Does Wagner's Law or the Keynesian Paradigm Hold in the Case of Malaysia?

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The objective of this paper is to establish whether the Malaysian government expenditure obeys Wagner's law or is endogenously responding to the macroeconomic situation in a Keynesian counter-cyclical fashion generally based on the experience of the past decade. Cointegration and Granger causality techniques as embodied in error correction modelling have been relied upon to analyze long- and short-run behavioral relationships between government expenditure normalized by real GDP and real GDP. The results of the study dismiss the relevance of Wagner's law in favor of Keynesian doctrine in relation to the Malaysian governments expenditure behavior. This is broadly consistent with casual observations as beginning from the end of the 1980s until the aftermath of the 1997 East Asian financial turmoil, Malaysia was generally maintaining a conservative fiscal policy as its economy was then sustaining an average annual growth rate of 8%. However, as the Malaysian economy plunged into a recession in the aftermath of the East Asian financial meltdown followed by a lackluster global economy, Malaysia started turning on the fiscal tap.

1. Overview

The purpose of this paper is to explore for the possible existence of long-run and short-run relationships between public expenditure (be it total, operating or development expenditure) and national income in the contexts of Wagner's law and the Keynesian paradigm. From the perspective of Wagner's law, public expenditure would grow in tandem with national income. This implies that causality would run from national income to public expenditure. The long-run tendency of public expenditure to grow relative to national income has also been perceived, relating the scale of

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government activity to economic development (Atkinson & Stiglitz, 1980; Henrekson, 1990). In contrast, the Keynesian doctrine regards fiscal policy as an instrument for macroeconomic stabilization. However, it may be appropriate empirically to treat public expenditure as an endogenous variable and to expect an inverse relationship between government expenditure and income. This may be particularly so if public sector expenditure responds passively to national income movements, with the quantum of expenditure set counter-cyclically in the Keynesian spirit to macroeconomic condition.

Cross-country and individual country studies on the relationship between public expenditure and national income based on data of annual and quarterly frequencies have yielded mixed results (see e.g. Bird, 1970; Mann, 1980; Sahni & Singh, 1984; Ram, 1986, 1987; Ansari, 1993; Oxley, 1994; Lin,1995; Ahsan, et.al, 1996; Biswal, et.al, 1999; Islam, 2001; Islam, 2001). With respect to Malaysia however, there is no known previous study that involved the use of econometric techniques on the scale of sophistication as in this paper such as the cointegration and Granger causality techniques. A notable past study on Malaysia is by Salleh and Rani (1991). They merely applied the Ordinary Least Squares technique to data over the period, 1963-86 without examining the stationarity properties of the data and concluded that Wagner's law holds in Malaysia.

The sample period of this study spans from 1991Q1 to 2002Q3 as officially reliable quarterly nominal and real GDP figures are only available since 1991. Public expenditure herein refers to that of the federal government as the overall public sector expenditure data are only available on an annual basis. However this should not materially affect the inferences drawn here as national economic development and stability considerations are within the purview of the federal government rather than provincial or state governments. This study may be of academic interest given that Malaysia has gained the acclaim of some economists as one of the most successfully managed developing economies.

The rest of this paper is configured as follows. Section II provides a brief review of the literature. Section III describes the empirical framework and the methodology employed in general. Empirical estimates and analyses are contained in Section IV and concluding remarks made in Section 5.

2. Theoretical Underpinnings

A generalized hypothesis on the positive long-run relationship between the level of economic development and the magnitude of the government sector was first formulated by Adolph Wagner, a German economist towards the end of the 19th century. Wagner formulated the 'law of expanding state expenditures' relating to the burgeoning significance of government activity and expenditure as an inevitable consequence of a progressive state (Bird,1971). In an industrializing nation as per capita income surges, the relative importance of the public sector would grow as it expands at a faster pace than the economy. Wagner cited three main factors contributing to this phenomenon. First, the administrative and protective functions of a state would extend with population density and urbanization in order to maintain efficient functioning of the economy, public order and security. Second, demand for public services such as education and other socioeconomic and cultural services is poised for a rise with an income elasticity exceeding unity. And third, the need for the state to embark upon large-scale capital spending in order to meet the technological requirements of an industrialized society. Wagner's law is often regarded as a long-term phenomenon, generally expected to prevail during the industrialization phase of an economy. In the case of Malaysia, the momentum of industrialization gathered pace after the mid 1980s when more aggressive industrial policies began to be pursued.

