INVESTIGATING CROWDING-OUT EFFECT OF GOVERNMENT SPENDING FOR TURKEY: A STRUCTURAL VAR APPROACH

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Özet : Türkiye için kamu müdahalelerinin dışlama etkisinin araştırılması: Bir yapısal VAR yaklaşımı

1980'li yıllarla birlikte Türkiye'deki kamu kesiminin küçültülmesi süregelen tartışmalardan birisidir. Bu tartışmaların odağını kamunun ekonomideki ağırlığının özel sektör üzerindeki dışlama etkisi oluşturmaktadır. Bu çalışmanın temel amacı 1980 sonrası dönem için Türkiye'deki kamu harcamalarının özel yatırımlar üzerindeki dışlama etkisinin araştırılmasıdır. Yapısal VAR modeli eş-dönemli parametre tahminlerine göre, kamu harcamaları özel yatırımlar üzerinde dışlama etkisini destekleyecek biçimde negatif bir etkiye sahiptir. Sonuçlar istatistik olarak anlamlı olmasına rağmen, dışlama etkisinin düşük düzeyde gerçekleştiği görülmüştür. Düşük dışlama etkisi nedeniyle, Türkiye'de özel yatırımları artırmanın uygun yolunun kamu harcamalarının kısılması olmadığı sonucuna varılmıştır.

Anahtar Kelimeler: kamu harcamaları, özel yatırımlar, dışlama etkisi, yapısal VAR..

JEL Kodları: C13, E22, E62.

Abstract.: After 1980, the debate about whether the government side of Turkish economy should become smaller is a continuing matter. The focus of this debate is crowding-out effect of government economic policy on private sector. The main purpose of this study is to investigate crowding-out effect of government spending on private sector investment in Turkey for the period after 1980. According to structural VAR model contemporaneous parameter estimation results government spending has a negative effect on real private investment, which is in support of crowding-out effect. Although these results statistically confirm crowding-out effect, this effect is relatively small. Because of the small crowding-out effect, it can be concluded that the proper way to increase the private investment in Turkey is not to reduce the government spending.

Keywords: Government spending, private investment, crowding-out, structural VAR.

JEL Classification: C13, E22, E62.

I.Introduction

The relationship between government actions and economic performance is an important subject of continuing discussion in economics.

Neoclassicals advocate that the budget deficits increase the level of consumption. This is because the individuals today think that the existing budget deficit will be financed by taxes collected from future generations. Since

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Neoclassicals assume that the economy is at full employment, they maintain that increasing consumption will decrease savings. Because of Savings-Investment identity, interest rates should increase to balance the decrease in savings. Increase in interest rates makes private investments less profitable, and accordingly, private investments decrease. Thus, budget deficit triggers crowding-out of private investment. Some empirical studies on the subject also found evidence supporting crowding-out hypothesis. (Aschauer 1989a, 1989b; Sundarajuan and Thakur, 1980; Monadjemi, 1993; Nazmi and Ramirez, 1997; Ghali, 1998; Everhart and Sumlinski, 2000; Voss, 2002).

On the other hand, Keynesian economists claim that, premising from the assumption that the economy is not always at full employment, budget deficits increase aggregate demand, and consequently private investment increases (crowding-in). The primary reason for this is the increase in national production resulting from the increase in public spending. Increasing national production brings about more optimism in expectations of private investors and accordingly their willingness to invest increases. Secondly, government spending in infrastructures of such areas as transportation, communication, etc. increases the profitability of private investments. Thus, studies by Eisner (1989), Greene and Villanueva (1991), Hadjimichel and Ghura (1995), Pereira (2000), Mallik (2001), Belloc and Vertova (2006) found evidence supporting crowding-in hypothesis.

Ricardian Equivalence Hypothesis advanced by Barro (1989) states that, contrary to both crowding-ouy and crowding in hypotheses, private investment is neutral to budget deficits. According to this hypothesis individuals will be cautious to the budget deficits. Budgets deficits are a result of, say, tax abatements. Under these conditions, individuals do not change their consumption, saving, and investment behaviors, thinking that abatements will be compensated by themselves in the future. As a result, budget deficits do not have any effects on private investment (Bahmani-Oskooee, 1999: 633-4).

Kuştepeli (2005) has studied the effects of public investments and public deficits on private investment in Turkey for the period of 1963-2003. The study, which employed Johansen Cointegration Test, verifies both the Keynesian and Neoclassical views. According to this study, the increases in public spending crowds-in private investment while public deficits have a crowding-out effect on private investment.

