

Government Expenditures and Private Investment: Evidence from Turkey

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Abstract

This paper examined the relationship between government expenditures and private investment, for Turkey (1967-2001) employing cointegration analysis of a multivariate system of equations. This method is applied in order to empirically estimate the long run relationship between government expenditures and private investment. The empirical evidences suggest that there is a long-run relationship between variables and government expenditures tended to crowd-out private investment.

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Introduction

In recent years, the relationship between the government expenditures and private investment has been investigated and several studies have been published. The impact of government expenditures on private investment is explained on two hands. On the one hand, an increase in government expenditures due to high government borrowing requirements displaces the private investment. This indicates the "crowding out" hypothesis. Hence, the high level of government expenditures crowds out private investment. On the other hand, since public investments enhance the marginal productivity of private capital, this increases the level of private investment (Mamatzakis, 2001)

In the literature there are two types studies and all studies found different results on the effects of government expenditures on private investment. The contrasting results from different studies gave rise to several studies try to investigate the impact of government expenditures on private investment. Aschauer (1989); Mamatzakis (2001); Pereira (2001) ; Ghali (1998) ; Apergis (2000); Laopodis (2001); Karagöl (2004) and Pereira (2001) used a disaggregate analysis in order to explain the relationship between disaggregate measures of government expenditures and private investment. On the other hand, only a few studies used an aggregate analysis. Lin (1994) states that increased in government expenditures made private investments costly because of competing the private sector in financing. The results strongly indicate that government expenditures crowd out private investment in Turkey. Following the above remarks, the purpose of this study is to investigate the relationship between government expenditures and private investments.

The rest of paper is proceeding as follows. Section 2 gives data and methodology. The empirical estimations results and the dynamic impulse response functions (IRF) are presented in the section 3. This paper ends up with concluding remarks.

Methodology and Data

The full information maximum likelihood procedure of Johansen (1988) and Johansen and Juselius (1990) performs better than others according to several criteria, we use the maximum likelihood estimation method of Johansen and Juselius (1990) to test for cointegration. Consider a VAR and the corresponding VECM:

$$X_t = c + x_1 X_{t-1} + x_2 X_{t-2} + \dots + x_p X_{t-p} + \varepsilon_t \quad (1)$$

Where X_t = (private investment (PI), government expenditures (GE) and GDP (Y)). Moreover, c is a constant term (3×1 in our case), $\pi = n \times n$ matrices of autoregressive coefficients for $i = 1, 2, \dots, p$. To distinguish between stationarity by linear combinations and differencing, a reparametrisation of equation (1) is needed. Thus the system is equation (1) can be rewritten equivalently as:

$$\Delta X_t = c + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \dots + \Gamma_{p-1} \Delta X_{t-p+1} + \Pi X_{t-p} + \varepsilon_t \quad (2)$$

Where

$$\Gamma_i = -(I - \pi_1 - \dots - \pi_i) \quad (i = 1, \dots, p-1) \quad \text{and} \quad \Pi = -(I - \pi_1 - \dots - \pi_p) \quad (3)$$

By examining the Π matrix, we can detect the existence of cointegrating relations among the X variables. The most interesting case is that if $\text{rank}(\Pi) = r < n$, then there are matrices β' and α of dimension $n \times r$ such that $H_0: \Pi = \alpha \beta'$ and there are r cointegrating relations among the elements of βX_t is interpreted as a matrix of cointegration vectors and provides the property that elements in $\beta' X_t$ are stationary even though X_t is non-stationary.

For this study we use annual government expenditures (GE) and and GDP (Y) data. Our data for Turkey consists of the period of 1967-2001. All variables are transformed to natural logs denoted as LPI, LGE and LY. Private investment (PI) is defined as real net fixed investment in non-residential equipment and structures. We use real GDP (Y) for this analysis. The GDP data are obtained from State Planning Organisation, *Economic and Social Indicators: 1950-2000* and various years. The GNP deflator (1987=100) was used to deflate variables. Government expenditure consists of government consumption on goods and services and public investment. The source of the above time series is the State Planning Organization of Turkey (SPO) (2002).

Empirical Estimations Results

Table 1 reports the results of testing for unit roots in the level variables as well as in their first difference. In the first half of the table the null hypothesis that each variable has a unit root cannot be rejected by the Augmented Dickey-Fuller (ADF) (see Dickey and Fuller (1979)). However,

after applying the first difference, both tests reject the null hypothesis. Since the data appear to be stationary in first differences, no further tests are performed. We, therefore, maintain the null hypothesis that each variable is integrated of order one.

