completely different method namely the stochastic frontier analysis. More specifically, we will use the Battese and Coelli (1995) model. It should be noted however that, by choosing this method, we will provide evidence as to the impact of inter-governmental grants on tax efficiency instead of on fiscal effort. Still, the two notions are very closely related to each other and to a certain extent, can be used interchangeably. Indeed, a stylised interpretation of inefficiency is that it captures the 'inability' or the 'laziness' of managers (Syrjänen *et al.* 2006). In our case, inefficiency will thus be interpreted as the lack of effort of the state governments in collecting their taxes.

The stochastic frontier production function was independently proposed by Aigner *et al.* (1977) and Meeusen and van de Broeck (1977). The original specification involved a production function specified for cross-sectional data which had an error term with two components, one to account for random effects and another to account for technical inefficiency. This model can expressed in the following form:

$$Y_i = X_i \beta + (v_i - u_i), \qquad i = 1,.....,N \tag{1}$$

where Y_i is the production (or the logarithm of the production) of the i-th firm, X_i is a k x 1 vector of (transformation of the) input quantities of the i-th firm, β is a vector of unknown parameters, v_i random variables which are assumed to be iid N(O,dv^2) and independent of the u_i which are non negative random variables which are assumed to account for technical inefficiency in production and are often assumed to be iid N(m_{it}, σ_υ^2)

This original specification has been used in a vast number of empirical applications over the past two decades. The specification has also been altered and extended in a number of ways.

Battese and Coelli (1992) proposed a stochastic frontier production function for panel data which has firm effects that are assumed to be distributed as truncated normal random variables, which are also permitted to vary systematically with time. The model may be expressed as

$$Y_{it} = X_{it} \beta + (v_{it} - u_{it}), \qquad i = 1,....., N, t = 1,......,T. \tag{2}$$

where Y_{it} is the logarithm of the production of the i-th firm in the t-th period, X_{it} a k x 1 vector of (transformation of the) input quantities of the i-th firm in the t-th time period, β as defined earlier, v_{it} random variables which are assumed to be iid and independent of

$$u_{it} = u_i e^{-n(t-T)} \tag{3}$$

where u_i are non-negative random variables that are assumed to account for technical efficiency in production and are assumed to be iid as truncation at zero of the $N(\mu,\sigma_{\upsilon}^2)$ distribution; n is a parameter to be estimated.

A number of empirical studies have estimated stochastic frontiers and predicted firm-level efficiencies using the estimated functions and then regressed the predicted efficiencies upon firm-specific variables (such as managerial experience, ownership characteristics, etc) in an attempt to identify some of the reasons for differences in predicted efficiencies between firms in an industry. This has long been recognised as a useful exercise, but the two-stage estimation procedure has also been recognised as one which is inconsistent in its assumptions regarding the independence of the inefficiency effects in the two estimation stages. The two-stage estimation procedure is unlikely to provide estimates as efficient as those that could be obtained using a single-state estimation procedure.

The issue was addressed by Kumbhakar *et al*. (1991) and Reifschneider and Stevenson (1991) who proposed stochastic frontier models in which the inefficiency effects (U_i) are expressed as an explicit function of a vector of firm-specific variables and a random error. Battese and Coelli (995) proposed a model which is equivalent to the Kumbhakar *et al*. (1991) specification, with the exceptions that allocative efficiency is imposed, the first-order profit maximising conditions removed, and panel data is permitted. The Battese and Coelli (1995) model specification may be expressed as

$$Y_{it} = X_{it}\,\beta + (v_{it} - u_{it}), \qquad i = 1,....., N, t = 1,......,T \tag{4}$$

where, Y_{it} , X_{it} and β are as defined earlier, v_{it} random variables which are assumed to be iid and independent of the u_{it} which are non negative random variables which are assumed to account for technical inefficiency in production and are assumed to be independently distributed as truncations at zero of the N (m_{it}, σ_{υ}^2) distribution where

$$M_{it} = Z_{it}\,\alpha \tag{5}$$

where Z_{it} is a p x 1 vector of variables which may influence the efficiency of a firm and α is an 1 x p vector of parameters to be estimated.

3.2 Data Specification

The data used in this chapter are mainly sourced from the state governments' financial statement which is published and made public by the state government on a yearly basis. Our data covers the period of 1980 to 2003 which means that we have a total of 312 observations. Our measure of tax efforts will be proxied by the amount of tax actually collected by the state governments. According to Sanguinetti and Besfamille (2004), although tax revenue is an accurate and observable variable, still one can hardly say that it is a good estimate of tax effort. The reason is for a given region in a given time period, tax revenue is affected by a myriad of potential variables outside the control of local governments (like idiosyncratic shocks to some specific tax bases) which are seldom well controlled for estimates of tax capacity.

