A DISAGGREGATED ANALYSIS OF GOVERNMENT EXPENDITURES AND PRIVATE INVESTMENT IN TURKEY

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This article investigates whether disaggregated measures of government expenditures (government consumption and public investment) exert a positive or negative effect on private investment in Turkey over the period 1968-2000. A cointegration analysis of a multivariate system of equations is applied in order to empirically estimate the long run relationship between different measures of government expenditures and private investment. Moreover, impulse response functions and variance decomposition are estimated. The estimation results indicate that public investment and government consumption tended to crowd out private investment. Thus, a large increase in public investment and government consumption appears to have adversely affected private investment and the development of the Turkish economy.

1. INTRODUCTION

Government expenditures (government consumption and public investment) and private investment association has been highly investigated and the bulk of the studies carried out was published in recent years. It is argued that government expenditures affect private investment in two ways: Firstly, they may increase the productivity of private investment and, secondly, they can crowd out private investment. Thus, the empirical findings have been subjects of controversy. There are a number of studies with a similar economic framework that look at a similar set of questions. Aschauer (1989) and Munnell (1992) show that there is a positive relationship between private investment and government spending. Laopodis (2001) investigates the effects of military and non-military public expenditures on gross private investment. The results of this study suggest that military spending does not affect private investment. Mamatzakis (2001)

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found that public investment has a positive effect on private investment while government consumption has a negative effect on private investment in Greece. He also claims that the effect of public investment on private investment is explained in two ways. On the one hand, an increase in public investment raises the national level of investment above the level expected by the private sector. Hence, the high level of public investment 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. These two different effects determine whether public investment substitutes or complements private investment. Pereira (2001) shows that, based on impulse response analysis, the empirical results indicate that public investment crowds in private investment in the United States for the 1956-1997 period. On the other hand, Ghali (1998) employs multivariate cointegration techniques to develop a vector-error correction model for investigating long-run effects of public investment on private investment in Tunisia over the period 1963-1993. It is shown that public investment is found to have a negative effect on private investment in both the short and long run. Moreover, the financing of the public capital expenditures through internal indebtedness, the repression of the private financial system, has crowded out the private sector from profitable investment opportunities (Ghali, 1998). Apergis (2000) also concludes that a large increase of public investment tends to crowd out private investment in Greece.

These studies show that the relationship between government expenditures and private investment is still controversial. Different results are found for different countries as well as for different times within the same country. Based on these mixed results, it is improper to make any type of generalisations on the potential relationship between government expenditures and private investment. Thus, it would be of interest to investigate this issue.

This article investigates whether disaggregated measures of government expenditures exert a positive (crowding in) or a negative (crowding out) effect on private investment in Turkey for the 1968-2000 period. Our objective is to look into the relationship between disaggregated measures of government expenditures (government consumption and public investment) and private investment. To this purpose, rather than adopting an aggregate definition for government

expenditures, we decompose it into public investment and government consumption and attempt to empirically estimate whether government consumption and public investment have a differential effect on private investment. One can claim that the relation between government expenditures and private investment may be due to more than one cause. There are some possible cases: (i) government expenditures cause private investment or vice versa, (ii) government expenditures and private investment are causally independent, and (iii) government expenditures and private investment are reciprocally causal.

The rest of the article proceeds as follows. Section 2 provides a short review of the role of fiscal and monetary policies in Turkey. Section 3 presents data and methodology. The empirical estimation results, the dynamic impulse response functions (IRF) and variance decomposition responses are presented in Section 4. The article ends with concluding remarks.

2. ROLE OF FISCAL AND MONETARY POLICIES

Government expenditures (government consumption and public investment) had a negative effect on private investment in Turkey over the period 1968-2000. Karagöl (2002) states that the decline in investment in Turkey in the late 1970s and the beginning of the 1980s could have been determined by poor fiscal and monetary policies. Firstly, the economic crisis of the late 1970s was essentially a balance-of-payments crisis which was accumulated by fiscal deficits and the weakness of the underlying structure of foreign trade. Fiscal deficits were magnified by operating losses of the state-owned economic enterprises (SEEs). Due to large fiscal deficits and less available resources for investment, investment declined in Turkey.

