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The Effect of Economic Growth on Taxation Revenue: The Case of a Newly Industrialized Country

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The effects of economic growth on government tax revenue were investigated for Malaysia during the period of 1970-2009. Theoretically and empirically it has been shown that taxes affect the allocation of resources and often distort the economic growth. However finding of this study clearly shows that there is a unidirectional relationship between economic growth and total government tax revenue with 21% speed of adjustment in the short run to reach equilibrium level in the long run. Based on the finding, we highlight some of major issues that policymakers should consider for effective taxation policy formulation and implementation in line with the dynamic nature of the Malaysia economy.

1. Introduction

The role of taxation in influencing economic growth is not only a major concern of the economic policy makers, tax specialists and administrators but has long been of interest to academics. Indeed voluminous amount of studies have been devoted to explore the role and impact of taxation towards the economic growth performance. The researchers have theoretically and empirically attempted to see the nexus between these variables, further support the existence of significance relationship between tax and economic growth (Herfindahl, 1957, Karran, 1985, Easterly et al., 1994). From the previous literature the discussions of this relationship can be divided into two groups. The first focuses on the impact of tax policy on economic growth. In this discussion the impact of policy changes towards economic growth is examined (Poulson and Kaplan, 2008, Koch et al., 2005, Lee and Gordon, 2005) and it can be summarize that tax distortion will reduce the growth potential. In other words there are negative relationship between tax policy and economic growth. Second, the analyses focus on empirical examination on the relationship between tax revenue and economic growth and the nature of relationship can be negative, positive or neutral depending on how important the role of revenue as an economic resources. Referring to supply side hypotheses, higher rates of taxation inhibit economic activity and economic growth. The most prominent studies which support the supply side hypotheses are Marsden (1983) and Koester and Kormendi (1989). Results show that countries with higher rate of tax results with the lower growth rate. However in this study the later become our main focus. We aim to determine if there is any causal relationship exists between taxation revenue and economic growth. Does tax revenue lead economic growth or otherwise? The main reason for conducting a causality test is to ensure that there is a causal relationship between the two variables and to avoid spurious regressions and also for policy making purposes where it is important for understanding whether the impact is short run or long run. To the best of my knowledge, this is the first study to investigate the causal relationship

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between taxation revenue and economic growth in the Newly Industrialized Countries (NIC) specifically Malaysia. Therefore the result will provides insights into the question whether and how strong the relationship between these two variables. The rest of the paper is organized as follows: Section 2 presents the review of related literature; Section 3 describes the methodology used, while Section 4 includes the discussion of the results; and finally Section 5 is the conclusion part.

2. Literature Review

Neoclassical growth models determine the long term rate of growth of a country by the labor supply and its technical progress (Tobin, 1955, Solow, 1956). This model, therefore, does not include any reference to tax on economic growth. In addition, it is still uncertain on how tax policy can promote economic growth and stability (Herfindahl, 1957). However, tax is believed to affect a country's economic growth and should be considered in any economic growth model (Futagami et al., 1993, Barro and Sala-I-Martin, 1992). Therefore, in the endogenous growth theory the impact of tax is dependent on how other factors such as human capital are affected by the tax (Tanzi and Zee, 1997, Saint-Paul, 1992) and is included in the discussion. Economists have always believed that there is a connection between fiscal policies and economic growth. This connection has been thought to originate from various channels such as the negative effect of distortive tax on the performance of the economy (Tanzi and Zee, 1997).

Studies reveal that any changes in policy that lead to an increase in tax burden distort economic growth (Karran, 1985, Easterly et al., 1994, Kneller et al., 1999). As mentioned earlier supply side hypothesis has support the inverse relationship between tax and economic growth. Specifically, increases in the tax rate lead to a significant negative impact on economic growth. Second, the relationship between tax revenue and economic growth shows the positive association between these two. Any significant increase in tax income will have a positive impact on economic growth. A possible explanation is that an increase in tax revenue will boost the economy and prospective development. The tests on the relationship between the tax rate and economic growth have been extensively performed. The results show that economic development is the strongest determinant of tax growth. For instance Easterly et.al (1994) has shown how the distortion in tax structure affects the growth rate. Similarly Kneller et.al (1999) found evidence on how tax can affect the growth rate. It was found that a rise in income tax could lead to an increase in economic growth if the time preference is endogenously determined (Chang et al., 1999). In addition Chang et.al (1999) assumes that the government collects income tax revenue and transforms it into a productive public expenditure that has an effect on the economic growth.