The depression of the 1930s was generally perceived as a blatant failure of the market economy and laissez-faire that demanded greater state intervention (Tanzi & Schuknecht, 2000). It witnessed the adoption of expansionary fiscal policies in the spirit of Keynes. Social security systems though rudimentary were instituted in many European countries by the late 1920s. Massive spending on the unemployed and on public works for employment generation was observed. In fact, the post WWII period particularly from 1960 to 1980 saw an unprecedented preference for active expenditure policies amongst governments with rapid intensification of government participation in the economy. Macroeconomic stabilization a la Keynes is predicated upon the belief that the application of demand management policy could dampen business cycles and unemployment. The 1960s and 1970s were the heyday of Keynesianism indeed and corresponded with the period when governments were popularly regarded efficient in discharging their allo-cative, distributive and stabilization functions.

3. Empirical Specification and Methodology

The long-run relationship between government expenditure and gross domestic product in the context of the hypotheses to be evaluated may be specified as follows:

$$\ln G_t = \alpha + \beta \ln Y_t + \varepsilon_t \qquad (1)$$

where G refers to real government expenditure normalized by real gross domestic product (GDP), Y the real GDP, α the constant and ε the error term. The operation of Wagner's law in Malaysia would be confirmed if $\beta > 0$. On the other hand, $\beta > 0$ could imply adherence to the Keynesian notion.

Prior to assessing relationships amongst variables based upon the concept of cointegration, their orders of integration have to be examined. Cointegration acknowledges the possibility that though a unit root may be present in individual time series, a linear combination amongst them may not display any unit root behavior. Economic time series are typically integrated of order one, I(1) which implies that their non stationarity is typically stochastic rather than deterministic. They can be rendered stationary by first differencing. The Dickey-Fuller based approach for unit root testing involves running the following univariate regression:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{i=1}^{n} \varphi_i \Delta y_{t-i} + \mu_t \qquad (2)$$

where y_t is the natural logarithm of the variable of interest and μ_t is a white noise stationary error term. Equation (2) may be augmented by a deterministic trend term if y_t is trended. If y_t is non stationary, α_1 assumes a value zero and y_t is deemed to have a unit root. The null hypothesis that $\alpha_1 = 0$ can be tested by referring to its usual *t*-statistic computed as the ratio of α_1 to its estimated standard error. This statistic has been formally termed in this application as the Augmented Dickey-Fuller (ADF) statistic. However its distribution does not follow the usual student's t and its approximate critical values are originally found in Fuller (1976). The optimal lag length (n) can be identified based on the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). If n=0, the t-value is referred to merely as the Dickey-Fuller (DF) statistic though its critical values are similar to cases requiring augmentation.

Equation (2) is just designed for testing whether a series is I(1) or I(0) though an I(1) outcome need not suggest that the series is inherently I(1). However, in the implementation of the test, the possibility that the series is integrated of higher order is also explored along the lines of Dickey & Pantula (1988). In this paper, it is assumed that the order of integration of each series is at most 2.

However, the distribution theory that underlies the Dickey-Fuller tests assumes statistical independence of errors with constant variance. Thus if such methodology is applied, it must be ensured that the error terms are uncorrelated with constant variance. In view of this, a generalization of the Dickey-Fuller approach that allows for the presence of unknown forms of autocorrelation and conditional heteroskedasticity in the error term was developed by

Phillips and Perron (1998). Thus the disturbance term need not be serially uncorrelated or homogenous in the course of unit root testing. Akin to the Dickey-Fuller test, the null hypothesis associated with the Phillips-Perron test is that the series follows a random walk. The Phillips-Perron procedure involves making a non parametric correction to the simple ADF statistic. Critical values for the Phillips-Perron statistic which may be referred to as the Modified ADF statistic are similar to those for the Dickey-Fuller test. The regression equation involved is essentially the same as that of ADF test except in one respect that the trend term included is centred in the case of a trended variable.

Nevertheless, macroeconomic variables may not be characterized by unit root but instead by trend stationary processes with structural breaks (Perron, 1989). If structural breaks do exist, the Dickey-Fuller and Phillips-Perron test statistics are biased towards acceptance of the unit root hypothesis. A formal approach to unit root testing in case of a structural break in the data series was developed by Perron (1989). The unit root test for a series that takes into consideration a possible structural break at time involves estimating the following equation:

$$\Delta y_t = \alpha_0 + \mu_t D_L + \mu_2 D_P + \alpha_1 y_{t-1} + \alpha_2 t + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \varepsilon_t \tag{3}$$

where the pulse dummy variable (D_P) that takes a value of 1 at time $\tau + 1$ and zero otherwise while the level dummy variable (D_L) assumes value of 1 beginning in $\tau + 1$ and zero otherwise.

