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Expenditures and Revenues: Testing for Causality in Sabah Local Government Finances

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Abstract

This paper is concerned with the issue of the intertemporal relationship between revenues and expenditures and the way in which a state government deals with the management of their public deficits. In this study, different hypotheses are considered to examine such problems. The so-called tax-spend hypothesis postulates that governments raise tax revenues ahead of engaging in new expenditures. The spend-tax hypothesis, on the other hand, predicts that governments spend first and then increases tax revenues to finance their expenditures. There is also the fiscal synchronization hypothesis that suggests that governments take decisions about revenues and expenditures simultaneously. Lastly, there is the possibility of independence as regards the decisions to spend and raise revenues. Using annual data on revenues and expenditures for 16 municipalities in Sabah over the period 1965 to 2003, empirical analysis from our vector error correction models suggest that the results are at best mixed.

Keywords: Local Government, Revenue-expenditure Nexus, Cointegration, Causality, VECM

INTRODUCTION

One of the most researched topics in macroeconomics is the empirical testing of the relationship between government expenditures and tax revenues.

Establishing the direction of interdependence between the two macroeconomic variables, namely, government expenditures and tax revenues would assist policy makers in identifying the source of any fiscal imbalances that might exist. Consequently this would facilitate efforts to develop a suitable fiscal reform strategy.

The discussion of the causal link between revenues and expenditures has resulted in several competing hypotheses. First, the fiscal synchronization hypothesis implies that fiscal authorities make decisions on taxation and spending simultaneously. In the Granger sense, this is known as a bi-directional relationship between tax revenue and government spending. Second, a unidirectional causality that runs from revenue to expenditure supports the so- called tax-and-spend hypothesis. The hypothesis indicates that, since government revenue causes changes in government expenditure, the control of tax revenue should represent a good policy to reduce the size of government expenditure. On the other hand, the spend-and-tax hypothesis implies that government expenditure leads to changes in tax revenue. In other words, the chain of causality runs from government spending to tax revenue. Lastly, Baghestani and McNown (1994) relate to the institutional separation of expenditure and taxation decisions of government. This perspective suggests that revenues and expenditures are independent of one another.

In a recent study on Malaysia, Aziz et al. (2000) have pointed out that Malaysia's government expenditures have almost consistently exceeded government revenues throughout most of the past decades since 1959 except for the 1959-61 and 1993-97 periods. The government's commitment in pursuing rapid economic development programmes, as embodied in the various five year Malaysian development plans, largely accounts for the fiscal deficits incurred. Nevertheless, the expanded role of the public sector has resulted in rapid growth of government expenditure. When testing for the above hypotheses, Aziz et al. (2000) found that Malaysia's revenue and expenditure data support the fiscal synchronization hypothesis. It implies a bi-directional causal relationship, in the Granger sense, between government revenue and spending.

The purpose of the present study is to investigate the causal relationship between revenues and spending at the municipality level in the state of Sabah

for the period of 1965 to 2003. Using the concept of cointegration and vector error correction models, inference can be made concerning the respective hypothesis set forth. Section 2 will provide a brief overview of the hypotheses along with a review of related literature on the tax-spend debate. Section 3 discusses the methodology and data used in the analysis. Section 4 provides the empirical results while section 5 contains our conclusion.

REVIEW OF RELATED LITERATURE

The relationship between government revenue and expenditure can be categorized into four main competing hypotheses. First, the fiscal synchronization hypothesis implies that taxation and spending decisions are made simultaneously by the fiscal authorities. In the Granger sense, this is known as a bi-directional relationship between tax revenue and government spending. According to Musgrave (1966), voters compare the marginal benefits and marginal costs of government services when formulating a decision in terms of the appropriate levels of government revenues and expenditures. Thus, revenue and expenditure decisions are jointly determined under the fiscal synchronization hypothesis. Second, a unidirectional causality that runs from revenue to expenditure supports the so-called tax-and-spend hypothesis. The hypothesis indicates that, since government revenue causes changes in government expenditure, the control of tax revenue should represent a good policy to reduce the size of the government expenditure. The tax-and-spend hypothesis advocated by Friedman (1978) argues that changes in government" revenue leads to changes in government expenditure. Friedman suggests that tax increases will only lead to expenditure increases resulting in the ability to reduce budget deficits. On the other hand, the spend-and-tax hypothesis implies that government expenditure leads to changes in tax revenue. In other words, the chain of causality runs from government spending to tax revenue. Peacock and Wiseman (1979) argue that temporary increases in government expenditures, as a result of crises, can lead to permanent increases in government revenues. Lastly, when there is no causality between revenue and expenditure, then the act of collecting tax revenue and spending are independent from each other as put forward by Baghestani and McNown (1994).