An enormous amount of studies have examined how tax may encourage or discourage the long term economic growth rate (Padovano and Galli, 2002, Koch et al., 2005, Lee and Gordon, 2005). The reduction in growth is sometimes caused by the distortion tax where levels of tax policy change, whereas non-distortion tax will not affect the growth as the tax policy is stable. Padovano and Galli (2002) verified the robustness of the correlation between tax variables and growth by progressively including additional policy and control variables in the growth regression. Later, Lee and Gordon (2005) while exploring how tax policies affect a country's growth rate,

using cross-country data, found that any increment in tax rate leads to lower future economic growth. A similar finding was found by Koch et al. (2005) who, by using time series analysis for the period of 1960-2002, examined the implication of tax policy and economic growth by using a two-stage modeling technique. Findings reveal that the changes in economic growth are strongly associated with the changes in tax burden. In addition, they revealed that the impact of tax in developing economies is larger than in developed economies. Moreover taxes raise the cost or lower the return to the taxed activity. Results show that higher marginal tax rates have a negative impact on economic growth (Poulson and Kaplan, 2008).

A tour of literature suggests that changes in tax will distort economic growth. However, in terms of the connection of tax revenue and economic growth the results are totally different. A number of studies have empirically examined the nexus between tax in terms of revenue and economic growth. For instance, Karran (1985) found that economy and tax always grows together, and for that reason economic growth always has a positive/negative effect on tax. Any significant increases in revenue collection positively affect the economic growth and vice versa. The changes in tax by increasing the tax burden might affect the long term growth of the economy and might involve higher deficits in the future. Based on VAR methodology results show that net-tax increases often produce a positive although small and hardly significant output response (Castro and Cos, 2008). Most of the prior studies have found a positive relationship between tax and economic growth, but Reed (2008) has found a negative relationship between these two variables in US Compare to previous studies conducted in various part of the globe, this study have its own strength. Most recent Gordon and Li (2009) and Kuismanen and Kamppi (2010) again emphasize on the significant effect of fiscal policy on the economic activity. Therefore considering the significant impact of tax and economic growth we aim to identify the long run and short run relationship between tax revenue and economic performance for Malaysia using time series data for entire period of 4 decades employing the empirical approach. Though substantial amount of literatures has addresses this issues, the discussion in the developing context or NIC is scarce. Since these types of countries is progressing rapidly, the analysis of such analysis is important to help the government in policy formulation.

3. Data and Model Specification

This study gauges the empirical relationship between government revenue and economic growth. Yearly data was collected for the period 1970 to 2009 providing 40 observations. Most of the studies conducted to study the relationship of economic growth with any variables (Colombage, 2009, Koch et al., 2005, Soli et al., 2008, Karran, 1985, Hahn, 2008, Butkiewicz and Yanikkaya, 2005) used the Gross Domestic Product (GDP) as the measurement of economic growth. Similarly, this study utilizes GDP growth as a proxy of economic growth (EG) and the value of GDP (Base year 2000=100). To measure government tax revenue (TR), total tax revenue collection includes collection from direct tax and indirect tax revenues. Both data is directly obtained or compiled from Economic Reports from the Ministry of Finance Malaysia.

3.1 Unit Root Identification

Various time series techniques can be used in order to model the dynamic relationship between time series variables. However, it is important to determine the characteristics of the individual series before conducting further analysis. Therefore, unit root tests for stationary are examined on the levels and first differences for all variables using the most common unit root tests, which is the Augmented Dickey-Fuller (ADF) and the Philip-Perron tests (PP). In some circumstance, lack of power in both the ADF and PP tests is widely acknowledged the NG-Perron (NP) test will also be employed from Ng-Perron (2001). They propose a new test for unit root that has good size and power properties. NP stationary test also address the problem of sensitivity of unit root testing to choice of lag.

