Government Expenditures and Economic Growth: A Cointegration Analysis for Thailand under the Floating Exchange Rate Regime

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Abstract

Contributing to the controversial issue of the impact of government spending on economic growth, this paper shows that government spending has a long-run impact in stimulating aggregate output in Thailand during the floating exchange rate regime. The results reveal that the long-run relationship between aggregate output, government expenditures, and private consumption is stable. Based on the quarterly dataset from1997Q3 to 2019Q4, the results suggest that expansionary fiscal policy is effective under the floating exchange rate regime. Furthermore, the traditional version of Wagner's law is supported since an expansion in aggregate output causes government expenditure to increase. Therefore, the findings in this paper support both the Keynesian hypothesis and Wagner's law.

Keywords: Government expenditures, real GDP, cointegration, causality

JEL classification: C22, E52, E62

1. Introduction

Previous empirical studies find mixed results of the impact of government expenditures on economic growth. Some researchers find evidence that supports the Keynesian hypothesis, i.e., government spending stimulates growth (Ram, 1986; Aschauer, 1989; Holmes and Hutton, 1990, and Devarajan et al. 1996). Other researchers find a negative impact of government expenditures on growth (Barro, 1990; Miller and Russek, 1997). Contrary to the Keynesian view, the traditional version of Wagner law posits that an increase in real GDP will cause government expenditures to increase and vice versa (e.g. Peacock and Wiseman, 1961). Wagner's law has been examined by some researchers. This law postulates that the share of government spending in output increase with the level of development of each country. This law is rejected by Holmes and Hutton (1990). However, Oxley (1994) finds unidirectional causality running from economic growth to government expenditure in Britain during 1870 and 1913, and this finding supports Wagner's law. Antonis et al. (2013) find that Wagner's law holds for the Greek economy. However, Biswal et al. (1999) find that both Wagner's law and Keynesian hypothesis are supported when GDP and broad aggregate expenditure data are used. Chang et al. (2004) re-examine the validity of this law for ten countries. They find that there is unidirectional causality from income to government expenditure in five countries (including the U. S. and the U. K.), and no causality in the remaining five countries. Kumar et al. (2012) find that aggregate output causes the share of government expenditure in the long run for New Zealand. Some researchers find that the relationship between government expenditures or government size and output is nonlinear or government spending has an asymmetric impact on output (e.g. Chistie, 2014, and

Asimakopoulos and Karavias, 2016, among others). These studies fail to find this relationship when linear cointegration and causality tests are used.

Recently, Dudzeviute et al. (2018) examine the impact of government expenditure on economic growth in the European Union countries and find mixed results, i.e., government expenditure causes economic growth in eight EU countries, but economic growth causes government expenditures in other EU countries. Paparas et al. (2019) find bidirectional causality between government expenditure and economic growth for the U. K. and conclude that both Wagner's law and Keynesian hypothesis are supported. Ali and Zakaria (2019) find that the law does not hold for Kuwait. More recently, Ghazy et al. (2021) find that Wagner's law holds for Egypt.

Besides the role of government spending or government size, money is a key determinant of output. A positive money-output relationship is evidenced because money has explanatory power over output (Hafer and Kutan, 1997; Cariani, 2012; Shi et al. 2016). This money-output relationship is also controversial since some researchers find that there is a weak or no relationship between money and output (Hayo, 1999; Berger and Osterholm, 2009; Kichian, 2012).

The motivation of this paper is based on the notion that the efficacy of fiscal policy, particularly government expenditures, can depend on exchange rate regimes. Recent results found by Ilzetzky et al. (2013) are consistent with the Mundell-Fleming model proposed by Mundell (1963) and Fleming (1962), which predicts that expansionary fiscal policy is effective in stimulating aggregate output under predetermined exchange rate regime, but ineffective under floating exchange rate regime. The residual-based test for cointegration with an unknown breakpoint of Gregory and Hansen (1996) is employed to investigate whether aggregate government spending has explanatory power over output during the floating exchange rate regime in Thailand. This paper contributes to the existing literature in that it provides the results showing that government expenditures and private consumption can exert a positive effect on real GDP in the long run. The results also support Wagner's law since real GDP causes government spending to expand in the long run.

This paper is organized as the followings. Section 2 describes the data and estimation methods employed in the analysis. Section 3 presents empirical results and the last section concludes.

2. Data and Methodology

2.1. Data

Quarterly data from 1997Q3 to 2019Q4 are used, which is the period when Thailand adopted the floating exchange rate regime. The data for real GDP (Y) and real government expenditures (G), real private consumption expenditures (C) are obtained from the Office of Economic and Social Development Board, the broad money supply is obtained from the Bank of Thailand and the consumer price index series is obtained from the Ministry of Commerce. The broad money supply is deflated by the consumer price index to obtain the real money supply (M). The series are seasonally adjusted and transformed into logarithmic series.