Secondly, growing public sector deficits were financed by foreign borrowing. Thus, the government had to increase future taxes to pay interest and principal debt obligations. These taxes lowered the return to investment and provided a disincentive to domestic capital formation. Kamin *et al.* (1989) states that one would expect investment to have fallen because of the decline in available resources for investment and a less profitable and more uncertain macroeconomic environment. Savvides (1992) claims that as debtor-country benefits from external debt are less than those from any investment because of the external debt

service obligations, debt acts as a high marginal tax rate on the country, thus lowering the return to investment and providing a disincentive to domestic capital formation. The disincentive effect of the debt may have repercussions on private investment. The government has little incentive to institute policies to promote domestic capital formation or reduce its consumption in exchange for higher future economic growth when the benefits from such policies go to creditors in the form of higher debt payments.

Thirdly, the fall in investment rate in developing countries may be attributable to the extreme economic and financial distress of the most recent period. Some components of the adjustment to growth programmes may have been responsible for the investment decline. The depreciation of the Turkish Lira is one of the factors. A real exchange rate devaluation may substantially raise the real cost of capital goods (Buffie, 1984). Conway (1990) indicates that due to the low elasticity of supply especially in both agriculture and the non-manufacturing sectors, earnings have not been stimulated much through excessive devaluations. Thus, real currency depreciation remained one of the main reasons for investment decline in Turkey. Moreover, exchange rate depreciation had a negative impact on manufacturing investment through the prices of imported machinery.

In the beginning of the 1990s, government expenditures increased due to pricing policies used for distributional and electoral objectives and credit support extended to state-owned economic enterprises (SEEs) to cover their operating deficits. Turkey experienced a financial crisis in early 1994 mainly due to the above-mentioned factors. Real public investment fell dramatically by about 34 percent from 1993 to 1994. Real private investment, however, contracted only moderately (about 4 percent). Due to another major economic crisis in early 2001, real private investment declined by about 29 percent from 2000 to 2001.

3. METHODOLOGY AND DATA

Specifically, several studies have used the conventional regression. This method makes the implicit assumption that the cointegration vector is unique, which means that we are bound to end up with a model that is a linear combination of independent cointegration vectors. In particular, the assumption is made that the cointegrating vector is unique. This may

not however be the case, and the two-step procedure provides no framework for addressing this question. Moreover, it has been argued that test procedures do not have well-defined limiting distributions and, as a result, testing for cointegration is not a straightforward procedure. Another disadvantage of the conventional regression is that it examines only the dominant cointegrating vector between series. It is difficult to draw a general conclusion from the findings of those studies as to which determinants provide important information on investigated variables.

This study overcomes the spurious regression problem associated with non-stationary time series by means of unit root test and the use of cointegration techniques within a multivariate system of equations which is developed by Johansen (1988) and applied by Johansen and Juselius (1990). The procedure suggested by Johansen (1988) basically depends on direct investigation of cointegration in the vector autoregressive (VAR) representation. This analysis yields maximum likelihood estimators of the unconstrained cointegration vectors, but allows one to explicitly test for a number of cointegration vectors.

A pth-order vector autoregression, denoted as VAR (p), can be explained as:

$$X_t = c + x_1 X_{t-1} + x_2 X_{t-2} + \ldots\ldots x_p X_{t-p} + \varDelta Q_t + \varepsilon_t \qquad (1)$$

Where X_t is nx1 vector of variables (private investment (PI), GDP, public investment (PU) and government consumption (GOC)), c is nx1 vector of constants (5x1 in our case), $\pi = nxn$ matrices of autoregressive coefficients for i = 1, 2…p, and Q_t denotes the deterministic conditioning variables. To distinguish between stationarity by linear combinations and differencing, a reparametrisation of equation (1) is needed. Thus, the system in equation (1) can be rewritten equivalently as:

$$\varDelta X_t = c + \varGamma_1 \varDelta X_{t-1} + \varGamma_2 \varDelta X_{t-2} + \ldots\ldots \varGamma_{p-1} \varDelta X_{t-p+1} + \varPi X_{t-p} + \varDelta Q_t + \varepsilon_t \quad (2)$$

where

$$\varGamma_i = -(I - \pi_1 - \ldots \pi_i) \ (i = 1\ldots, \ p\text{-}1) \qquad (3)$$

and

$$\Pi = -(I - \pi_1 - \ldots - \pi_p) \tag{4}$$

The only difference between equation (2) and a standard VAR in differences is the error-correction term, ΠX_{t-p}. The system represented in equation (2) also contains information on both short and long-run adjustment to changes in X_t, via the estimates of Γ_i and Π respectively. The transformation of a VAR model for $I(1)$ variables into equation (2) can be called a cointegrating transformation.