3.2 Long Run Co-Integration: Johansen Approach

Since the influential work of Granger and Newbold (1974) and Engle and Granger (1987) on the treatment of integrated time series data, many studies have been conducted using the co-integration methodology in order to avoid the spurious regression problems, particularly in causality testing. The purpose of co-integration test in this study is to examine whether economic growth and tax revenue share a common stochastic trend. We employ Johansen's (1988) and Johansen approach to determine whether any combinations of the variables are co-integrated. The procedure is based on the following vector autoregressive model:

$$Y_t = A_1 Y_{t-1} + \ldots\ldots\ldots A_p Y_{t-p} + BX_t + \varepsilon_t \qquad (1)$$

Where, $Y_{t\ is}$ a *k*-vector of non-stationary *I*(1) variables, X_t is a d-vector of deterministic variables, and ε_t is vector of white noises with zero mean and finite variance. Johansen and Juselius (1990) recommend the trace test and the maximum eigen-value t-statistics in making the inference of the number of co-integrating vectors. For the trace statistic, the test statistic for co-integration is formulated as follows:

$$\lambda_{Trace}(r) = -T\sum_{i=r+1}^{g} \ln(1-\hat{\lambda}_i) \qquad (2)$$

Where, T represents the sample size, r represent number of long run relationship exists, and λ represent the eigen-value. For trace statistic, the null hypothesis is the number of co-integrating vectors is less than equal to co-integrating vectors (r) against an unspecified alternative. Meanwhile, for maximum eigen-value statistic, the test statistics for co-integration is formulated as follows:

$$\lambda_{Max-eigen}(r+1) = -T\ln(1-\hat{\lambda}_i) \qquad (3)$$

In the case of maximum eigen-value co-integration test, the null hypothesis is the number of co-integrating vectors (r) against the alternative of r+1 (Ng et al., 2008)

3.3 Short Run Co-Integration: Vector Error Correction Model (VECM)

According to Engle-Granger (1987), if two time series are co-integrated then the VECM will represent them most efficiently. VECM specification represent in the following form:

$$\Delta Y_t = \sum_{n-1}^{p-1} \theta_i \Delta Y_{t-n} + \alpha\beta' Y_{t-1} + \varepsilon_t \qquad (4)$$

Where Y_t is a vector of endogenous variable, while θ_i and β' are respectively (nxn), (nxr) and (nxr), 0<r<n, matrices such that $\pi=\alpha\beta'$, the linear r combination of Y_t, the co-integrating vectors, $\beta' Y_t$, are interpreted as a deviation of equilibrium and α parameters measure the speed at which the variables in the system adjust to an equilibrium. Basically $\alpha \leq 1$ and the closer its value is to unity implies how strongly the dependent variable feeds back onto the system in the long run. In the case of this study, both variables are *I*(1) and co-integrated. Therefore, the VECM for this study can be derived as follows:

$$\Delta TR_t = \beta_0 + \beta_1 \gamma_{t-1} + \beta_2 \Delta TR_{t-1} + \sum_{i=0}^{n} \beta_3 \Delta EG_{t-1} + \varepsilon_t \qquad (5)$$

Where, γ_{t-1} refers to the residual error derived from the co-integrating vector. In this study, the lag 1 was selected on basis of minimum value of Akaike Information Criteria (AIC).