Empirical evidences with respect to the above competing hypotheses are at best mixed. Musgrave (1966), Meltzer and Richard (1981), Miller and Russek (1990), Bohn (1991) and Bhat et al. (1993) support the fiscal synchronization hypothesis. Studies by Friedman (1972, 1978), Buchanan and Wagner (1977), 1978), Darrat (1998), Blackley (1986), Marlow and Manage (1987) and Joulfaian and Mookerjee (1990); all indicate that government tax revenues lead expenditures. On the other hand, the spend-and-tax hypothesis is supported by studies done by Peacock and Wiseman (1961, 1979), Jones and Joulfaian (1991), Anderson et al. (1986), von Furstenberg et al. (1986) and Provopoulos and Zambaras (1991). Conversely, Baghestani and McNown (1994) found that government expenditure and revenue are not interdependent.

Other studies on the government revenue-expenditure nexus found a diversity of results, depending on the time period used, lag length and also between the different levels of government. For instance, Manage and Marlow (1986) found that using different lag lengths gave different sets of results. Varying the lag length between two and five, the results indicate that in all cases the lowest and uppermost lag lengths suggest a unidirectional relationship; a causal relation that runs from expenditures to revenues. On the other hand, the intermediate lag lengths provide support for bi-directional causal relationship between the two variables. Ram (1988) used both annual and quarterly data to examine the expenditures-revenues nexus for both the Federal government and State and Local government. This study also derived conflicting results. For example, using annual data, the results support the fiscal synchronization hypothesis at the Federal government level. However, when quartely data was used, the results suggest that causelity runs from revenues to expenditures, thus, supporting the tax-and-spend hypothesis. But, at the state and local level, both annual and quartely data indicate results that support the spend-and-tax hypothesis. In another study, Owoye (1995) studied the causal relationship between taxes and expenditures in the G7 countries. Despite the similarities in terms of the economic settings of the sample countries, Owoye found that the results of causality relationships are not similar. The empirical results obtained from the error-correction models support the fiscal synchronization hypothesis for the U.S., Germany, U.K., France and Canada. This implies that the fiscal authorities in these countries make tax and spending

decisions jointly. On the other hand, causality runs from revenues to expenditures in Japan and Italy, thus, supporting the tax-and-spend hypothesis. A study on selected EU economies by Kollias and Makrydakis (2000) found that the fiscal decision-making process in Greece, Ireland, Spain and Portugal is diverse. In the case of Greece and Ireland, the evidence supports overwhelmingly the principal of synchronization in the making of spending and tax decisions by the fiscal authority. In the case of Spain, causality is found to run from revenues to expenditures implying that the Spanish fiscal authorities decide first on the amount of tax collections and then decide on how much to spend. In the case of Portugal, decisions on government spending and tax levies were found to be independent actions. On the other hand, the study by Chang et al. (2002) on three newly industrialized countries in Asia (South Korea, Taiwan and Thailand) and seven industrialized countries (Australia, Canada, Japan, New Zealand, South Africa, UK and the USA) found that data for Japan, South Korea, Taiwan, UK and the USA support the tax-and-spend hypothesis, while the spend-and-tax hypothesis holds only for Australia and South Africa. In the case of Canada, it supports the fiscal synchronization hypothesis. Further, Chang et al. (2002) found out that revenues and expenditures are not interrelated for New Zealand and Thailand.

Studies on tax-spend nexus for the developing economies are quite numerous and among others include Chang and Ho (2002) for China; Fuess et al. (2003) and Chang and Ho (2002) for Taiwan; AbuAl-Foul and Baghestani (2004) for Egypt and Jordan; Ewing and Payne (1998) for Latin America; and Carneiro et al. (2004) for Guinea-Bissau.