The aim of this study is to find out which of the three hypotheses mentioned above is valid in explaining the effects of public spending on private investment in post-1980 period. To this end, the study employs structural VAR method, which has not been used in any similar study conducted for Turkey before.

This study is organized as following: Structural VAR technique is briefly explained in the following section. Third and fourth sections describe the

estimating model and data, respectively. In the fifth section estimation results are given. Conclusions and some comments are provided in the last section.

II.Model

For the investigation of the validity of crowding-out hypothesis, a structural VAR (SVAR) model is estimated by using private investment, GNP and government spending variables in real per capita levels.

A K-dimensional VAR model is written as;

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + ... + A_p y_{t-p} + e_t \quad (1)$$

where y_t is variable vector, e_t is residual vector, and A_i is coefficient matrices. e_t is normally distributed white-noise stochastic process and it is assumed that its elements are contemporaneously correlated. In SVAR application, a VAR model is seen as a reduced form of a simultaneous structural model in which all variables are taken as endogenous. The following contemporaneous relationship exists between VAR model residuals and structural model error terms (u_t):

$$Ge_t = Ju_t \quad (2)$$

where, G and J are structural parameter matrices that establish relationships among individual elements of unexpected reduced form shocks e_t and structural shocks u_t respectively. In this study, crowding out hypothesis is defined is in Eq. (2).

Covariance matrix of VAR model, Σ_e, has the following representation with respect to structural parameters:

$$\Sigma_e = G^{-1} J \Sigma_u J' G^{-1'} \quad (3)$$

where Σ_u is covariance matrix of structural errors. Thus, an OLS estimate of the VAR provides an estimate of Σ_e that can be used in Eq. (3) to obtain estimates of G, J and Σ_u. The contemporaneous structural approach imposes restrictions on these three matrices. There are n^2 elements in G, n^2 elements in J, and $n(n+1)/2$ unique elements in Σ_e, but only $n(n+1)/2$ unique elements in Σ_u. The maximum number of structural parameters is equal to the number of unique elements in Σ_u. Thus, a structural model will not be identified unless at least $2n^2$ restrictions are imposed on G, J and Σ_u.

Often these restrictions are exclusion restrictions that need not be the case. Typically, Σ_u is specified as a diagonal matrix because the primitive structural disturbances are assumed to be originated from independent sources. The remaining parameters are identified by imposing additional restrictions on G and J. The main diagonal elements of G are set to unity because each structural equation is normalized on a particular endogenous variable. The main diagonal for J has the same specification since each equation has a structural

shock. Hence, J is usually taken to be the identity matrix, leaving at least $n(n-1)/2$ additional identifying restrictions to be imposed on G.

A two-step procedure is used to estimate structural VAR models. First, the reduced-form VAR, with enough lags of each variable to eliminate serial correlation from the residuals, is estimated with OLS. Next, a sufficient number of restrictions are imposed on G, J and Σ_u to identify these parameters.

Our contemporaneous relationships between unexpected reduced form shocks and structural shocks come from Mitra (2006). This relationship is defined as follows:

$$e_1 = \gamma_{13} e_3 + u_1 \tag{4}$$

$$e_2 = \varphi_{21} u_1 + u_2 \tag{5}$$

$$e_3 = \gamma_{31} e_1 + \gamma_{32} e_2 + u_3 \tag{6}$$

where the coefficient γ_{ij} represents response of variable j to an unexpected shock in variable i and the coefficient φ_{ij} represents response of variable j to a structural shock in variable i. The variables are defined as government spending, real private investment and real GNP, respectively. Thus, Eq. (4) states that the unexpected shock to government spending is due to an unexpected shock to GNP and a structural shock to government spending. The unexpected shock to private investment, as shown in Eq. (5), is due to structural shocks in government spending and its own structural shock. Finally, unexpected shocks in output are results of unexpected shocks in government spending, private investment and its own structural shock (Eq. (6)). The presence of crowding-out is detected by the reaction of private investment to a shock to government spending which is measured by φ_{21}. If this parameter is significantly negative (positive); crowding-out (crowding-in) hypothesis is valid. Otherwise, if this parameter is not statistically significant REH can be accepted.