3.4 Causality Analysis

The deterministic components are selected using the Pantula principle suggested by Johansen (1992). The Pantula principle selected the co-integration equation with linear deterministic trend. Lag lengths in vector auto regression were selected using likelihood ratio test. Before testing the causality of the VECM, we will first examine the Granger causality test between tax revenue and economic growth to determine the short run causality. The Granger causality test or well known as 'joint F-test' between government tax revenue and economic growth can be written in the following forms:

$$\Delta TR_t = \beta_0 + \sum_{i=1}^{p-1} \beta_{xi} \Delta TR_{t-i} + \sum_{i=1}^{p-1} \beta_{xi} \Delta EG_{t-i} + \beta_x \gamma_{t-1} + \mu_t$$

$$\Delta EG_t = \gamma_0 + \sum_{i=1}^{p-1} \gamma_{yi} \Delta TR_{t-i} + \sum_{i=1}^{p-1} \gamma_{yi} \Delta EG_{t-i} + \gamma_y \gamma_{t-1} + \varepsilon_t \qquad (6)$$

4. Estimation Results

Table 1 presents the results of the ADF, PP and NG unit root tests. According to the results non-stationary of economic growth and tax revenue cannot be rejected in the levels. The results are consistent when an intercept and a linear trend are included as deterministic components in the test equation. Based on these statistics, the null hypothesis of unit root could not be rejected at the levels for both variables. However, stationary could be rejected at the first-difference, which implies that these series are integrated of order one, *I*(1). Once the variables are integrated with *I*(1), we proceeds with the Johansen co-integration test to determine whether there exists a long term relationship between these two variables. The trace and maximum eigen-value statistics are used to test the null hypothesis of no co-integration for these time series:

Table 1 ADF, PP and NG-Perron Stationary Result for

	ADF	PP	NG-Perron			
			MZ_{α}^{d}	MZ_{t}^{d}	MSB^{d}	MP_{T}^{d}
Without trend: *I*(0)						
EG	-1.63	-0.63	1.63	2.67	1.64	197.99
TR	-0.17	-0.21	1.35	1.30	0.96	69.34
Without trend: *I*(1)						
ΔEG	-7.55*	-7.80*	-23.85*	-3.45*	0.14*	1.03*
ΔTR	-5.18*	-5.20*	-21.74*	-3.27*	0.15*	1.22*
With trend and intercept: *I*(0)						
EG	-2.88	-2.93	-13.17	-2.52	0.19	7.18
TR	-1.53	-1.89	-4.23	-1.44	0.34	21.4
With trend and intercept: *I*(1)						
ΔEG	-7.49*	-7.77*	-23.73**	-3.44*	0.15*	3.86*
ΔTR	-5.17*	-5.17*	-22.28**	-3.33**	0.15**	4.11**

Note: * and ** denotes significance at the 1% and 5% level respectively. Both ADF and NG-Perron test is based on the selection of the Akaike Information Criterion (AIC) and PP is based on the Newey-West Bandwith Criterion.

Table 2 shows the summary of Johansen co-integration test results where both trace and maximum eigen-value statistics find that one co-integrating vector exists between tax revenue and economic growth. Therefore, we conclude that there is co-integrating vector between both variables, where both tests rejects the null hypothesis of no co-integration with one co-integrating vector.

Table 2 Johansen Test Results for Long Run Co-Integration

H_0	k=1,r=1			k=1,r=1		
	$\lambda_{Max-eigen}$	C.V (5%)	C.V (1%)	λ_{Trace}	C.V (5%)	C.V (1%)
r = 0	38.13*	15.89	20.16	47.05*	20.26	25.07
r ≤ 1	8.91	9.16	12.76	8.91	9.16	12.76

Note: The 'k' value represents the lag length criteria and 'r' value indicates number of co-integrating vector. * and ** denotes rejection of the hypothesis at 1% and 5% level respectively.

While, figure 1 indicates the long run co-integration relation between both variables for the entire period of 1970-2009. The graph clearly indicates an unstable mode of long run relation in the middle of 1980's and 1990's. This is not a surprising indication because most of the Asian countries have faced unstable economics performance in that particular period, thereby the tax revenue and economics growth were also affected directly from unstable monetary effects.