Using annual time series data for China over the period 1977 to 1999, and employing the multivariate error correction models in their study, Chang and Ho (2002) found that bi-directional Granger causality exists between government revenues and government expenditures, thus, supporting the fiscal synchronization hypothesis for China. As for Taiwan, both studies by Chang and Ho (2002) and Fuess et al. (2003) support the tax-and-spend hypothesis of one-way causality from government receipts to expenditures. For the Latin American countries, Ewing and Payne (1998) found that Chile and Paraguay support the fiscal synchronization hypothesis. For Colombia, Ecuador and Guatemala, there is evidence of causality running from revenues to

expenditures, thus supporting the tax-and-spend hypothesis. The study by Abu Al-Foul and Baghestani (2004) on Egypt and Jordan found that data for Egypt indicate a unidirectional causality from revenue to spending, with higher revenue leading to higher spending. Results for Jordan indicate bi-directional causality between revenue and spending, thus supporting the fiscal synchronization hypothesis. For Guinea-Bissau, Carneiro et al. (2004) found that there exists a stable long-term relationship between government expenditures and revenues. The spend-and-tax hypothesis means that the government seems to spend first and then raise tax revenues and/or request/ receive grants to finance its expenditures, rather than adopting the approach of raising funds to finance future spending.

METHODOLOGY

Testing for Long-Term Relationships between Economic Variables

To determine the long-term relationship between revenue and expenditure, we employ the Johansen (1988) and Johansen and Juselius (1990) multivariate maximum likelihood estimation procedure. Detailed exposition on the Johansen-Juselius technique has been provided in Dickey et al. (1991), Cuthbertson et al. (1992) and Charemza and Deadman (1992). However, a brief discussion on the Johansen-Juselius technique is provided below. We begin by defining a k-lag vector autoregressive (VAR) representation,

$$X_t = a + \Pi_1 X_{t-1} + \Pi_2 X_{t-2} + \ldots + \Pi_k X_{t-k} + \nu_t \quad (t=1, 2,\ldots,T) \qquad (1)$$

where X_t is α *px1* vector of non-stationary *I(1)* variables, α is a *px1* vector of constant terms, II_1, $II_2 \ldots II_k$ are *pxq* coefficient matrices and v_t is α *px1* Vector of white Gaussian noises with mean zero and finite variance. Equation (1) can be reparameterised as:

$$\Delta X_t = \alpha + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \ldots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi_k X_{t-k} + \nu_t \qquad (2)$$

where $\Gamma_i = -I + \Pi_1 + \Pi_2 + \ldots + \Pi_i$ $\quad (i=1, 2,\ldots k-1)$ and Π is defined as:

$$II = -I + II_1 + II_2 + \ldots + II_3 \quad (3)$$

Johansen (1988) shows that the coefficient matrix II_k contains essential information about the cointegrating or equilibrium relationships between the variables in the data set. Specifically, the rank of the matrix II_k indicates the number of cointegrating relationships existing between the variables in X_t. In this study, for a two case variables, X_t (revenue and expenditure) and so $p=2$. Hence the hypothesis of cointegration between revenue and expenditure is equivalent to the hypothesis that the rank of $II_k = 1$. In other words, the ranks r must be at most equal to $p-1$, so that $r \leq p-1$, and there are $p-r$ common stochastic trends. If $r=0$, then there are no cointegrating vectors and there are p stochastic trends.

The Johansen-Juselius procedure begins with the following least square estimating regressions:

$$\Delta X_t = \alpha_1 + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \omega_{1t} \quad (4)$$

$$X_{t-p} = \alpha_2 + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \omega_{2t} \quad (5)$$

Defining the product moment matrices of the residuals as $S_{ij} = T^{-1} \sum_{t=1}^{T} \varpi_{it} \varpi_{jt}$ (for $i,j=1,2$), Johansen (1988) shows that the likelihood ratio test statistic for the hypothesis of at most r equilibrium relationships is given by:

$$-2lnQ_r = -T \sum_{i=r+1}^{p} ln(1-\lambda_i) \quad (6)$$

where $\lambda_1 > \lambda_2 > \ldots \lambda_p$ are the eigenvalues that solve the following equation:

$$|\lambda S_{22} - S_{21} S_{11}^{-1} S_{12}| = 0. \quad (7)$$

The eigenvalues are also called the squared canonical correlations of ω_{2t} with respect to ω_{1t}. The limiting distribution of the $-2lnQ_r$ statistic is given in terms of a $p-r$ dimensional Brownian motion process, and the quantiles of the distribution are tabulated in Johansen and Juselius (1990) for $p-r=1,\ldots,5$ and in Osterwald-Lenum (1992) for $p-r=1,\ldots 10$.

Equation (6) is usually referred to as the trace test statistic which is rewritten as follows:

$$L_{trace} = -T\sum_{i=r+1}^{p} ln(1-\lambda_i) \quad (8)$$

where $\lambda_{r+1},...\lambda_p$ are the p-r smallest squared canonical correlation or eigenvalue. The null hypothesis is at most r cointegrating vectors. The other test for cointegration is the L-maximal eigenvalue test based on the following statistic:

$$L_{max} = -T.ln(1-\lambda_{r+1}) \quad (9)$$

where λ_{r+1} is the $(r+t)^{th}$ largest squared canonical correlation or eigenvalue. The null hypothesis is r cointegrating vectors, against the alternative of $r+1$ cointegrating vectors. Comparing the two tests, Johansen and Juselius (1990) indicate that the trace test may lack effectiveness relative to the maximal eigenvalue test which will produce clearer results.