This system is under-identified since there are 7 unknowns, 3 variances and 4 parameters to be estimated with 6 variances and covariances of the estimated reduced form VAR model.

The system is identified by specifying the effect of GNP on government spending, γ_{13}. In a similar fashion with Blanchard and Perotti (2002) and Giannini (1989), we set up coefficient on unexpected shock of GNP on government spending for one, $\gamma_{13}=1$.

III.Data

With the economic policy decisions of January 24, 1980, Turkish economy has undergone important structural changes. Since one of the essential aims of these decisions is to increase private investment, structural VAR

estimation in this study covers annual data for 1980-2005 periods. All variables are in logarithmic form, and deflated by wholesale price index. Data and their sources are indicated in Table 1.

Table 1: *Data explanations*

Data	Explanation	Sources
ℓnY	Per capita real *GNP* at 1987 Prices	SPO and CBRT
ℓnPINV	Per capita gross private investment, deflated by *WPI*	SPO and Treasury
ℓnGOV	Per capita real government expenditures without interest payments, deflated by *WPI*	CBRT

Note: SPO and CBRT refer State Planning Organization and Central Bank of Republic of Turkey respectively.

IV.Estimation Results

When using time series for estimation, order of integration of variables are important. A nonstationary time series is said to be integrated of the order (d) if it achieves stationarity after being differenced (d) times. Such variable is said to be an $I(d)$ variable. At one time conventional wisdom was that nonstationary variables should be differenced to make them stationary before including them in multivariate models. However, Engle and Granger (1987) introduced the concept of cointegration. They showed that it is quite possible for a linear combination of integrated variables to be stationary. In this case the variables are said to be cointegrated. If all variables are stationary, a VAR model should be estimated together with these variables. But if variables are neither stationary nor cointegrated, the best approach is to take differenced terms or to use percentile differences of variables. Whether variables are not stationary but cointegrated, using first differences of variables is not appropriate (Enders, 2004: 579). In this situation, using VECM is more appropriate instead of VAR (Temurlenk, 1998:62). For these reasons, before first step reduced form VAR estimation, we applied KPSS (Kwiatkowski, Phillips, Schmidt and Shin, 1992) stationarity test for all three variables to determine the order of integration of variables.

KPSS test results are presented at Table 2.

Table 2: *KPSS test results*

	ℓnY	*ℓnPINV*	*ℓnGOV*	Critical Values
Intercept	0.76	0.57[a]	0.71[a]	0.01=0.73 0.05=0.46 0.10=0.34
Trend and intercept	0.15[a]	0.13[b]	0.19[a]	0.01=0.21 0.05=0.14 0.10=0.11

Note: (*a*), (*b*) and (*c*) indicate significance levels at 1%, 5% and 10%, respectively. Critical values are taken from Kwiatkowski et al. (1992: 166) Table 1.

According to the KPSS test results, stationarity null hypothesis can not be rejected at 1% significance level for *lnY* and *lnGOV* and at 5% significance level for *lnPINV* in the trend and intercept case. Thus, we accept all variables as stationary with drift around linear time trend. Therefore, we estimate first step reduced form VAR in levels of the variables.

Second step contemporaneous parameters are estimated by using first step covariance matrix. In the estimation stage, we use maximum lag length as four and reported all SVAR parameters for all lag lengths from 1 to 4. The estimation results are presented in Table 3.