2.2. Empirical Methodology

2.2.1. Cointegration Analysis

In the long-run analysis, a residual-based test for cointegration proposed by Gregory and Hansen (1996), which is based on Engle and Granger's (1987) cointegration test is used to detect the long-run relationship between variables in the model with an unknown level shift. The long-run relationship with an unknown structural break can be expressed as:

$$Y_t = b_{01} + b_{11}G_t + b_{21}Z_t + b_{31}D_t + e_{1t} \tag{1}$$

where Y_t is the log of real GDP, G_t is the log of real government expenditures, Z_t is the log of real money supply (M_t) or real private consumption (C_t). Private consumption is chosen because there is evidence showing that private consumption and GDP are cointegrated (Hong and Lim Choon Seng, 2019). The models will contain an unknown level shift (D_t), which is determined by the data. Eq. (1) is used to test the Keynesian view.

For testing Wagner's law, the model is expressed as:

$$G_t = b_{02} + b_{12}Y_t + b_{22}C_t + b_{23}D_t + e_{2t} \tag{2}$$

The equation used to test for cointegration between variables in the models can be expressed as:

$$\Delta e_{it} = a_0 + a_1 e_{it-1} + u_t \tag{3}$$

where e_{it} is the residual series obtained from the estimate of Eqs. (1) and (2). For the existence of cointegration of the three variables, the t-statistic of a_1 should be negative and has an absolute value larger than the 5% critical value. The computed t-statistic is ADF* statistic.

2.2.2. Short-run Dynamics

When cointegration between government spending, aggregate output, and another variable is found, the adjustment towards the long-run equilibrium can be analyzed by the error-correction model (ECM). Due to the relatively small sample size, a parsimonious ECM can be selected. The ECM is expressed as:

$$\Delta Y_t = \alpha_1 + \lambda_1 e_{1t-1} + \beta_1 \Delta Y_{t-1} + \gamma_1 \Delta G_{t-1} + \delta_1 \Delta Z_{t-1} + v_{1t} \tag{4}$$

and

$$\Delta G_t = \alpha + \lambda_2 e_{2t-1} + \beta_2 \Delta G_{t-1} + \gamma_2 \Delta Y_{t-1} + \delta_2 \Delta C_{t-1} + v_{2t} \tag{5}$$

where e_{it-1} is the error correction term (ETC). The coefficient, λ_i, is the speed of adjustment toward long-run equilibrium. Eqs. (4) and (5) can be used to test for both long-run and short-run causality (Granger, 1988).

3. Empirical Results

The residual-based test for cointegration requires that the variables be integrated of order one, or I(1) series. These I(1) series must be non-stationary in level, but stationary in first difference. Therefore, the unit root tests for the stationarity property of the data are necessary.

Table 1 ADF tests for unit root.

Variable	ADF statistic
Y (Real GDP)	-1.608 [7]
	(0.474)
ΔY	-5.721 [3]
	(0.000)
G (Government spending)	-0.849 {4]
	(0.799)
ΔG	-6.547 [3]
	(0.000)
M (Real money supply)	-1.023 [4]
	(0.997)
ΔM	-3.553 [3]
	(0.000)
C (Private consumption)	-1.200 [0]
	-0.081
ΔC	-5.594 [1]
	(0.000)

Note: The number in parenthesis is the p-value, and the number in the bracket is the optimal lag length.

The results of the Augmented Dickey-Fuller (ADF) tests reveal that all series are nonstationary in level, but they are stationary in first difference. Therefore, these series are integrated of order 1, or they are I(1) series.

The next step is to estimate the long-run equation using Gregory and Hansen's (1996) procedure with a level shift in the model. By letting Z_t be M_t as specified by Jiranyakul and Brahmasrene (2007). The ADF* statistic is -5.27 and the 5% critical value is -4.92. Since the absolute value of the test statistic is larger than the absolute value of the critical value, real GDP is cointegrated with government spending and real money supply. However, the coefficient of the ETC has a correct negative sign but is not significant, -0.083 (p-value=0.113). Therefore, the estimated long-run equilibrium relationship is not stable and thus any inference cannot be made. When letting Z_t be C_t, cointegration is found because the absolute value of the estimated ADF* statistic = -5.09 is larger than that of the 5% critical value.

The results of the estimated long-run relationship and the parsimonious ECM are shown in Tables 2 and 3.

Table 2 Long-run relationship between government expenditures, private consumption, and real GDP.

Dependent variable: Y_t

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	1.206***	0.114	10.617	0.000
G_t	0.286***	0.025	11.463	0.000
C_t	0.682***	0.034	19.875	0.000
D_t	0.031***	0.007	4.383	0.000
$R^2 = 0.994$, $F = 4713.227$				

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

The results show that an increase in government spending by 1% leads to an increase in real GDP by 0.29%, and vice versa. Similarly, an increase in private consumption leads to an increase in real GDP by 0.68%, and vice versa. These impacts are significant at the 1% level. The coefficient of the dummy variable is significantly positive with a small value. This indicates that structural break slightly strengthens the long-run relationship.

For short-run dynamics, the estimate of Eq. (4) gives the results shown in Table 3.

Table 3 Short-run dynamics.