Sources of Data

Data on total revenues and total expenditures for eighteen municipals in the state of Sabah, for the period 1965 to 2003, was collated from the various issues of the Statistical Yearbook Sabah published by the Department of Statistics Malaysia, Sabah. The 18 municipalities include Beaufort, Keningau, Kota Belud, Kota Kinabalu, Kuala Penyu, Kudat, Labuk and Sugut, Lahad Datu, Papar, Ranau, Sandakan, Sipitang, Tambunan, Tawau, Tenom and Tuaran. Other municipals such as Labuan, Kata Kinabalu Rural, Panampang, Pensiangan, Sandakan Rural and Tawau Rural are not included in this study due to unavailability of consistent data. All time series variables were transformed into natural logarithms.

THE EMPIRICAL RESULTS

Before testing for cointegration by using the Johansen-Juselius procedure, we test for the order of integration of all variables for all municipalities. Table 1

shows the results of the unit root test for the test of the order of integration of revenue and expenditure for the eighteen municipals in Sabah under investigation. Clearly, in all cases, the augmented Dickey-Fuller test (Dickey and Fuller, 1981) statistics indicate that the two series in Sabah are difference stationary, in other words, they are I(1) in levels, except for Kinabatangan and Sempoma.

Table 1 Results of Unit Root Tests

Municipals	Revenues		Expenditures	
	Levels	First-differences	Levels	First differences
Beaufort	-3.23 (0)	-8.28* (0)	-2.36 (0)	-6.91* (0)
Keningau	-3.77 (0)	-7.04* (1)	-2.94 (0)	-9.03* (0)
Kinabatangan	-4.54* (0)		-4.37* (0)	
Kota Belud	-3.31 (0)	-7.79* (0)	-2.91 (0)	-5.79* (1)
Kota Kinabalu	-2.72 (0)	-5.83* (0)	-2.72 (0)	-5.83* (0)
Kuala Penyu	-3.29 (0)	-7.92* (0)	-3.05 (0)	-7.74* (0)
Kudat	-2.51 (0)	-6.35* (1)	-2.49 (0)	-6.98* (1)
Labuk and Sugut	-3.13 (0)	-7.79* (0)	-2.75 (0)	-8.09* (0)
Lahad Datu	-1.65 (0)	-7.32* (0)	-1.56 (0)	-7.33* (0)
Papar	-2.34 (0)	-8.35* (0)	-1.83 (0)	-5.55* (0)
Ranau	-1.56 (0)	-6.71* (0)	-1.62 (0)	-8.51* (0)
Sandakan	-1.51 (0)	-5.49* (0)	-1.76 (0)	-8.05* (0)
Semporna	-4.39* (0)		-3.17 (0)	-5.73* (1)
Sipitang	-1.21 (1)	-8.99* (0)	-1.68 (0)	-7.24* (0)
Tambunan	-2.02 (1)	-5.69* (0)	-2.65 (1)	-4.39* (0)
Tawau	-2.07 (0)	-8.86* (0)	-1.72 (0)	-7.49* (0)
Tenom	-1.06 (0)	-6.32* (0)	-1.43 (0)	-6.87* (0)
Tuaran	-1.93 (0)	-7.75* (0)	-2.44 (0)	-8.77* (0)

Notes: Asterisk (*) denotes statistical significance at the 1% level. Critical values are taken from MacKinnon (1996). Series in levels were estimated with constant and trend, while series in first-differences were estimated with constant only. Figures in parentheses denote lag length chosen by SBC criterion

Having noted that both series are of the same order of integration, we run the cointegration test following the procedure provide by Johansen and Juselius (1990). These results are tabulated in Table 2. The null hypothesis of no cointegration cannot be rejected in all cases of the tax-spend nexus using both the trace and *L*-max statistics at the one percent significance level. However, in the cases of Kudat, Tambunan and Tawau, the null hypothesis of no more than zero and no more than one cointegrating relations is soundly rejected at the one percent significance level using the trace statistics, while in the cases of Tambunan and Tawau using the *L*-max statistics. Since according to Cheung and Lai (1993), the trace test shows more robustness to both skewness and excess kurtosis in the residuals than does the *L*-max test, we will therefore only emphasise on the use of trace statistics to make inferences for non- cointegration between revenue and expenditure in this study.