Our choice is made mainly based on data availability. Although it is highly desirable to have a measure of tax rate included in our estimation of tax efficiency, we could not do so, due in particular to technical and data constraints. The two main fiscal resources of the state governments are from land as well as forestry resources. In case of the taxes on land, the rates not only varied across states they also varied across type of land, the use of lands and the location of lands. As for the forest-based taxes, the rates varied according to the type of tree, the circumference of the tree and the age of tree. It will thus be very difficult to come up with a single rate that can summarise all the rates that are being used. As such we decided not to include tax rate in our estimation and replaced it with the following three variables: the proportion of forest area in order to represent the revenues derived from the forestry resources, the rate of urbanisation and the rate of agricultural activities in order to represent the land-based revenue. We also included the state gross domestic product to represent the level of economic activity in each state. Total population is also included as populous states may have an upper hand in terms of the amount of taxes collected. Finally, the time trends are introduced using the variables time and time square.

The inefficiencies are modeled as functions of other exogenous variables. These variables are observed factors that may explain differences in technical efficiency across state governments in Malaysia.

The efficiency level of state governments in their tax collection will in part be determined by the quality of the state apparel. State governments that are equipped with state-of-the-art machinery and qualified personnel are more likely to be able to monitor their tax collection more efficiently and make due diligence in case of fraud. However, we do not have any data that reflect the quality of state apparel. Nevertheless, we believe that the latter is in part determined by the level of development of the state. Assuming that there is a minimum level of wastage and corruption, richer states should be able to invest more in modern and state-of-the art equipment in order to upgrade and improve the state machinery. Furthermore, since richer states have better amenities and facilities, they are more likely to attract qualified professionals to work for them. We will thus retain the level of GDP to control for the effects of the quality of state apparel on tax efficiency.

It can also be argued that states with a smaller land area will be able to administer and collect tax more efficiently than states with a more vast area. On the other hand, land area will not pose any problems in terms of tax collection if the state government is staffed with qualified personnel and equipped with machinery of the latest technology. To control for these two effects, we will include in our estimation the size of the state as well as its interaction with the GDP.

Finally in order for us to test for the effect of inter-governmental grants on tax efficiency, we included in our regression the share of grants in the state governments' total expenditures. Table 1 provides the descriptive statistics of the variables described above.

3.3 Empirical Specification

Following Battesse and Coelli (1995), the frontier is defined by

$$TA_{it} = exp\,(X_{it}\,\beta + (v_{it} - u_{it})) \tag{6}$$

Table 1. Descriptive statistics

	Mean	Standard error	Min	Max
Own Revenues (RM'000)	549.63	358.31	24.64	1790.63
Forest area (km2)	14911.39	24252.63	66.08	86368.30
Urbanisation rate (%)	40.57	14.30	32.04	80.00
Agricultural activities (km2)	218654.38	188207.19	31937.00	1070349.00
GDP (RM '000)	10.936	5.950	3.219	37.110
Population ('000)	1355.86	754.88	209.10	4498.10
Grant share (%)	0.31	0.20	0.02	0.81
Size (km2)	25374.07	34341.67	795.00	124450.00

where TA_{it} denotes real total own tax revenues of state i in year t, X_{it} represents a (1 x K) vector of values for the i-th state in the t-th year, which are functions of tax capacity factors namely forest areas, urbanisation rate, agricultural activities, state GDP, population as well as time. The v_{it} are assumed to be independently and identically distributed random error terms which have normal distribution with zero mean and standard deviation σ_v, the u_{it} are non negative unobservable random variables (with standard deviation σ_u) associated with the inefficiency of tax collection, such that, given the X_{it}, the observed level of tax collection falls short of potential.

Concurrently with the stochastic frontier, then, we estimated

$$U_{it} = Z_{it}\delta + Z^*_{it} X_{it}\delta' + W_{it} \tag{7}$$

where Z_{it} is a (1 x M) vector of explanatory variables (state GDP, land area, land area x GDP, intergovernmental grants and time) associated with the technical efficiency effects, δ is a (M x 1) vector of unknown parameters to be estimated, δ' is a vector of parameters associated with the interaction terms. $Z^*_{it} X_{it}$ and W_{it} are unobservable random variables assumed to be independently distributed, obtained by truncation of the normal distribution with mean zero and variance, σ^2, such that the U_{it} is non negative.