Thus, this methodology investigates whether the coefficients matrix methodology Π contains information about long-run relationships among the variables of the system. The non-stationary component Π can also be factorised to test the null hypothesis of reduced rank or equivalently, the number of cointegrating relationships. That is

$$H_0: \Pi = \alpha \beta' \tag{5}$$

If rank $(\Pi) = r < n$, then there are matrices β and α of dimension nxr such that $H_0: \Pi = \alpha \beta'$, and there are 'r' cointegrating relations among the elements of $\beta'X_t$. Matrix β is interpreted as a matrix of cointegration vectors and has the property that elements in $\beta'X_t$ are stationary even though X_t is non-stationary. On the other hand, the elements of α indicate the speed of adjustment of particular variables with respect to a disturbance in the equilibrium relation.

Our data on Turkey cover the period 1968-2000. All variables are transformed into natural logs denoted as LPI, LGDP, LPU and LGOC. We use real GDP for this analysis. The GDP data are obtained from *Economic and Social Indicators: 1950-2000* and various years of the State Planning Organisation. The GNP deflator (1987=100) is used to deflate variables. Private investment is defined as real net fixed investment in non-residential equipment and structures. Public investment includes net fixed investment in non-residential equipment and structures. The source of the above time series is the State Planning Organisation of Turkey (SPO, 2002). All time series are expressed in real terms. GDP is measured as real GDP and taken from the same source. Government expenditure on goods and services is used as government consumption variable. This includes wages and salaries, non-wage expenditures and social security payments.

4. EMPIRICAL ESTIMATION RESULTS

To determine the time series properties of the LPI, LGDP, LPU and LGOC series, the conventional unit root tests and the Augmented Dickey-Fuller (ADF) (see Dickey and Fuller 1979) unit root test are applied to the natural logs of the series. Table 1 presents the ADF test results for the log levels and first differences of logs of PI, GDP, PU and GOC. The results of the ADF test show that time series are not stationary in levels. These results indicate the existence of one unit root. Furthermore, ADF test is calculated for first differences. On the basis of Table 1, all variables are stationary in first differences. These results indicate that our time series are integrated of order 1, I (1).

Table 1. Unit Root Test- ADF

Levels ADF (lag 1)		First Differences	
LPI	-2.754	ΔLPI	-3.497*
LGDP	-2.199	ΔLGDP	-3.007*
LPU	-2.588	ΔLPU	-4.608**
LGOC	-1.139	ΔLGOC	-3.967**

Notes: 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, GDP, PU and GOC.
ΔL indicates the first differences of logs of PI, GDP, PU and GOC.

Table 2. Johansen Cointegration Method Test

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesised No. of CE(s)
0.534094	56.98637	53.12	60.16	None *
0.390056	31.01812	34.91	41.07	At most 1
0.236365	14.20893	19.96	24.60	At most 2
0.137780	5.040305	9.24	12.97	At most 3

Notes: *(**) denotes rejection of the hypothesis at the 5% (1%) significance level.
L.R. test indicates 1 cointegrating equation at the 5% significance level.

Given that the integration of the two series is of the same order, it is then tested whether the two series are cointegrated over the sample period. Table 2 shows the results of the Johansen test. The likelihood ratio (LR) test 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 percent significance level.

The normalised parameter estimates of this cointegration vector are:

$$LPI = 26.0944 + 3.9769\ LGDP - 0.3276\ LPU - 1.5636\ LGOC \qquad (6)$$
$$\quad\quad\quad\quad\quad (3.0340) \qquad\quad (0.5027) \qquad\quad (2.1276)$$

where the figures in parentheses are t-values.

The normalised cointegrating coefficients are shown in equation 6, and the signs of the variables conform to the theory in the literature, i.e. there is a negative relationship between government consumption, LGOC and private investment. Moreover, the effect of public investment, LPU, on private investment is also negative but not statistically significant at the 5 percent level. All 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.

4.1. Impulse Responses of Private Investment to Disaggregate Government Expenditures

Impulse response analysis is used to investigate the interrelationships between the variables and assess adjustments to long-run equilibrium. Since the deviations from the equilibrium are stationary, any shock to the system generates a time path that eventually returns to a new equilibrium provided no further shocks occur. Impulse response functions allow us to examine the dynamic effects of disaggregated measures of government expenditures (government consumption and public investment) shock on private investment. Based on the vector error correction model, the impulse response function and variance decomposition are calculated. The order of variables is: LPI, LPU and LGOC.