Table 2 Results of Bi-variate Cointegration Tests (VAR=2)

Municipals	Null hypothesis	Trace test	L-max test
Beaufort	$H_o: r = 0$	15.49	13.90
	$H_o: r \leq 1$	1.58	1.58
Keningau	$H_o: r = 0$	17.78	14.97
	$H_o: r \leq 1$	2.80	2.80
Kota Belud	$H_o: r = 0$	14.13	12.87
	$H_o: r \leq 1$	1.26	1.26
Kota Kinabalu	$H_o: r = 0$	11.60	9.36
	$H_o: r \leq 1$	2.23	2.23
Kuala Penyu	$H_o: r = 0$	9.84	8.58
	$H_o: r \leq 1$	1.26	1.26
Kudat	$H_o: r = 0$	20.24*	14.43
	$H_o: r \leq 1$	5.80	5.80
Labuk and Sugut	$H_o: r = 0$	15.22	13.62
	$H_o: r \leq 1$	1.59	1.59

Lahad Datu	H_o: r = 0	17.74	11.89
	H_o: r ≤ 1	5.85	5.85
Papar	H_o: r = 0	7.43	4.57
	H_o: r ≤ 1	2.86	2.86
Ranau	H_o: r = 0	17.46	14.52
	H_o: r ≤ 1	2.93	2.93
Sandakan	H_o: r = 0	15.90	12.24
	H_o: r ≤ 1	3.65	3.65
Sipitang	H_o: r = 0	8.30	5.62
	H_o: r ≤ 1	2.67	2.67
Tambunan	H_o: r = 0	26.86*	22.75*
	H_o: r ≤ 1	4.10	4.10
Tawau	H_o: r = 0	18.86	11.89
	H_o: r ≤ 1	6.97*	6.97*
Tenom	H_o: r = 0	4.14	4.06
	H_o: r ≤ 1	0.08	0.08
Tuaran	H_o: r = 0	13.63	10.65
	H_o: r ≤ 1	2.97	2.97

Notes: Asterisk (*) denotes statistical significance at the 1% level. Critical values are taken from MacKinnon et al. (1999).

Furthermore, knowing that the Johansen-Juselius cointegration procedures are distorted in small samples, we carry out our analysis by employing the vector error correction model to infer cointegration among the series. According to the 'Granger Representation Theorem', not only does cointegration imply the existence of an error correction model but the converse also applies, that is, the existence of an error correction model implies cointegration of the variables. Recent developments in cointegration and error correction models, as pointed out by Pesavento (2004), suggest that the Johansen 's test for cointegration has low proficiency for both large and small samples compared to the error correction model. In fact, Kremers et al. (1992) have argued that

the standard *I-ratio* for the coefficient on the error-correction term in the dynamic equation is a more powerful test for cointegration. Banerjee et al. (1986) and Kremers et al. (1992) show that the standard asymptotic theory can be used when conducting the test in the context of an error correction model; specifically, the I-statistics on the error correction term coefficients have the usual distribution.

Since our task is to determine the long-term relationship and the causal direction between the two variables in question, we estimate the following vector error correction model. We specify the following two-variable vector error correction models (VECM) as:

$$\Delta y_t = a_0 + \sum_{i=1}^{k} \alpha_i \Delta y_{t-i} + \sum_{j=1}^{k} \alpha_j \Delta x_{t-j} + \gamma_1 ecm_{t-1} + \varepsilon_{1t} \quad (10)$$

$$\Delta x_t = b_0 + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \sum_{j=1}^{k} \beta_j \Delta x_{t-j} + \gamma_2 ecm_{t-1} + \varepsilon_{2t} \quad (11)$$

where ecm_{t-1} is the lagged residual from the cointegration between y_t (say, expenditure) and x_t (revenue) in level. Granger (1988) points out that based on equation (10), the null hypothesis that x_t does not Granger cause y_t is rejected not only if the coefficients on the x_{t-j}, are jointly significantly different from zero, but also if the coefficient on ecm_{t-1} is significant. The VECM also provides for the finding that x_{t-j} Granger cause y_t, if ecm_{t-1} is significant even though the coefficients on x_{t-j} are not jointly significantly different from zero. Furthermore, the importance of α's and β's represent the short-term causal impact, while γ's gives the long-term impact. In determining whether y_t Granger cause x_t, the same principle applies with respect to equation (11). Above all, the significance of the error correction term indicates cointegration, and the negative value for γ's suggests that the model is stable and any deviation from equilibrium will be corrected in the long-run.