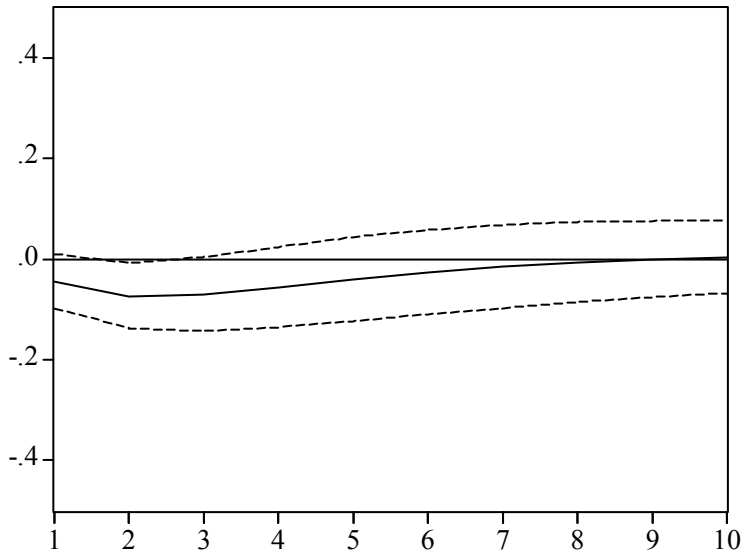
Table 3: *Estimation results*

Parameter	*VAR*(1)	*VAR*(2)	*VAR*(3)	*VAR*(4)
φ_{21}	-0.044[a] (-1.65)	-0.037 (-1.30)	-0.033 (-1.03)	-0.043 (-1.13)
γ_{31}	0.091[a] (1.80)	0.032 (0.57)	0.078 (1.24)	0.080 (1.28)
γ_{32}	0.282[c] (6.72)	0.285[c] (6.86)	0.262[c] (6.61)	0.257[c] (7.55)
AIC	-5.80	-5.23	-4.18	-3.12
SC	-5.20	-4.19	-2.69	-1.94

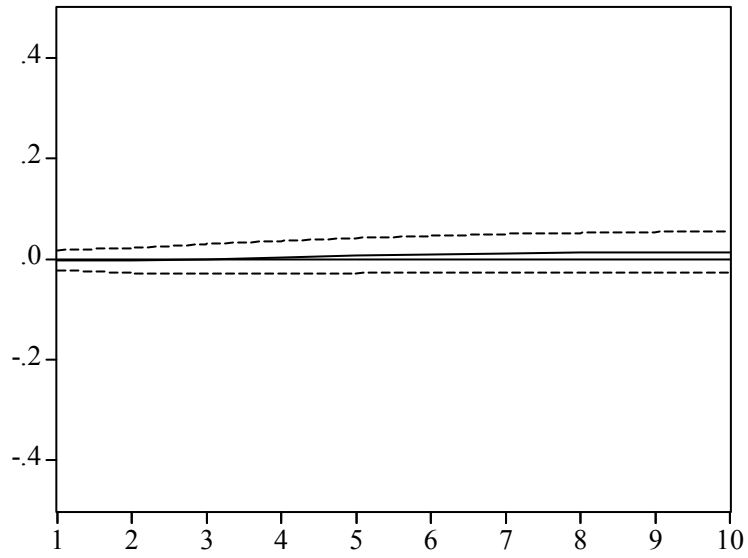
Note: The numbers in parentheses are *t*-statistics. (*a*), (*b*) and (*c*) indicate significance levels at 10%, 5% and 1%, respectively.

In Table 3 *AIC* and *SC* represent lag length selection criteria; Akaike's Information Criterion and Schwartz Criterion. According to *AIC* and *BC*, VAR(1) is the most suitable model. Thus, we used *VAR*(1) model for inference. In this model response of private investments to governments spending, φ_{21} coefficient, is statistically different from zero for two sides test at 10% significance level or negative for one side test at 5% significance level These results are in favor of crowding-out effect of government spending on private investment. However, one percent shock to government spending coincides with a significant decrease of private investment by 0.044 percent. Both the response of GNP to unexpected shocks in government spending (0.091) and private investment (0.282) have the correct sign in favor of crowding-out and both are statistically significant at 1% significance level.

The impulse-response graphs are given below. Graph (1) and Graph (2) indicate response of private investment to structural one standard deviation shock of government spending and a structural shock of government spending on GNP, respectively.



Graph 1 Response of Private Investment to Structural One S. D. Shock of Government Spending



Graph 2 Response of Real GNP to Structural One S.D. Shock of Government Spending

As indicated in Graph 1, government spending has an adverse effect on private investment. On the other hand, as shown in Graph 2, government spending has a positive effect on GNP. As seen in Graph (1) and Graph (2), these effects are in rather relatively small amounts.

V.Conclusion

After 1980, the debate about whether the government side of Turkish economy should become smaller is a continuing matter. The focus of this debate is crowding-out effect of government economic policy on private sector. In this context, the main purpose of this study is to investigate crowding-out effect of government spending on private sector investment. The structural VAR and impulse-response results capture government spending, real GNP and private investment support crowding-out effect, contrary to Kuştepeli (2005), who found government spending crowds-in private investment in Turkey. But, this effect occurs in relatively small amounts.

Although these results confirm crowding-out hypothesis, this effect is rather minimal. Therefore, it can be concluded that reducing government spending is not the most suitable way for increasing private investment in Turkey.

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