Given the specification of the model, the hypothesis that the technical inefficiency effects are not random, is expressed by H_0: , $\gamma = 0$, where $\gamma = \sigma_u^2/\sigma^2$ and $\sigma^2 = \sigma_u^2 + \sigma_v^2$. Further, the hypothesis that the technical inefficiency effects are not influenced by the level of explanatory variables in Equation (2) is examined by testing the significance of δ and δ'. The estimation used Maximum Likelihood methods with the Frontier 4.1 software.

Relative efficiency can be measured by applying stochastic frontier techniques to the individual annual samples, and to the total sample as a panel, but in many cases efficiency differences are a function of inadequate models and data, even when the frontier is stochastic. These two potential difficulties are directly addressed here. First, in many cases, model error is likely, because the functional form fitted is usually the Cobb Douglas, which is highly restrictive. Thus, the adequacy of the Cobb Douglas should be tested against a flexible functional form, such as the translog. Second, data error is inevitable where a model, essentially representing economic production, employs accounting data. However, apart from measurement error embodied in the available variables, failure to adjust for variable omission and inappropriate aggregation is the norm rather than the exception. In addition, a third problem has been highlighted by Smith (1997) who has shown that inefficiency levels, or choice of frontier over the average production function, depend on both the functional form and the level of aggregation, even if there are no missing variables. For all these reasons, inefficiencies need to be treated with a degree of caution and appropriate tests are required to select the correct model. This problem has been addressed by Battese and Coelli (1995). Their inefficiency model, in which the efficiency differences are simultaneously estimated from the stochastic frontier and explained by further variables, incorporates tests that choose between functional forms and between frontier and average models. The method of maximum likelihood is used to estimate the unknown parameters, with the stochastic frontier and the inefficiency effects estimated simultaneously. A number of related models can be tested, following the estimation.

The first test is the selection of the functional form, where the null hypothesis is that the Cobb-Douglas is an adequate representation of the data. The functional form of the stochastic frontier was determined by testing the adequacy of the log-linear model relative to the less simplistic translog, which includes cross-products and square terms to allow for interactions and non linearities in the data. The results of our test point to the rejection of the null hypothesis. We will thus adopt the translog specification as follows:

$$\begin{aligned} TA_{ij} &= \beta_0 + \beta_1 Forest + \beta_2 Forest^2 + \beta_3 Urbanisation + \beta_4 Urbanisation^2 + \beta_5\, Agriculture \\ &+ \beta_6 Agriculture^2 + \beta_7 GDP + \beta_8 GDP^2 + \beta_9 Population + \beta_{10} Population^2 + \beta_{11} Time + \\ &\beta_{12} Time^2 + \beta_{13} Forest*Urbanisation + \beta_{14}\, Forest*Agriculture + \beta_{15}\, Forest*GDP + \\ &\beta_{16} Forest*Population + \beta_{17} Forest*Time + \beta_{18} Urbanisation*Agriculture \\ &+ \beta_{19} Urbanisation*GDP + \beta_{20} Urbanisation*Population + \beta_{21} Urbanisation*Time \\ &+ \beta_{22}\, Agriculture*GDP + \beta_{23}\, Agriculture*Population + \beta_{24}\, Agriculture*Time + \\ &\beta_{25} GDP*Population + \beta_{26}\, GDP*Time + \beta_{27}\, Population*Time + \eta_i + u_{it} \end{aligned} \tag{8}$$

while the technical efficiency is estimated as follows:

$$\begin{aligned} u_{it} &= \delta_0 + \delta_1\, Grants + \delta_2 GDP + \delta_3 Time + \delta_4 Land\ Area + \delta_5 GDP*Land\ Area \\ &+ \delta_6 GDP*Grants + w_{it} \end{aligned} \tag{9}$$

The next test was to determine whether this is indeed a frontier model and not simply a mean response function (MRF) or OLS. A weak criterion is a *t*-test on the estimated parameter, $\gamma = \sigma_u^2/\sigma^2$, which is bounded by zero and one. If $\gamma = 0$, technical inefficiency is not present; hence, the null hypothesis is that $\gamma = 0$, indicating that the mean response function (OLS) is an adequate representation of the data. The closer this is to unity, the more likely it is that the frontier model is appropriate. The results of LR tests of the hypothesis show that the technical efficiency effects are not simply random errors. Finally, the power of the LR test is increased by testing the dual null hypothesis that both the frontier parameter and all the inefficiency effects are jointly zero $\gamma = \delta_i = 0$, for all *i*, meaning that neither the constant term nor the inefficiency effects are present in the model. Since γ takes values between 0 and 1, any LR test involving a null hypothesis which includes the restriction that $\gamma = 0$ has been shown to have a mixed χ^2 distribution, with appropriate critical values (Kodde and Palm