The results of estimating equations (10) and (11) are presented in Table 3. In our study, we attempt to determine whether revenues and expenditures among the municipalities in the state of Sabah are related and when these variables are related or exhibit long-term relationships, we would expect the estimated parameters of the error correction terms in equations (10) and (11) to be

significant. From the VECM results in Table 3, we present the t-statistics of the error correction term, $ecm_{1\ 1}$, where we can infer the long-term causality between the variables. The significance (at least one) of the error correction term implies cointegration or exhibits long-term relationships between revenue and expenditure. Generally, the results in Table 3 indicate that expenditure and revenue are cointegrated in 5 out of the 16 municipalities. These municipalities are Keningau, Kudat, Labuk and Sugut, Lahad Datu and Ranau. In all five cases, at least one error correction term is statistically significant at the 5 percent level in the two variable VAR systems. In other words, both these variables are bound together by the long-term relationship. Further, the significance of the error correction term (*ecm)* in the revenue equation supports the spend-and-tax hypothesis for Keningau, Kudat, Labuk and Sugut, and Ranau. On the other hand, the Lahad Datu Municipal supports the tax-and-spend hypothesis.

Table 3 Results of Long-term Causality from the VECM Models (VAR=2)

Municipals	Dependent variable	*t*-statistics of ecm_{t-1} in VECM model	
Beaufort	ΔExpenditure	-0.69	
	ΔRevenue	1.35	
Keningau	ΔExpenditure	0.57	
	ΔRevenue	3.15*	
Kota Belud	ΔExpenditure	-0.79	
	ΔRevenue	1.40	**1**
Kota Kinabalu	ΔExpenditure	-0.74	**3**
	ΔRevenue	0.84	
Kuala Penyu	ΔExpenditure	1.31	
	ΔRevenue	1.77	
Kudat	ΔExpenditure	0.71	
	ΔRevenue	1.97*	
Labuk and Sugut	ΔExpenditure	0.06	
	ΔRevenue	2.14*	

Lahad Datu	ΔExpenditure	-2.88*
	ΔRevenue	-1.22
Papar	ΔExpenditure	0.39
	ΔRevenue	1.16
Ranau	ΔExpenditure	-0.10
	ΔRevenue	2.14*
Sandakan	ΔExpenditure	-1.94
	ΔRevenue	0.76
Sipitang	ΔExpenditure	-0.88
	ΔRevenue	-0.27
Tambunan	ΔExpenditure	-1.67
	ΔRevenue	0.25
Tawau	ΔExpenditure	-1.21
	ΔRevenue	0.85
Tenom	ΔExpenditure	-1.89
	ΔRevenue	-1.82
Tuaran	ΔExpenditure	-1.21
	ΔRevenue	0.31

Notes: Asterisk (*) denotes statistical significance at the 5% level.

Further Analysis with GDP as a Third Variable

Studies on the tax-spend nexus have indicated that gross domestic product as a third variable in the analysis can reduce the problem of misspecification. Dalagamas (2000) has pointed out that omission of certain key macroeconomic variables will result in spurious regression problems. Payne (1997) has pointed out that the inclusion of other exogenous variables will give a better reflection of the effect of the overall conditions in the economy on the variables being analyzed. In his study on tax-spend nexus for Canada, not taking into account the gross domestic product (GDP) will lead to misspecification problems. Fuess et al. (2003) put forward that the interrelationship between government revenues

and expenditures is likely to differ depending on the inclusion of a third variable as a control variable. The rationale for including GDP as a third variable is that revenue and expenditure growth should be related to the overall conditions of the economy (see also Baghestani and McNown, 1994; Koren and Stiassny, 1998; Chang et al., 2002). In this study, we used Sabah's gross domestic product as proxy for the state of the economy.

Results of the tri-variate cointegration test using the Johansen-Juselius approach are presented in Table .4. The results clearly indicate that the null hypothesis of no cointegration between revenue and expenditure with the presence of a third variable can be rejected in 8 out of 16 cases. Municipalities that exhibit long-term relationships between revenue and expenditure, inferring from the trace test this includes Beaufort, Keningau, Kota Kinabalu, Kuala Penyu, Labut and Sugut (with two cointegrating vectors), Ranau, Tambunan and Tuaran. This is an improvement from the bi-variate case in Table 2.

