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 on the impact of government spending on economic growth, this paper shows that government spending has both long-run and short-run impacts in stimulating aggregate output in Thailand during the floating exchange rate regime. In addition, real money supply can also stimulate aggregate output in the long run even though it does not have any contribution to economic growth in the short run. Based on quarterly dataset during 1997Q3 to 2017Q4, the results suggest that expansionary fiscal policy is effective under the floating exchange rate regime.

Keywords: Government expenditures, money supply, cointegration, causality
JEL Classification: C22, E62

1. Introduction

Previous empirical studies find mixed results of the impact of government expenditures on economic growth. Some researchers find evidence that supports 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). The Wagner's law has also been examined. 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, 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 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.

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 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 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, which predicts that 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 of Engle and Granger (1987) is employed to investigate whether aggregate government spending and real money supply have explanatory power over output during the floating exchange rate regime in Thailand. The results show that government expenditures and money supply exert positive effect on real GDP in the long run. In the short run, only government spending expansion Granger causes economic growth.

2. Long-run Relationship

In the long-run analysis, a residual-based test for cointegration proposed by Engle and Granger (1987) is used to detect long-run relationship between government expenditures, real money supply and real GDP in Thailand from 1997Q3 to 2017Q4. The data for real GDP and real government expenditures are obtained from the 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 consumer price index to obtain the real money supply series. The series of real GDP (Y), real government expenditures (G) and real money supply (M) are transformed to logarithmic series. The stationarity properties of the three series are shown in Table 1.

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)

Note: The number in parenthesis is p-value, and the number in 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, the three series are integrated of order 1, or they are I(1) series. The next step is to estimate the long-run equation used by Jiranyakul and Brahmasrene (2007), which is expressed as:

$$Y_t = b_0 + b_1 G_t + b_2 M_t + e_t \quad (1)$$

where Y_t is the log of real GDP, G_t is the log of real government expenditures, and M_t is the log of real money supply. The parameter estimates of Eq. (1) by the ordinary least squares (OLS) method are reported in Table 2.[1]

Table 2. Relationship between government expenditures, money supply, and real GDP.

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	1.181**	0.486	2.430	0.017
G_t	0.316***	0.088	3.581	0.001
M_t	0.488***	0.099	4.932	0.000
R^2 = 0.901, F = 369.145, D-W = 0.729				

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

The results show that an increase in government spending by 1% leads to an increase in real GDP by 0.32%, and vice versa. Similarly, an increase in real money supply leads to an increase in real GDP by 0.49%, and vice versa. These impacts are significant at the 1% level. However, the Durbin-Watson statistic of the estimated Eq. (1) is smaller than the coefficient of determination. Therefore, the relationship shown in Table 2 might be spurious or not meaningful if the variables in question are not cointegrated. The next step is to test for cointegration between government expenditures, real money supply and real GDP. The test equation suggested by MacKinnon (2010) is expressed as:

$$\Delta e_t = a_0 + a_1 e_{t-1} + u_t \quad (2)$$

where e_t is the residual series obtained from the estimate of Eq. (1). For the existence of cointegration of the three variables, the t-statistic of a_1 should be negative and has the absolute value greater than the 5% critical value. The estimated t-statistic of a_1 is -4.22, which is larger than the 5% critical value of -3.74. Therefore, the estimate of Eq. (1) gives the long-run relationship between the three variables because the null hypothesis of no cointegration is rejected at the 5% level of significance.[2] The existence of cointegration allows an analysis of the short-run relationship in the next section.

3. Short-run Dynamics

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

$$\Delta Y_t = \alpha + \lambda e_{t-1} + \beta \Delta Y_{t-1} + \gamma \Delta G_{t-1} + \delta \Delta M_{t-1} + u_t \quad (3)$$

[1] The impact of the 2008 global financial crisis is also tested by adding the dummy variable that takes the value of 1 during 2008Q4 and 2009Q2 and zero otherwise. However, the coefficient of the dummy is insignificant and thus this dummy is excluded.

[2] Even though Jianyakul and Brahmasrene (2007) fail to find cointegration of the three variables, this paper discovers the existence of cointegration of these variables.

where e_{t-1} is the error correction term. The coefficient, λ, is the speed of adjustment toward long-run equilibrium. Eq. (3) can be used to test for both long-run and short-run causality (Granger, 1980). The estimate of Eq. (3) is shown in Table 3.

Table 3. Short-run dynamics
Dependent variable: ΔY_t

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	0.003	0.005	0.548	0.585
λ	-0.264***	0.070	-3.743	0.000
ΔY_{t-1}	0.237*	0.134	1.763	0.082
ΔG_{t-1}	0.162**	0.062	2.619	0.011
ΔM_{t-1}	0.230	0.268	0.860	0.393
Adj. R^2 = 0.257, F = 7.817				

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

The coefficient of the error correction term has a minus sign with the absolute value of less than 1. This coefficient is significant at the 1% level. The value of -0.264 indicates that previous disequilibrium from the long-run equation will be corrected at a speed of 26.4%. For a one-period lagged change in government expenditures, its coefficient is significant at the 5% level. This implies that a 1% increase in this variable causes economic growth to increase by 0.16%. However, the coefficient of lagged real money supply growth is positive, but not significant. Therefore, money supply growth does not affect economic growth. In Granger causality sense, the F-statistic should be applied to the estimate of Eq. (3). The Wald coefficient restriction tests are applied to test for the null hypothesis that each of the three coefficients is equal to zero. The test results are shown in Table 4.