Table 2. Frontier estimation results (full sample)

	Model A		Model B	
	Coefficient	Standard error	Coefficient	Standard error
Forest	-1.1026	0.8118	-0.5671	0.8275
Forest^2	0.0141	0.0222	0.0073	0.0276
Urbanisation	-2.7961	1.8465	-3.6273***	0.9644
Urbanisation^2	0.2775	0.3694	0.3017	0.3283
Agriculture	0.8303	0.6189	1.2362*	0.6795
Agriculture^2	-0.0398**	0.0175	-0.0522***	0.0233
GDP	-4.7509***	1.4956	-3.9290***	0.9526
GDP^2	-0.6597*	0.3759	-0.7948	0.5186
Population	5.3438***	0.9265	4.1761***	0.8887
Population^2	-0.4719	0.2918	-0.4031	0.3683
Time	-0.0423	0.0954	-0.0268	0.1413
Time^2	-0.0009	0.0008	-0.0004	0.0017
Forest*Urbanisation	0.2098	0.1459	0.1524	0.1788
Forest*Agriculture	0.0125	0.0305	0.0166	0.0363
Forest*GDP	-0.0573	0.1283	-0.1108	0.1679
Forest*Population	0.0484	0.1479	0.0389	0.1713
Forest*Time	-0.0115*	0.0064	-0.0088	0.0084
Urbanisation*Agriculture	0.0462	0.1154	0.0695	0.1361
Urbanisation*GDP	1.6035***	0.5644	1.7365***	0.6021
Urbanisation*Population	-1.1773**	0.5099	-1.1475**	0.5711
Urbanisation*Time	-0.0364	0.0284	-0.0438	0.0345
Agriculture*GDP	-0.0881	0.0973	-0.1236	0.1084
Agriculture*Population	0.0108	0.0981	-0.0098	0.0010
Agriculture*Time	0.0139**	0.0057	0.0181**	0.0079
GDP*Population	0.9724**	0.4394	1.1052*	0.6572
GDP*Time	-0.0332**	0.0173	-0.0288	0.0189
Population*Time	0.0461***	0.0156	0.0336	0.0217
Constant	4.4791**	1.9915	3.4261***	0.1005
Sigma squared	0.3014	0.0268	0.3332	0.0313
Gamma	0.9999	0.0000	0.9999	0.000

Notes: Significant at 10%*, 5%**, and 1%*** level, respectively.

1986). The results point to the rejection of the null-hypothesis and suggest that the traditional production function is not an adequate representation of the data.

4. Results

4.1 Baseline Regressions

The results of our frontier estimation are summarised in Table 2. In column A, the distribution is assumed to be half normal while in column B, a truncated normal distribution is assumed. These maximum likelihood estimators of the translog coefficients are not very informative.

Rather, the elasticities for each of the four inputs, calculated from these results, at the variable means, are of interest. These elasticities with respect to the inputs, x_j, for the translog is

$$\xi_j = \frac{\partial \ln(y_i)}{\partial \ln(x_{ji})} = \beta_j + \sum_{j=1}^{4} \beta_{jh} \ln(x_j) \tag{10}$$

These estimates can be expressed as

$$\xi_j = \lambda_j \hat{\theta} \tag{11}$$

where $\hat{\theta}$ is the full vector of the maximum likelihood estimators of the parameters and λj is a row vector of the same dimension, which has zero entries everywhere, except when corresponding to the elements of θ involving β_j and β_{jh}. The reported standard errors of the elasticities are

$$\hat{V}(\lambda_j \hat{\theta}) = \lambda_j \hat{V}(\hat{\theta}) \lambda_j^{'} \tag{12}$$

where $\hat{V}(\hat{\theta})$is the estimated covariance matrix for q. The elasticties are reported in Table 3.