Table 4 Results of Tri-variate Cointegration Tests (VAR=2)

Municipals	Null hypothesis	Trace test	L-max test
Beaufort	H_o: r = 0	38.61*	25.27
	H_o: r ≤ 1	13.34	9.36
	H_o: r ≤ 2	3.97	3.97
Keningau	H_o: r = 0	36.31*	27.04*
	H_o: r ≤ 1	9.26	6.78
	H_o: r ≤ 2	2.48	2.48
Kota Belud	H_o: r = 0	28.51	18.91
	H_o: r ≤ 1	9.59	5.94
	H_o: r ≤ 2	3.65	3.65
Kota Kinabalu	H_o: r = 0	47.31*	31.92*
	H_o: r ≤ 1	15.38	9.36
	H_o: r ≤ 2	6.02	6.02
Kuala Penyu	H_o: r = 0	37.12*	19.18
	H_o: r ≤ 1	17.93	12.67
	H_o: r ≤ 2	5.26	5.26
Kudat	H_o: r = 0	33.11	20.44
	H_o: r ≤ 1	12.67	9.86
	H_o: r ≤ 2	2.81	2.81
Labuk and Sugut	H_o: r = 0	44.53*	23.31
	H_o: r ≤ 1	21.21*	15.97
	H_o: r ≤ 2	5.24	5.24

Lahad Datu	H_o: r = 0	30.21	18.35
	H_o: r ≤ 1	11.86	9.77
	H_o: r ≤ 2	2.08	2.08
Papar	H_o: r = 0	24.13	13.70
	H_o: r ≤ 1	10.42	8.14
	H_o: r ≤ 2	2.28	2.28
Ranau	H_o: r = 0	34.06*	26.17
	H_o: r ≤ 1	7.88	6.77
	H_o: r ≤ 2	1.11	1.11
Sandakan	H_o: r = 0	27.35	16.29
	H_o: r ≤ 1	11.05	8.09
	H_o: r ≤ 2	2.96	2.96
Sipitang	H_o: r = 0	17.14	10.09
	H_o: r ≤ 1	7.05	4.77
	H_o: r ≤ 2	2.28	2.28
Tambunan	H_o: r = 0	47.24*	33.72*
	H_o: r ≤ 1	13.52	9.98
	H_o: r ≤ 2	3.53	3.53
Tawau	H_o: r = 0	29.74	17.77
	H_o: r ≤ 1	11.96	8.15
	H_o: r ≤ 2	3.81	3.81
Tenom	H_o: r = 0	19.29	12.71
	H_o: r ≤ 1	6.57	6.52
	H_o: r ≤ 2	0.04	0.04
Tuaran	H_o: r = 0	46.56*	38.31*
	H_o: r ≤ 1	8.24	7.96
	H_o: r ≤ 2	0.27	0.27

Notes: Asterisk (*) denotes statistical significance at the 1% level. Critical values are taken from MacKinnon et al. (1999).

On the other hand, Table 5 shows the results of estimating the vector error correction model for the tri-variate case. Interestingly, the results suggest that 13 out of 16 cases exhibit long-term relationships between revenue and expenditure in the state of Sabah. The VECM model indicates that at least one of the error correction terms is statistically significant at the 5 percent level. The only municipals that do not show any long-term relationship between revenue and expenditure are Kota Belud, Kudat and Sipitang, which is consistent with earlier results presented in Table 4.

As suggested by the results in Table 5, there are four competing tax-spend hypotheses derived by the models. The tax-and-spend hypothesis is supported by Papar, Sandakan, Tambunan, Tawau, Tenom and Tuaran. The spend-and- tax hypothesis is supported by Keningau, Lubuk and Sugut, Lahad Datu and Ranau. Fiscal synchronization is supported only by Kota Kinabalu. Lastly, the hypothesis that revenue and expenditure is independent of each other is supported by Beaufort and Kuala Penyu. These results are summarized in Table 6.

Table 5 Results of Long-term Causality from the VECM Models (VAR=2)