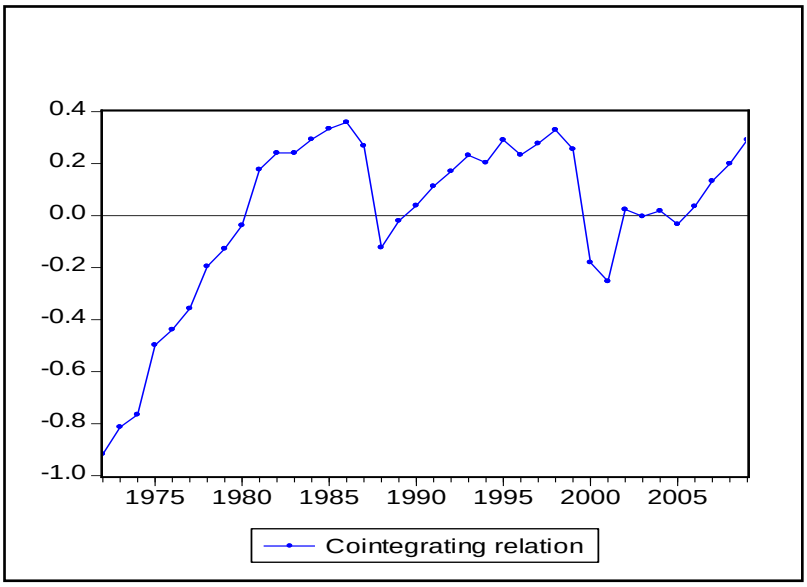

Figure 1 Long Run Co-Integration Relation

For further analysis, the VECM will be used to investigate the causality between tax revenue and economic growth. Since the series is co-integrated, the short run equation of the series can be determine using VECM, which represent symmetrical lag order. The VECM equation is as follows with the stability test results:

$$\Delta TR_t = 0.09 - 0.21\gamma_{t-1} + 0.19\Delta TR_{t-1} - 0.10\Delta EG_{t-1}$$

(0.02)	(0.05)	(0.14)	(0.14)
[3.48]*	[-3.58]*	[1.34]	[-0.69]

R-square = 0.36 Adj. R-square = 0.30 AIC = -3.75

$\chi^2_{\text{Hetero}} = 0.39(0.91)$ $\chi^2_{\text{Serial}}(2) = 0.59(0.55)$ $\chi^2_{\text{Normality}} = 1.48(0.47)$

All stability test conducted through VECM were also not indicates any chronic indication, therefore the estimated VECM is statically in a stable mode. The error correction term indicates that there is 21% of speeds of adjustment in short run to restore long run equilibrium level running from government tax revenue to economic growth in Malaysia. This is not a surprising indication because Malaysia is a developing nation mostly depends on tax revenue to reach sustainable economic growth. Meanwhile, all of the stability tests were also in a stable mode without any problem and there is no any structural breaks appeared using CUSUM test as well.