Under the presumption of a one-time change in the mean of a unit root process, $\alpha_1 = 0$, $\alpha_2 = 0$ and $\mu_2 = 0$ while under the alternative hypothesis of a permanent one-time break in the trend-stationary model, $\alpha_1 < 0$ and $\mu_1 = 0$. The appropriate lag length (k) is determined based on the t-tests of coefficients β_i's. The lag length k is selected if the t-statistic on β_k exceeds 1.6 in absolute terms and the t-statistic on β_i for i > k is below 1.6. The t-statistic for the null hypothesis $\alpha_1 = 0$ can be compared against the critical values calculated by Perron under varied assumptions on the proportion of observations occurring prior to the break ($\lambda = \tau/L$) where L is the total number of observations. If the t-statistic exceeds the critical value, the null hypothesis of a unit root can be rejected.

The Johansen maximum likelihood procedure of testing for cointegration is preferred to the Engle-Granger method as the latter may not yield a definitive conclusion with regard to cointegration between two variables. It is often the case that while cointegration is suggested to exist between two variables in a regression of one variable on the other, a reverse regression between them would yield an opposite conclusion. This problem does not arise with the maximum likelihood procedure. It permits simultaneous estimation of systems involving two or more variables and regards all variables in a model as endogenous within a vector autoregression (VAR) framework. Generally, it allows estimation and testing for the presence of one or more cointegrating vectors in a multivariate system.

The procedure departs from the following standard vector autoregression (Cuthbertson, et.al, 1992):

$$X_t = \Pi_1 X_{t-1} + \ldots\ldots + \Pi_k X_{t-k} + e_t \qquad (4)$$

where X is an Nx1 vector of I(1) variables and Π_k is an NxN matrix of parameters. Reparameterization of the system of equations (4) in an ECM form yields the following:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \ldots\ldots + \Gamma_{k-1} \Delta X_{t-(k-1)} + \Gamma_k X_{t-k} + e_t \qquad (5)$$

where $\Gamma_i = -(I - \Pi_1 - \ldots\ldots - \Pi_i)$ $i = 1, \ldots\ldots, k$

The long-run (levels) relationship amongst the variables in the VAR is embodied in Γ_k. By virtue that X_t is a vector of I(1) variables, the left-hand side and the first k-1 terms of (5) must be I(0) while the last represents a linear combination of I(1) variables.

All possible distinct combinations of the levels of X that yield high correlations with the I(0) elements in (5) are then estimated. These combinations are referred to as the cointegrating vectors.

The rank of the matrix Γ_k is determined by the number of cointegrating vectors, r, amongst the elements of X. There are three possible scenarios subject to the rank of Γ_k. If Γ_k is of full rank N, the matrix is then stationary and by implication, the elements in vector X are not I(1). On the other hand, if its rank is zero, then all the individual variables in X are (1) but not cointegrated. However if its rank, r is greater than zero but less than N, then there exist r cointegrating vectors which are identifiable and can be incorporated into an error correction model.

The two statistics that may be used to test for the presence of cointegrating vectors are the λ_{max} and the λ_{trace} statistics. The former is for testing the null hypothesis that the number of cointegrating vectors is r against the alternative of (r+1), while the latter for testing the null hypothesis that the number of distinct characteristic roots is less than or equal to r against a general alternative. Johansen and Juselius (1990) provide the critical values of these test statistics. These statistics have a χ^2 distribution with degrees of freedom, (N-r) where N refers to the total number of observations and r to the value of the rank under the null hypothesis.

If cointegration exists, there can be no systematic divergence amongst the variables from some long-run equilibrium relationships. Cointegration constitutes a sufficient condition for causality. Hence if variables are cointegrated, then either unidirectional or bidirectional Granger causality relationship must exist between them. In a two variable (say Y and Z) system that is akin to (5), if the error correction term formulated based on an estimated cointegrating vector is statistically significant in the ΔZ equation, then Y is said to Granger cause Z. Similarly, statistical significance of the error correction term in the ΔY equation would imply Z Granger causing Y. Bidirectional causality arises when the error correction term is statistically significant in both equations.

In case of non cointegration, then the standard Granger causality test may be conducted by modeling the short run dynamics in a VAR framework without the inclusion of any correction term as variables may be causally related in the short though not in the long run.