Table1. Unit Root Test- ADF

<i>Levels ADF (1lag)</i>		<i>Firs Differences</i>	
LPI	-1.769	Δ LPI	-3.007*
LGE	-1.861	Δ LGE	-4.05**
LY	-2.754	Δ LY	-3.497*

Note: an asterisk indicates significance at 5% level while two asterisks indicate significance at 1% level. The critical values are from Dickey-Fuller.
L indicates the logs of PI, GE and GDP.
 Δ L indicates the first differences of logs of PI, GE and GDP.
Critical values used in ADF test: 5%=-2.945, 1%=-3.623

After the investigation of the order of integration of the data, Johansen maximum likelihood procedure is used to detect cointegration. Table 2 shows the results of the Johansen-Juselius likelihood cointegration tests. The trace statistics rejects the hypothesis of no cointegration, $r = 0$ (see Osterwald-Lenum 1992; for critical values) and indicates that there is one cointegrating equation at the 5%significance level i.e. The results also indicate that there is a long-run relationship between government expenditures and private investment for Turkey.

Table 2. Johansen Cointegratioin Method Test

Ho=rank=r	Trace Test	95%	Max	95%
R= =0 *	35.35*	34.9	20.74	22.0
R <=1	14.61	20.0	11.48	15.7
R <=2	3.12	9.2	3.128	9.2

*(**) denotes rejection of the hypothesis at 5% significance level

L.R. test indicates 1 cointegrating equation(s) at 5% significance level

The normalized cointegrating coefficients are shown in equation 4, and the signs of the variables conform to the theory in literature, i.e. there is negative relationship between government expenditures (LGE), and private investment (LPI).

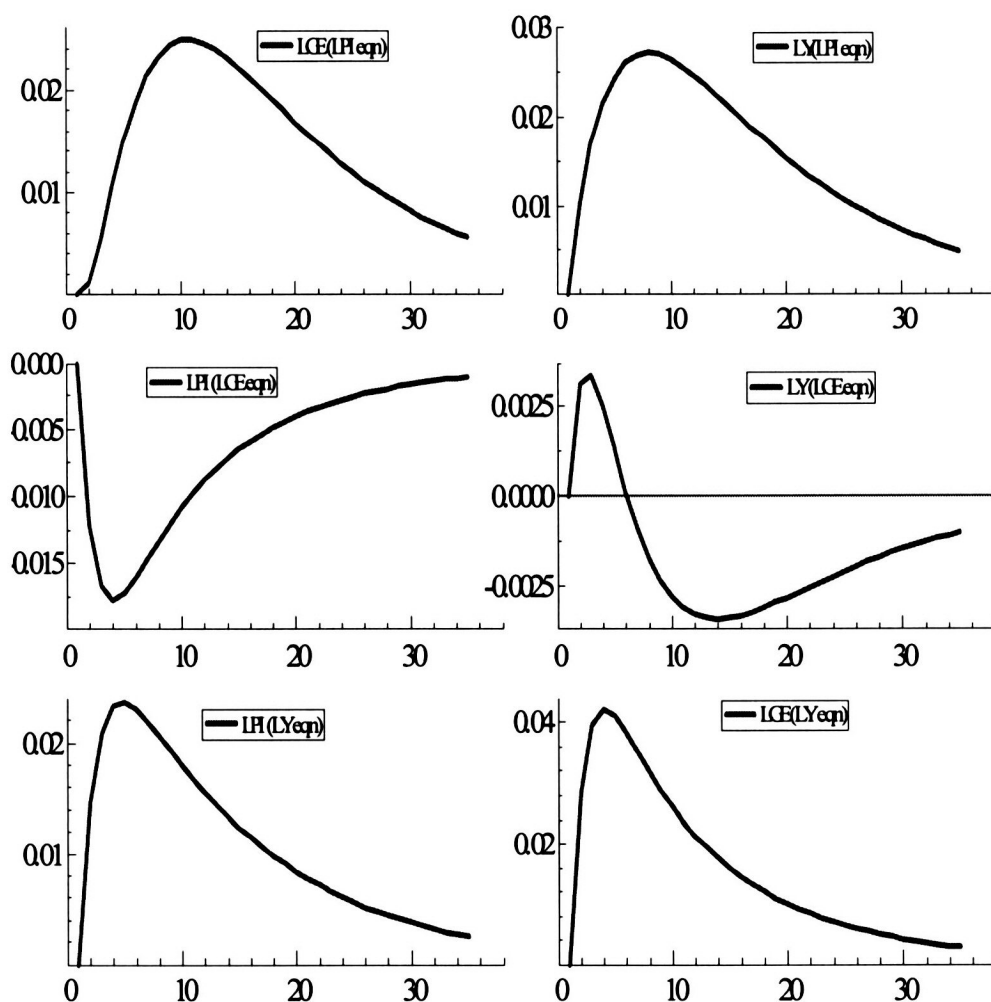
$$LPI = -22.444 - 0.212LGE + 2.306LY \quad (4)$$

These results strongly indicate that there is a negative relationship between government expenditures and private investment in the long run. The estimated results also suggest that government expenditures crowd out private investment.