Table 4. Wald F tests for Granger causality.

Coefficient	F-statistic	p-value
$\hat{\lambda}$	14.010	0.000
$\hat{\gamma}$	6.861	0.011
$\hat{\delta}$	0.739	0.393

Note: The null hypothesis is rejected or accepted depends on p-value of each test.

The F test show that long-run causality from government expenditures and money supply to aggregate output exists, because the null hypothesis that the estimated λ is zero is rejected at the 1% level of significance. For short-run causality, the estimated γ is significant at the 5% level while the estimated δ is insignificant. Therefore, government spending expansion Granger causes economic growth in the short run, but money supply growth does not Granger cause economic growth. This finding seems to be consistent with the findings by Aschauer (1989), Devarajan et at. (1996), Holmes and Hutton (1990) and Ram (1986). However, it is not inline 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.

4. Concluding Remarks

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? A cointegration analysis and a dataset are used to address this question. The results from this study indicate that government expenditures along with real money supply have long-run positively affects on aggregate output in Thailand. Furthermore, a change in government expenditures causes economic growth in the short-run. The findings suggest that an expansionary fiscal policy

can be effective even under the floating exchange rate regime. Therefore, policy makers should be aware that government spending expansion is important when the country's aggregate output tend to decline in the short run.

References

Aschuaer, D. A., (1989). Is public expenditures productive? Journal of Monetary Economics, 23(2), 177-200.

Asimakopoulos, S. and Karavias, Y., (2016). The impact of government size on economic growth: a threshold analysis. Economics Letters, 139(C), 65-68.

Barro, R. J., (1990). Government spending in a simple model of endogenous growth. Journal of Political Economy, 98(5), 103-126.

Berger, H. and Osterholm, P., (2009). Does money still matter for the U.S. output. Economics Letters, 102(3), 143-146.

Biswal, B., Dhawan, U. and Lee, G., (1999). Testing Wagner versus Keynes using disaggregated public expenditure data for Canada. Applied Economics, 31(10), 1283-1291.

Carianni, P., (2012). Money and output: new evidence based on wavelet coherence. Economics Letters, 116(3), 547-550.

Chang, T, Liu, W. and Caudill, S., (2004). A re-examination of Wagner's law for ten countries based on cointegration and error-correction modeling techniques. Applied Financial Economics, 14(8), 577-589.

Christie, T., (2014). The effect of government spending on economic growth: testing for the non-linear hypothesis. Bulletin of Economic Research, 66(2), 183-204.

Devarajan, S., Swaroop, P and Zou, H., (1996). The composition of public expenditure and economic growth. Journal of Monetary Economics, 37(2-3), 313-344.

Dudzeviute, G., Simelyte, A. and Liucvaitiene, A., (2018). Government expenditure and economic growth in the European Union countries. International Journal of Social Economics, 45(2), 372-386.

Engle, R. F. and Granger, C. W. J., (1987). Conintegration and error correction: representation, estimation, and testing. Econometrica, 55(3), 251-276.

Granger, C. W. J., (1980). Testing for causality: a personal viewpoint. Journal of Economic Dynamics and Control, 2(1), 329-352.

Hafer, R. W. and Kutan, A. M., (1997). More evidence on the money-output relationship. Economic Inquiry, 35(1), 48-58.

Hayo, B., (1999). Money-output Granger causality revisited: an empirical analysis of EU countries. Applied Economics, 31(11), 1489-1501.

Holmes, J. M. and Hutton, P. A., (1990). On the causal relationship between government expenditures and national income. Review of Economics and Statistics, 72(1), 87-95.

Ilzetzky, E., Mendoza, E. G. and Vegh, C. A., (2013). How big (small?) are fiscal multipliers?, Journal of Monetary Economics, 60(2), 239-254.

Jiranyakul, K. and Brahmasrene, T., (2007). The relationship between government expenditures and economic growth in Thailand. Journal of Economic and Economic Education Research, 8(1), 93-103.

Kichian, M., (2012). Financial condition and the money-output relationship in Canada. Staff Working Papers 12-13, Bank of Canada.

Kumar, S., Webber, D. J. and Fargher, S., (2012). Wagner's law revisited: cointegration and causality tests for New Zealand. Applied Economics, 44(5), 607-616.

MacKinnon, J. G., (2010). Critical values for cointegration tests. Working Paper No. 1227, Economics Department, Queen's University.

Miller, S. M. and Russek, F. S., (1997). Fiscal structures and economic growth: international evidence. Economic Inquiry, 35(3), 603-613.

Paparas, D., Richter, C. and Kostakis, I., (2019). The validity of Wagner's law in the United Kingdom during the last two centuries. International Economics and Economic Policy, 16(2), 269-291.

Ram, R. (1986). Government size and economic growth: a new framework and some evidence from cross-section and time series. American Economic Review, 76(1), 191-203.

Shi, S., Hurn, S. and Phillips, P. C. B., (2016). Causal change detection in possibly integrated system: revisiting the money-income relationship. NCER Working Paper Series 113, National Center for Economic Research.