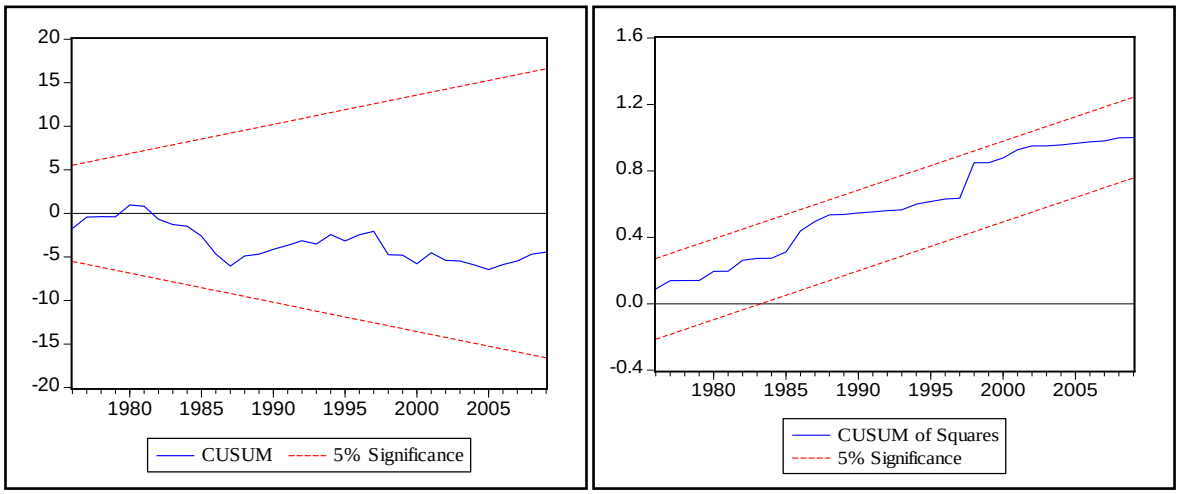

Figure 2 CUSUM and CUSUM Square

Table 3 indicates the short run causal relationship between economic growth and tax revenue using joint F-test approach with the error correction terms respectively. Based on the F-statistic values reported in table 3 shows that, economic growth does not Granger cause tax revenue and the null is accepted. On the other hand, the Granger cause hypothesis of tax revenue and economic growth has been rejected with 10% significant level. Therefore, the findings of this study imply that there is a unidirectional relationship between government tax revenue and economic growth in Malaysia.

Table 3 Causality Tests between Government Tax Revenue and Economic Growth

	F-value	Hypothesis	ECT (t-statistics)
ΔEG →ΔTR	3.05 (0.08)***	Reject	-0.21 [-3.48]*
ΔTR →ΔEG	0.48 (0.49)	Accept	-0.04 [-0.99]

Note: *, ** and *** Denotes significant at 1%, 5% and 10% level. Figures in ( ) and [ ] indicates p-values and t-values respectively.

Table 4 presents the results of variance decompositions (VD) for government tax revenue and economic growth. The forecast error variance of government tax revenue due to economic growth is relatively low. For instant, in the first 5 years, the forecast error variance of tax revenue due to economic growth increases from 0.28% to 11.32%. For the same period, the forecast error variance of economic growth due to government tax revenue increases from 0.15% to 24.66%. Furthermore, after tenth year, the forecast error of government tax revenue attributed to economic growth increases further to a larger elasticity of 37.56%, while the forecast error of economic growth attributed to government tax revenue declines further to 20.28%. In summary, the statistical results of the forecast error variance suggest that the feedback government tax revenue to economic growth is relatively stronger and consistent with the long run and short run elasticity findings in the previous section.

Table 4 Results of Forecast Error Variance Decompositions (VD)

Period	VD of TR		VD of EG	
	TR	EG	TR	EG
1	100.00	0.00	0.15	99.84
2	99.71	0.28	19.34	80.65
3	97.86	2.13	23.50	76.49
4	94.08	5.91	24.92	75.07
5	88.67	11.32	24.66	75.33
6	82.56	17.43	23.86	76.13
7	76.60	23.39	22.91	77.08
8	71.21	28.78	21.96	78.03
9	66.50	33.49	21.07	78.92
10	62.43	37.56	20.28	79.71

Note: Cholesky ordering: TR, EG

5. Conclusions

This paper attempts to determine the role of economic growth in fostering government tax revenue in Malaysia and the causal behavior of movement of income tax and economic growth both in the long and short run. In fact it is worthwhile to conduct an empirical test to observe the time related nature of the relationship between revenue collection and growth in order to see the direction of movement of these so called two components of government fiscal policy. The determination of the causal ordering between these two macroeconomic aggregates is vital to ensure a sharpening of tax policy and the effectiveness of fund management for expenditure (Taha and Loganathan, 2008). Based on the analysis, unlike other studies (Karran, 1985, Poulson and Kaplan, 2008) the results show that changes in taxation does not have any impact on economic growth. Therefore a result of this study does not support the supply-side hypothesis which emphasizes the effect of tax towards economic growth. However the strong growth performance helps to boost up the tax revenue collection. Economic stability in the long run and short run cause on positive relationship between both variables. Both LR and SR relationship appeared in this study. There are several ways to extend the study. First we have focused on the total revenue and GDP. However, it is known that the composition of taxation changes with development. Therefore considering the decomposition of revenue such as direct tax, indirect tax and non tax revenue may provide meaningful results. Further by expand the analysis to cover other developing Asia will give a clear picture on the results for other countries for comparison purposes.

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