Dynamic Responses of Private Investment to Government Spending

Impulse response analysis is used to examine the interrelationships between the variables and to assess adjustments to long-run equilibrium. Impulse response functions allow us to look at the dynamic effects of government expenditures shock on private investment. The time period of the IRF function extend over ten years. The impulse response function traces over time the effects on a variable of an exogenous shock to another variable. The persistence of a shock tells us how fast the system adjusts back to equilibrium. The response is measured in terms of standard deviation. The results indicate that there is a negative relationship between private investment and government expenditures. As we see from first column, second row of Figure 1 it is obvious that the effect of one standard deviation shock of government expenditures on private investment is negative. Hence we can conclude that, in Turkey, investments made by the public sector are having a “crowding-out” effect on private investment. This result is quite realistic in the case of Turkey where government expenditures especially public investment undertaken by heavily subsidized and inefficient state-owned enterprises, agriculture, manufacturing, energy, banking and financial services, has often reduced the possibilities for private investment. Moreover, the financing of the government expenditures through external indebtedness, a reduction in the debt service should lead to an increase in investment for any given level of future indebtedness. If a greater portion of foreign resources are used to service external debt, very little is available for investment and growth (Karagol, 2002). On the other hand, from first column and first row of Figure 1 the effect of one standard deviation shock of private investment on government expenditures is positive.

Figure1. Impulse Response Functions



Conclusions

This paper attempted to investigate relationship between government expenditures and private investment in Turkey for the 1967-2001 period. We developed a VEC model after testing for multivariate cointegration between private investment, government expenditures and GDP. The results conclude that government expenditure is a limiting factor to private investment in Turkey and, hence, shocks to government expenditures will have a negative effect on private investment. Hence, a large increase in

government expenditures appears to have adversely affected private investment and development of Turkish economy. The impulse response function IRF functions above have shown the negative response of private investment to a one standard deviation shock of government expenditures. These results clearly suggest that government expenditures are substitute to private investment..

References

- Apergis, N. (2000) Public and private investments in Greece: complementary or substitute 'goods'? *Bulletin of Economic Research*, 52(3), pp. 225-234.
- Aschauer, D. A.(1989) Does public capital crowd out private capital?, *Journal of Monetary Economics*, September, pp. 171-188.
- Dickey, D.A. and Fuller, W.A.(1979) Distribution of the estimators for autoregressive time series with a unit root, *Journal of the American Statistical Association*, 74, pp.427-431.
- Ghali, K.H. (1998) Public investment and private capital formation in a vector error – correction model of growth, *Applied Economics*, 30, pp. 837- 844.
- Johansen, S. (1988) Statistical analysis of cointegration vectors, *Journal of Economic Dynamics and Control* , 12, (2/3), pp. 231-254.
- Johansen, S. and Juselius, K. (1990) Maximum likelihood estimation and inference on cointegration-with applications to the demand for money, *Oxford Bulletin of Economics and Statistics*, 52 (2), pp. 169-210.
- Karagol (2002) The Causality Analysis of External Debt Service and GNP: The Case of Turkey, *Central Bank Review*, 2 (1) pp.39-64
- Karagöl, E (2004) A Disaggregated Analysis of Government Expenditures And Private Investment In Turkey, *Journal of Economic Cooperation*, 25(2), 131-144.
- Laopodis, N.T. (2001) Effects of government spending on private investment, *Applied Economics*, 33, pp.1563-1577.
- Lin, S.A.Y. (1994) Government spending and economic growth, *Applied Economics*, 26, pp.83-94.
- Mamatzakis, E.C. (2001) Public spending and private investment; evidence from Greece, *International Economic Journal*, 15(4), pp. 33-46.
- Osterwald- Lenum, M. (1992) A note with quantiles of the asymptotic distribution of the maximum likelihood cointegration rank test statistics, *Oxford Bulletin Of Economics And Statistics*, pp. 461-472.
- Pereira, A.M.(2001) On the effects of public investment on private investment; what crowds in what, *Public Finance Review*, 29 (1) ,pp. 3-25.
- SPO (State Planning Organisation), (2002), *Economic and Social Indicators, 1950-2001*. Ankara, Turkey.