The parameter of our frontier models indicates that for the first model, only the elasticty of GDP is found to be significant. As for our second model, none of the elasticities are found to be significant. The results of estimates of variables on the efficiency level are presented in Table 4. We are particularly interested in the effects of federal grants on state governments' tax efficiency. The results show that the share of grants in the state governments' total expenditure has a positive impact on the level of inefficiency. In other words, the higher the share of federal grants of total state expenditure, the lower the tax efficiency. The result is robust to the change in distribution. As for the interaction term between grants and GDP, the estimates are significant only in the case of a truncated normal distribution. Also, the magnitude of the coefficient is rather small. The results imply that the inter-governmental grants system in Malaysia is not without consequence on the fiscal behaviour of the state governments. Though at first sight, the system may not seem to have any bearing on the fiscal behaviour of the state governments, our results show that somehow its implementation

Table 3. Elasticities of input (full sample)

	Model A		Model B	
	Coefficient	Standard error	Coefficient	Standard error
Forest Area	-0.1390	0.9927	-0.0949	0.5680
Urbanisation rate	-0.9827	9.3210	-1.1912	9.7162
Agricultural activities	0.4766	0.5087	0.6001	0.8397
GDP	22.8293***	6.6691	3.8366	9.4014
Population	3.2443	6.3141	2.7876	6.2499

Notes: Significant at 10%*, 5%**, and 1%*** level, respectively.

Table 4. Efficiency estimates (full sample)

	Model A		Model B	
	Coefficient	Standard error	Coefficient	Standard error
Grants	1.4156***	0.1522	1.5735***	0.1609
GDP	-0.4389	0.3011	1.5253***	0.1046
Time	0.0013	0.0105	0.0036	0.0124
Land Area	-0.7130***	0.1367	0.0983	0.0977
Land Area*GDP	0.0368	0.0302	-0.1391***	0.0191
GDP*Grants	-0.0000	0.0000	-0.0000	0.0000
Constant	8.8389***	1.2667		

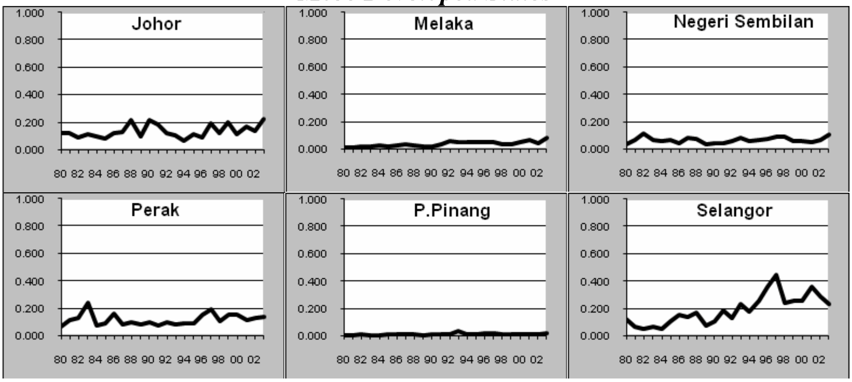
Notes: Significant at 10%*, 5%**, and 1%*** level, respectively.

has resulted in the state governments being less efficient in their tax collection. As for other variables, we found that in model A, size is associated with less inefficiency. This may due to the fact that states with vast superficy usually have a vast forest area and since forest based taxes are relatively easier to administer as compared to other taxes (especially land taxes), these states are found to be more efficient than smaller states.

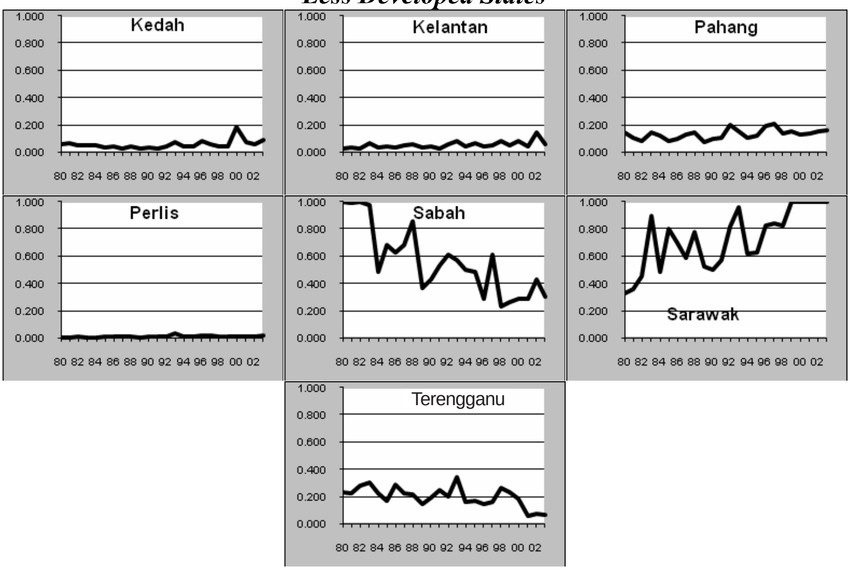
In Model B, we found that GDP is positively associated with tax inefficiency which, contrary to our expectations, implies that richer states tend to be less efficient. It is also found that the effect of GDP on inefficiency level is attenuated by the size of the state. The estimates of efficiency level for each state for the period under study are presented in Figure 1. The results show that except for two states, the level of tax efficiency of the state governments in Malaysia is rather low. During the whole period under study, their level of efficiency has never surpassed the 20 per cent level. The facts that there is a low level of efficiency is nevertheless not really that surprising especially given the huge amounts of tax arrears that are yet to be collected by the state governments. The estimates also show that there is stark contrast between the performance of the states situated in the Peninsular Malaysia and the two Borneo states, Sabah and Sarawak. Indeed, the two states are found to have a relatively higher level of efficiency as compared to the rest of the country. It is also noteworthy that the efficiency levels of these two states are found to be more volatile. In comparison, the efficiency level of the rest of the states fluctuated only within the 0 to 20 per cent band throughout the whole period.