4. Empirical Estimates and Analyses

Table I presents three sets of unit root test statistics, namely the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Perron (1989). With respect to the ADF test statistics, it is interesting to note that both the Akaike Information and the Schwarz Bayesian criteria for optimal lag length selection yield consistent results about the order of integration of the variables. Real GDP (Y) and real government expenditure based on total (TG), operating (OG) and development (DG) expenditures are found to be I(1). In the case of the Phillips-Perron tests however, only real GDP can be regarded as I(1) while the real government expenditures are I(0). Despite allowing for a possible structural change from the 4th quarter of 1998, real GDP and real government expenditures seem to have a unit root as indicated by the Perron statistics. It has thus turned out that there was no structural change as perceived. Hence the different test procedures have yielded mixed results with regard to the order of integration. Nevertheless, it may not be inappropriate to treat all the variables as I(1) given that they have at least two out of three statistics indicating that they have a unit root.

Results pertaining to cointegration analysis and error-correction modelling are furnished in Table II. Except development expenditure, both Akaike Information and Schwarz Bayesian criteria suggest adequacy of setting the order of VAR to 1. Generally, there exists cointegration between real government expenditure and real GDP. The estimated cointegrating vectors indicate a negative long run relationship between real government expenditure variously defined and real GDP, thus dismissing Wagner's law in favor of the Keynesian perspective on macroeconomic management. Whilst, the modified Granger causality test suggests causality running uni-directionally from real GDP to government expenditure in the short run. Henceforth, the results generally suggest the active pursuit of Keynesian demand management strategy by the Malaysian government over the last decade or so. This is in fact broadly consistent with casual observations.

5. Concluding Remarks

The purpose of this paper is to establish econometrically whether the Malaysian government expenditure behavior has been consistent with Wagner's law or the Keynesian paradigm based generally on the experience over the previous decade. Cointegration and error correction modelling techniques have been employed to analyze the behavioral relationship over long and short runs between government expenditure normalized by real GDP and real GDP. The results of the study rule out the relevance of Wagner's law in favor of Keynesian doctrine in explaining government expenditure movements in Malaysia. This is broadly consistent with casual observations as towards the end of the 1980s until the aftermath of the 1997 East Asian financial crisis, the Malaysian government was generally maintaining a tight fiscal discipline in the wake of an average annual growth rate of 8% sustained by the Malaysian economy. Maintaining low external debt and debt prepayments were the order of the day. However, the recessionary force unleashed by the East Asian financial debacle and the subsequent period of lackluster performance of the global economy forced the government to resort to pump-priming.

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Table 1 Unit Root Tests

	Levels [4]	1st Difference	2nd Difference
ADF 2			
Real GDP (Y)	-2.364 (-2.364)	-3.046* (-3.046*)	-4.329*(-4.329*)
Normalized Real Government Expenditure (G)[1]			
Total	-2.324 (-3.356)	-6.590* (-9.436*)	-6.678*(-6.678*)
Operating	-3.335 (-3.335)	-5.059* (-6.922*)	-7.407*(-7.407*)
Development	-1.995 (-1.995)	-9.633* (-9.633*)	-5.485*(-8.886*)
Phillips-Perron2			
Real GDP (Y)	-2.682	-19.506*	-16.907*
Normalized Real Government Expenditure (G)[1]			
Total	-3.966*	-9.677*	-12.379*
Operating	-3.509*	-11.409*	-14.337*
Development	-4.106*	-14.434*	-15.775*
Perron3			
Real GDP (Y)	1.228	-	-
Normalized Real Government Expenditure (G)[1]			
Total	-0.441	-	-
Operating	-0.363	-	-
Development	-1.629	-	-

1. Deseasonalized as deterministic seasonals are present in the original series.
2. The 5% critical values for 50 and 100 observations are -3.50 and -3.45 respectively.
3. λ is about 0.6. The 5% critical value for $\lambda = 0.6$ (0.7) is -3.76 (-3.80) while the 10% critical value is -3.47 (-3.51).
4. Estimated with a time trend included.

* Null hypothesis of unit root can be rejected.

( ) Based on Schwarz Bayesian Criterion.

Table 2 Cointegration and Causality Tests

Variables	Cointegrating Vector	Order of VAR	Error Correction-Based Causality Tests***
TG vs Y	TG = -1.878Y + 0.026T (0.461) (0.007)	1*	Y → TG
OG vs Y	OG = -1.530Y + 0.017T (0.417) (0.006)	1*	Y → OG
DG vs Y	DG = -2.222Y + 0.042T (0.646) (0.009)	1**	Y → DG

Figures in parentheses refer to the asymptotic standard error.

* Based on AIC and SBC.

** Based on AIC. SBC suggests an optimal order of VAR of 3. However no cointegration is found based on this order.

*** Based upon 5% statistical significance level.