Municipals	Dependent variables	*t*-statistics of ecm term from VECM models:	
		$ecm1_{t-1}$	$ecm2_{t-1}$
Beaufort	ΔExpenditure	-1.14	-
	ΔRevenue	0.84	-
	ΔGDP	-2.61*	-
Keningau	ΔExpenditure	1.21	-
	ΔRevenue	4.24*	-
	ΔGDP	2.99*	-
Kota Belud	ΔExpenditure	-1.11	-
	ΔRevenue	1.07	-
	ΔGDP	-1.39	-
Kota Kinabalu	ΔExpenditure	2.78*	-
	ΔRevenue	5.73*	-
	ΔGDP	1.19	-
Kuala Penyu	ΔExpenditure	1.31	-
	ΔRevenue	1.68	-
	ΔGDP	-2.37*	-
Kudat	ΔExpenditure	-0.68	-
	ΔRevenue	0.68	-
	ΔGDP	-0.54	-
Labuk and Sugut	ΔExpenditure	-0.07	-0.64
	ΔRevenue	2.41*	-3.01*
	ΔGDP	-2.20*	1.34
Lahad Datu	ΔExpenditure	0.24	-
	ΔRevenue	2.59*	-
	ΔGDP	0.90	-
Papar	ΔExpenditure	-2.84*	-
	ΔRevenue	-1.67	-
	ΔGDP	-0.61	-

Ranau	ΔExpenditure	-0.13	-
	ΔRevenue	2.33*	-
	ΔGDP	-1.89	-
Sandakan	ΔExpenditure	-3.56*	-
	ΔRevenue	-1.26	-
	ΔGDP	-1.55	-
Sipitang	ΔExpenditure	1.30	-
	ΔRevenue	1.79	-
	ΔGDP	1.37	-
Tambunan	ΔExpenditure	-2.00*	-
	ΔRevenue	0.00	-
	ΔGDP	-1.87	-
Tawau	ΔExpenditure	-2.61*	-
	ΔRevenue	-0.60	-
	ΔGDP	-1.21	-
Tenom	ΔExpenditure	-2.09*	-
	ΔRevenue	-1.64	-
	ΔGDP	-2.15*	-
Tuaran	ΔExpenditure	-2.72*	-
	ΔRevenue	-0.52	-
	ΔGDP	-2.15*	-

Notes: Asterisk (*) denotes statistical significance at the 5% level.

Table 6 Results Summary for Tax-spend Nexus for the State of Sabah Municipalities

	Bi-variate model:		Tri-variate model:	
	Cointegration	Tax-spend hypotheses	Cointegration	Tax-spend hypotheses
Beaufort	no		yes	independent
Keningau	yes	spend-and-tax	yes	spend-and-tax
Kota Belud	no		no	
Kota Kinabalu	no		yes	fiscal synchronization
Kuala Penyu	no		yes	independent .
Kudat	yes	spend-and-tax	no	
Labuk and Sugut	yes	spend-and-tax	yes	spend-and-tax
Lahad Datu	yes	tax-and-spend	yes	spend-and-tax
Papar	no		yes	tax-and-spend
Ranau	yes	spend-and-tax	yes	spend-and-tax

Sandakan	no	-	yes	tax-and-spend
Sipitang	no	-	no	tax-and-spend
Tambunan	no	-	yes	tax-and-spend
Tawau	no	-	yes	tax-and-spend
Tenom	no	-	yes	tax-and-spend
Tenom	no	-	yes	tax-and-spend

Notes: Extracted from Tables 3 and 5.

CONCLUSION

The objective of the present study is to extend the literature on the tax-spend debate to a sample of municipalities in Sabah, one of the fourteen states in Malaysia. To test several hypotheses concerning the temporal relationship between revenues and expenditures, we utilize both the multivariate cointegration approach proposed by Johansen and Juselius (1990), and the error correction model approach proposed by Kremers et al. (1992) and Pesavento (2004).

Our more robust model, with inclusion of GDP as a third variable, suggests that the results are mixed. On one hand, municipals in Papar, Sandakan, Tambunan, Tawau, Tenom and Tuaran support the tax-and-spend hypothesis. This implies that these municipals decide first on the amount of tax to be collected and then decide on how much to spend. Under this scenario, these municipals should focus their attention on adjusting revenues in order to control spending and the size of budget deficits.

On the other hand, municipals in Keningau, Lubuk and Sugut, Lahad Datu and Ranau support the spend-and-tax hypothesis. This would imply that the fiscal authorities of these municipals decide to spend first and then increase tax collection to cover expenses. Under this scenario, the fiscal authorities of these municipalities should try to control spending in order to restore fiscal discipline and control the size of their fiscal deficits. Only Kota Kinabalu supports the fiscal synchronization hypothesis and implies that under this scenario, the fiscal authority of Kota Kinabalu should try to raise revenues and cut spending simultaneously in order to control budget deficits. On the other

hand, municipals in Beaufort and Kuala Penyu suggest that revenues and expenditures are not interrelated in the long-run. This implies that the independent determination of revenue and spending suggests the absence of coordination between expenditure and revenue decisions in the respective municipalities.

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