We also note a net difference in the evolution across time of the efficiency level of Sabah and Sarawak. In the case of Sabah, we observed a net degradation of its tax efficiency across time. In the early 1980s, the state was the most efficient state in terms of tax collection. But in the mid-1980s, there was a sharp drop in its efficiency level which has continued to deteriorate over the years to finally reach the level of efficiency of other states. This evolution is in net contrast to that of the state of Sarawak. In the beginning of the period under study, the level of tax efficiency of Sarawak was relatively low especially in comparison to Sabah. However, in 1982, Sarawak has seen its level of efficiency increase to finally overtake Sabah

More Developed States



Less Developed States



Average more developed and less developed states

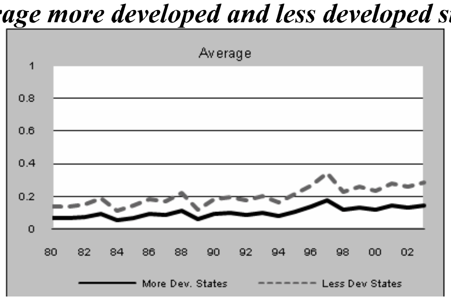


Figure 1. *Efficiency estimates (full sample)*

as the most efficient state in terms of tax collection in the mid-1980s. The evolution over time of the efficiency level of these two states somehow mirrors their standing in terms of financial management in the recently published Report by the Auditor General of Malaysia (2003). Indeed, in the Report, the Sabah state government is considered as one of the states in dire financial straits while Sarawak is identified by the General Auditor as one of the states that have the best financial record.

The fact that Sabah and Sarawak have a different position in terms of their efficiency level as compared to other states does not really come as a surprise. In fact, the two states are on a different footing compared to the rest of the states as far as their revenues and responsibilities are concerned. This is due to their special position in the Federal Constitution of Malaysia. Not only are they are devolved with more revenue sources and more responsibilities compared to the other 11 states, they are also entitled to special grants from the federal government.

Given their special position, it may seem inappropriate to put these two states in the same basket as the rest of the states. And the relatively low efficiency level of the rest of the states, as found in our estimations, may be due to the inclusion of these two states in our sample. Indeed, it can be argued that the low estimates of efficiency level of these states may not signify that they are very inefficient but rather that they are relatively inefficient in comparison to Sabah and Sarawak. Thus in the next section, we will re-estimate our regression by dropping the two states from our sample.

4.2 Subsample of Peninsular Malaysia

We present the results of our new estimations in Table 5. Again based on these parameters, we calculated the elasticity for each of the independent variable. The results are presented in Table 6. In model A, none of the elasticities are statistically significant. However, in model B the elasticity of GDP is found to be significant. In Table 7, we present the efficiency estimates.

As far as the estimates of the level of inefficiency is concerned, we found that even after dropping Sabah and Sarawak from our sample, federal grants are still positively associated with inefficiency level. The results may suggest that the association found previously between federal grants and tax efficiency is not spurious. Yet, the magnitude of the coefficient is somehow smaller than the one found in our preceding estimation. We also found that the effects of federal grants on inefficiency level to be conditional on GDP. The result implies that the level of GDP will attenuate the negative impact of federal grants on efficiency level. To put it differently, federal grants are found to be more disastrous for tax efficiency amongst poorer states. However, it should be noted that the magnitude of the coefficient for the interaction term is rather small. As for other explanatory variables, we found that the coefficients for GDP to be positively associated with tax inefficiency, indicating that richer states tend to be less efficient in their tax collection. On the other hand, it is also found that a higher dependence on grants as well a more vast land superficy attenuate the negative impact of GDP on inefficiency level.