Figure 1. Impulse Response Functions

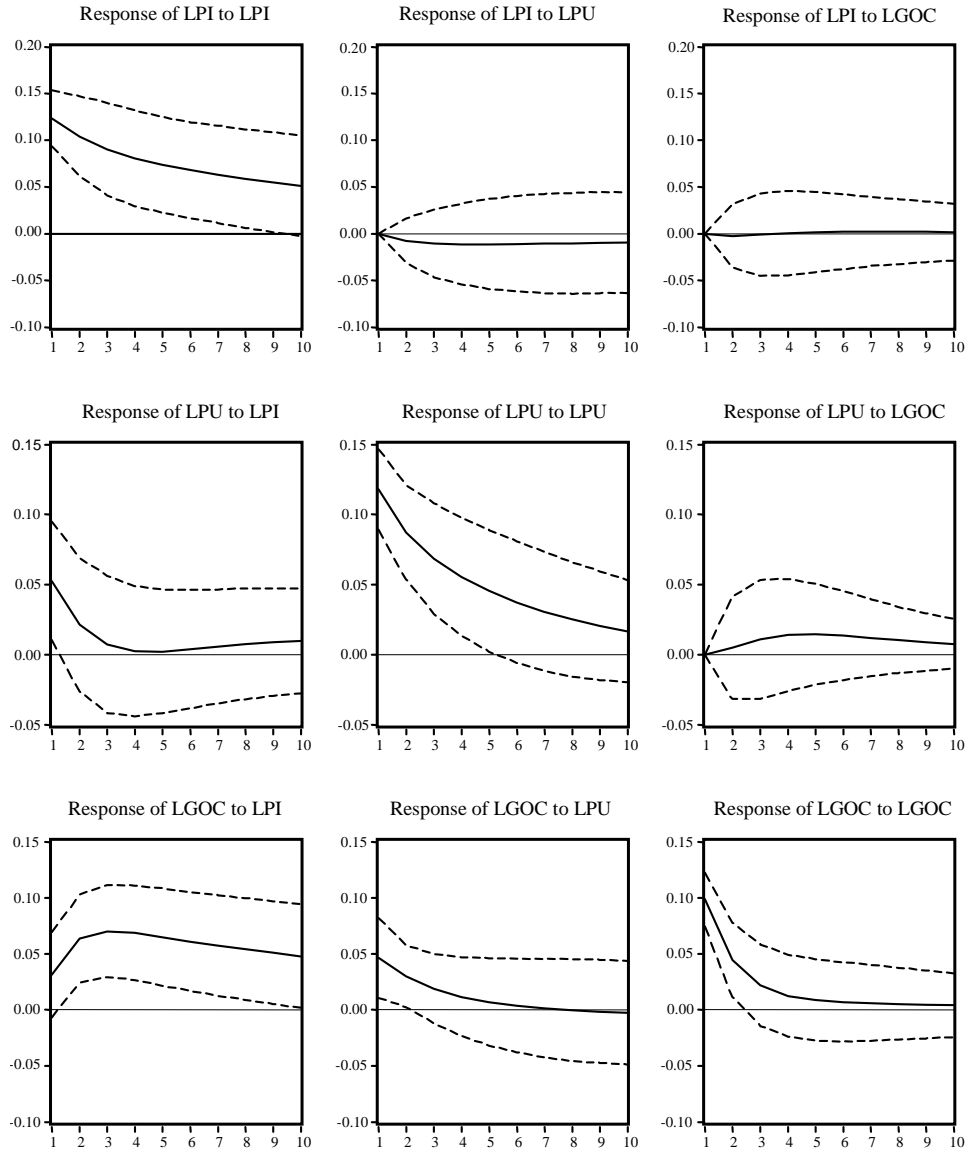Response to One S.D. Innovations ± 2 S.E.