Dependent variable: ΔY_t

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	0.009***	0.002	4.053	0.000
e_{1t-1}	-0.428***	0.122	-3.495	0.000
ΔY_{t-1}	-0.212	0.169	-1.258	0.212
ΔG_{t-1}	-0.050	0.063	-0.785	0.435
ΔC_{t-1}	0.156	0.230	0.677	0.500
Adj. $R^2 = 0.214$, $F = 5.667$				

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

The coefficient of the ETC (e_{1t-1}) has a minus sign with an absolute value of less than 1. This coefficient is significant at the 1% level. The value of -0.428 indicates that previous disequilibrium from the long-run equation will be corrected at a speed of 42.8% per quarter. For a one-period lagged change in government expenditures, its coefficient is insignificant. This implies that an increase in this variable does not cause economic growth in the short run. Similarly, the coefficient of lagged real consumption growth is negative, but not significant. Therefore, consumption growth does not affect economic growth in the short run.

Besides the Keynesian hypothesis, the estimate of Eq. (2) will test confirm the validity of Wagner's law. The ADF* statistic is -6.92, which is larger than the absolute value of the 5% critical value. Therefore, government expenditures, real GDP, and private consumption are cointegrated. The results of the long-run relationship are shown in Table 4.

Table 4 Long-run relationship between government expenditures, real GDP, and private consumption.

Dependent variable: G_t

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	-3.891***	0.029	-18.632	0.000
Y_t	2.110***	0.184	11.463	0.000
C_t	-0.925***	0.196	-4.707	0.000
D_t	-0.067***	0.020	-3.398	0.000
$R^2 = 0.970$, $F = 955.317$				

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

The results show that an increase in real GDP by 1% leads to an increase in real government expenditure by 2.11%, and vice versa. On the contrary, an increase in private consumption leads to a decrease in real government spending by 0.93%, and vice versa. These impacts are significant at the 1% level. This negative relationship implies that there is a substitution effect between government expenditures and private consumption (Baxter and King, 1993). The coefficient of the dummy variable is significantly negative with a small value. This indicates that structural break slightly weakens the long-run relationship.

The estimate of a parsimonious ECM of short-run dynamics is presented in Table 5.

Table 5 Short-run dynamics.

Dependent variable: ΔG_t

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	0.016***	0.004	4.348	0.000
e_{1t-1}	-0.142**	0.071	-2.001	0.049
ΔG_{t-1}	-0.339***	0.104	-3.255	0.002
ΔY_{t-1}	0.054	0.263	0.204	0.839
ΔC_{t-1}	-0.319	0.351	-0.896	0.373
Adj. $R^2 = 0.218$, $F = 5.769$				

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

Again, the coefficient of the ETC (e_{1t-1}) has a minus sign with an absolute value of less than 1. This coefficient is significant at the 5% level. The value of -0.142 indicates that previous disequilibrium from the long-run equation will be corrected at a speed of 14.2% per quarter. For a one-period lagged change in real GDP, its coefficient is insignificant. This implies that an increase in this variable does not cause government expenditures in the short run. Similarly, the coefficient of lagged real consumption growth is negative, but not significant. Therefore, consumption growth does not affect the growth of government spending in the short run.

In Granger's (1988) causality sense, the F-statistic should be applied to the estimates of Eqs. (4) and (5). The Wald coefficient restriction tests are applied to test for the null hypothesis that each of the coefficients is equal to zero. Since the short-run coefficients are not significant in the two ECMs, there should be no short-run causality between government expenditures and economic growth. However, there is long-run causality between the two variables due to the significance of the coefficients of ETCs.

These findings seem to be consistent with the findings by Aschauer (1989), Devarajan et al. (1996), Holmes and Hutton (1990), and Ram (1986). However, it is not in line with the results found by Ilzetzky et al. (2013), which indicate that many countries moving towards greater exchange rate flexibility will have little benefit from fiscal policy stimulus. Overall, the results support both the Keynesian hypothesis and Wagner's law as found by Biswal et al. (1999) and Paparas et al. (2019). It should be noted that linear cointegration tests are sufficient to validate the Keynesian view and Wagner's law even though some studies propose nonlinear cointegration tests (Christie, 2014; and Asimakopulos and Karavias, 2016).

4. Conclusion

This paper employs quarterly data from 1997Q3 to 2019Q4, which is the period when Thailand adopted the floating exchange rate regime, to investigate both long- and short-run relationships between GDP, government spending. Both the Keynesian view and the traditional version of Wagner's law are examined. The central question of this paper is: can expansionary policy be effective in raising output in an emerging market under the floating exchange rate regime? Cointegration analysis and a dataset are used to address this question. The results from this study indicate that government expenditures can have a long-run positive effect on aggregate output in Thailand. However, a change in government expenditures does not cause economic growth in the short run. Moreover, GDP also has a positive long-run impact on government expenditures The findings suggest that an expansionary fiscal policy can be effective even under the floating exchange rate regime. Therefore, policymakers should be aware that government spending expansion is important when the country's aggregate output tends to decline. An expansion in GDP will stimulate more government spending, which gives room for managing public resources effectively.

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