The scores of efficiency level for each state are presented in Figure 2. In contrast to our previous estimates, the state governments are found to be more efficient this time. The average efficiency level for all states during the period under study is 67 per cent. The

Table 5. Frontier estimation results (Peninsular Malaysia)

	Model A		Model B	
	Coefficient	Standard error	Coefficient	Standard error
Forest	0.6157	0.9328	0.5077	0.8757
Forest^2	0.0023	0.0261	0.0030	0.0264
Urbanisation	3.6591**	1.8277	3.2270*	1.7600
Urbanisation^2	-0.0022	0.3889	0.0662	0.3818
Agriculture	0.8974**	0.4274	0.9765	0.6733
Agriculture^2	-0.0203	0.0181	-0.0174	0.0209
GDP	-3.0553**	1.2036	-3.3179***	1.2507
GDP^2	-0.3804	0.4326	-0.3763	0.4436
Population	4.8254**	1.9261	5.3012***	1.2655
Population^2	-0.5331	0.3583	-0.5661*	0.3152
Time	-0.1523	0.0973	-0.1265	0.1298
Time^2	-0.0021	0.0013	-0.0020	0.0013
Forest*Urbanisation	-0.1551	0.1733	-0.1512	0.1746
Forest*Agriculture	0.0127	0.0276	0.0111	0.0283
Forest*GDP	-0.1509	0.1361	-0.1468	0.1330
Forest*Population	0.0592	0.1512	0.0706	0.1549
Forest*Time	0.0016	0.0084	0.0017	0.0082
Urbanisation*Agriculture	0.0369	0.1321	0.0272	0.1374
Urbanisation*GDP	0.7015	0.6760	0.7271	0.6779
Urbanisation*Population	-0.8305	0.6251	-0.8361	0.6086
Urbanisation*Time	-0.0065	0.0231	-0.0114	0.0299
Agriculture*GDP	-0.1247	0.0875	-0.1246	0.0890
Agriculture*Population	-0.0086	0.0651	-0.0201	0.0898
Agriculture*Time	0.0094	0.0063	0.0084	0.0070
GDP* Population	1.0479**	0.4930	1.0591**	0.4938
GDP* Time	-0.0324	0.0212	-0.0331	0.0218
Population*Time	0.0431**	0.0212	0.0438**	0.0219
Constant	-19.8381***	0.8859	-20.3323***	1.0315
Sigma squared	0.3322	0.0131	0.3295	0.0246
gamma	0.2215	0.0579	0.3273	0.0779

Notes: Significant at 10%*, 5%**, and 1%*** level, respectively.

results suggest that the low efficiency level of the Peninsular states found previously is due to the inclusion of Sabah and Sarawak in our sample. It is noteworthy that the state governments differ widely in terms of tax efficiency. The most efficient states are Perak and Pahang and the less efficient are Perlis and Penang. In Figure 2, we separated the estimates of efficiency level according to the level of development of the states. It appears that the level of efficiency does not depend on the level of development as both groups have their fair share of very efficient and less efficient states. Indeed, the average efficiency level for both groups is almost the same as shown by the lower panel of Figure 2.

Table 6. Elasticties of input (Peninsular Malaysia)

	Model A		Model B	
	Coefficient	Standard error	Coefficient	Standard error
Forest	-0.0322	0.6645	0.3387	0.5416
Urbanisation rate	0.1285	10.0599	-0.1217	8.3845
Agricultural activities	0.3842	0.3827	0.3567	0.6285
GDP	2.0330	6.6390	14.733***	4.1549
Population	3.7294	10.7510	3.9682	8.2150

Notes: Significant at 10%*, 5%**, and 1%*** level, respectively.

Table 7. Efficiency estimates (Peninsular Malaysia)

	Model A		Model B	
	Coefficient	Standard error	Coefficient	Standard error
Grants	1.2237***	0.0984	1.2026***	0.1489
GDP	0.7238**	0.3031	0.9133***	0.1006
Time	0.0039	0.0121	0.0019	0.0142
Land area	-0.1250	0.3488	-0.0169	0.1191
GDP* Land area	-0.0687**	0.0289	-0.0937***	0.0266
GDP*Grants	-0.0000**	0.0000	-0.0000*	0.0000
Constant	0.7906	3.1211		

Notes: Significant at 10%*, 5%**, and 1%*** level, respectively.