Figure 1 shows the impulse response function (IRF). The time period of the IRF function extends 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 correlation between private investment and public investment. As seen from the second column, first row of Figure 1, it is obvious that the effect of one standard deviation shock of public investment on private investment is negative over the whole period. Hence, we can conclude that in Turkey, investments made by the public sector have a crowding

Table 3. Variance Decomposition Analysis

Period	S.E.	LPI	LGDP	LPU	LGOC
Variance Decomposition of LPI:					
1	0.123430	100.0000	0.000000	0.000000	0.000000
5	0.219334	95.93713	1.506022	2.362870	0.193980
10	0.260091	94.34532	1.970937	3.524228	0.159519
15	0.278117	93.85318	2.036003	3.961804	0.149009
20	0.286597	93.65051	2.042536	4.161355	0.145604
Variance Decomposition of LGDP:					
1	0.067473	29.99965	70.00035	0.000000	0.000000
5	0.127525	49.84331	49.46536	0.087924	0.603404
10	0.157333	60.70239	38.50800	0.332608	0.456998
15	0.171396	65.05213	33.79460	0.767201	0.386072
20	0.178374	66.97010	31.58292	1.089317	0.357660
Variance Decomposition of LPU:					
1	0.129131	16.66940	12.60231	70.72829	0.000000
5	0.197471	8.464829	36.41162	54.84349	0.280062
10	0.213166	7.876728	41.33196	50.14261	0.648710
15	0.217017	8.883103	41.82103	48.60518	0.690687
20	0.218686	9.837625	41.60513	47.87009	0.687151
Variance Decomposition of LGOC:					
1	0.113329	7.753237	11.34320	9.081589	71.82197
5	0.191225	51.49689	13.48969	4.360084	30.65334
10	0.231391	62.75061	12.72607	3.580545	20.94277
15	0.250050	66.60180	11.79365	3.670081	17.93447
20	0.259203	68.24752	11.25003	3.809925	16.69253
Ordering: LPI, LGDP, LPU, LGOC.					

out effect on private investment. This result is quite realistic in the case of Turkey where public investment undertaken by heavily subsidised and inefficient state-owned enterprises in agriculture, manufacturing, energy, banking and financial services has often reduced the possibilities for private investment.

Moreover, as seen from the third column of the first row of Figure 1, the effect of one standard deviation shock of government consumption on private investment is negative. This means that government consumption has a negative effect on private investment in Turkey. On the other hand, from the second column and third row of Figure 1, it is clear that the effect of one standard deviation shock of public investment on government consumption is negative. This indicates that public investments substitute government consumption.

Table 3 presents variance decomposition (VDC) estimations. Mamatzakis (2001) states that the variance decomposition analysis indicates how much of the uncertainty surrounding the predictions of private investment can be explained by the uncertainty surrounding the other variables. Over twenty years, 4.16 percent of the forecast error variance of private investment is explained by disturbances in public investment, while 0.14 percent by government consumption.

5. CONCLUSION

This article attempts to investigate whether there is a link between disaggregated measures of government expenditures and private investment in Turkey for the 1968-2000 period. The empirical results of the study indicate that public investment and government consumption have a negative "crowding out" effect on private investment. Hence, a large increase in public investment and government consumption appears to have adversely affected private investment and the development of the Turkish economy. It is concluded that policy makers should make a distinction among different government expenditures. The effects of disaggregated government expenditures should be investigated separately.

The impulse response function (IRF) above shows the negative response of private investment to a one-standard deviation shock of government consumption and public investment. These results clearly

suggest that government consumption and public investment "crowd out" private investment. This result contrasts with the Erenburg and Wohar (1995) findings. They argue that there is a complementary relationship between public spending and private investment.

Fiscal policy in general and government spending in particular may indeed contribute to the development of the Turkish economy. However, one should not misjudge by looking at the effects of the disaggregate measures of government expenditures (government consumption and public investment) on private investment. This article argues that it might be more appropriate to look into the different components of government expenditures when the effectiveness of fiscal expenditures is assessed.

In terms of economic policy, these outcomes may further explain what is considered to be one of the greatest fallacies that the Turkish economy fell into in the late seventies and in the eighties. There are some reasons: Firstly, public investment undertaken by heavily subsidised and inefficient state-owned enterprises in agriculture, energy, banking and financial services has often reduced the possibilities for private investment. Secondly, in order to cover the increased government expenditures, private investors change their investment plans because of expected tax increase. This can exert a negative impact on private investment. Lastly, Lin (1994) states that increased government expenditures made private investments costly because of competing with the private sector in financing. The results indicate that government expenditures have crowded out private investment in Turkey during the period under consideration.

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