5. Conclusion

The main objective of this paper is to examine the relationship between the fiscal performance of the state governments in Malaysia with the political and institutional environment within which they evolve. The focus of our analysis is to analyse the impact of federal grants on state governments' fiscal efficiency. Our estimations results seem to point to the fact that there is indeed a negative impact of federal grants on the tax efficiency of the state governments in Malaysia. The results suggest that an increase in federal grants is associated with a decrease in tax efficiency of the state governments. On the other hand, the estimates also show that there is on average a slight increase in the level of tax efficiency of the state governments in Malaysia across time. Together, these two results suggest that a higher level of efficiency could be achieved if necessary steps are taken to minimise the effects of federal grants. A negative relationship between federal grants and fiscal efficiency has

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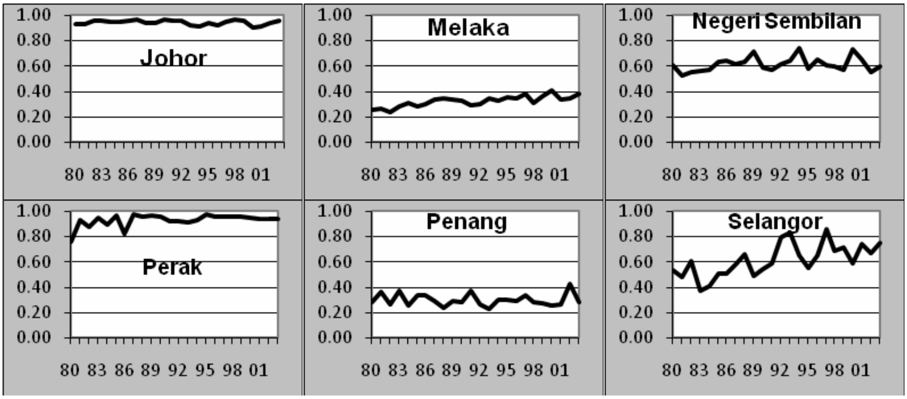

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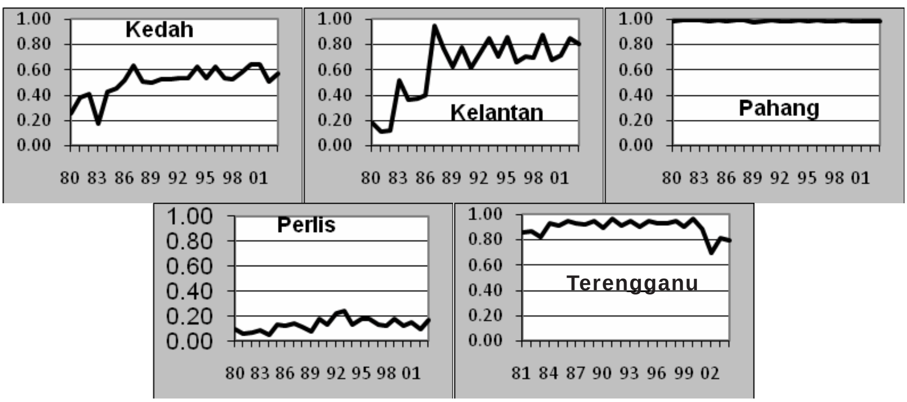

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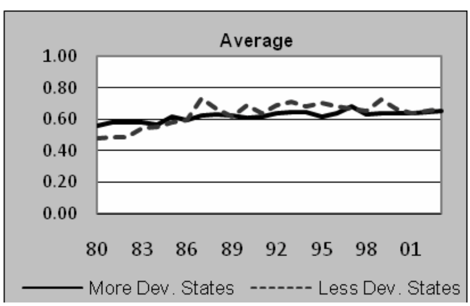

Figure 2. *Efficiency estimates (Peninsular Malaysia)*

serious policy implications. It suggests that the state governments have failed to mobilise their tax potentials to the maximum and preferred to rely on federal transfers instead to finance their expenditures. The danger of being too dependant on federal grants has been widely covered in the literature. However, within the context of our study, transfer dependence can also lead to another problem namely an under-developed local tax system. Due to federal grants, state governments can be discouraged from investing in the improvement of their tax system. Since federal grants are easily made available to them, state governments may not find it worthwhile to employ the latest technology or to hire more qualified personnel. Without these investments, the local tax system will not be able to cope with the latest developments in society and become less and less productive. This in turn will lead to a higher dependence on federal grants thus creating a vicious circle.

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