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CROWDING OUT EFFECT OF GOVERNMENT SPENDING ON PRIVATE INVESTMENTS IN TURKEY: A COINTEGRATION ANALYSIS

Türkiye'de Kamu Harcamalarının Özel Yatırımlar Üzerindeki Dışlama Etkisi: Koentegrasyon Analizi

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Özet
Bu çalışmada 1987:Q1-2007:Q3. dönemine ait veri kullanılarak Johansen-Juselius koentegrasyon analizi uygulanmış ve Türkiye'deki kamu harcamalarının özel yatırımlar üzerindeki etkisi araştırılmıştır. Çalışmadan elde edilen bulgulara göre toplam kamu harcamaları ve transfer harcamaları dışlama etkisinin aksine özel yatırımları desteklemektedir. Hükümetin yatırım harcamaları ise dışlama etkisi hipotezini doğrular şekilde özel yatırımlar üzerinde negatif etkiye sahiptir. Çalışmadan elde edilen diğer bulgulara göre, GSYİH özel yatırımları pozitif, faiz oranları ise negatif olarak etkilemektedir.
Anahtar Kelimeler: *Dışlama Etkisi, Kamu Harcamaları, Özel Yatırımlar, Koentegrasyon.*

Abstract
In this study, the crowding out impact of government spending on private investment in Turkey is investigated using Johansen-Juselius cointegration analysis for the period of 1987:Q1-2007:Q3. Obtained results indicated that total government spending and transfer payments had positive effects on private investments in accordance with the crowding-in hypothesis, while government investment spending crowded out private investment in Turkey. Other results suggest that GDP and interest rate have positive and negative effects on private investment, respectively.
Keywords: *Crowding Out, Government Spending, Private Investment, Cointegration*

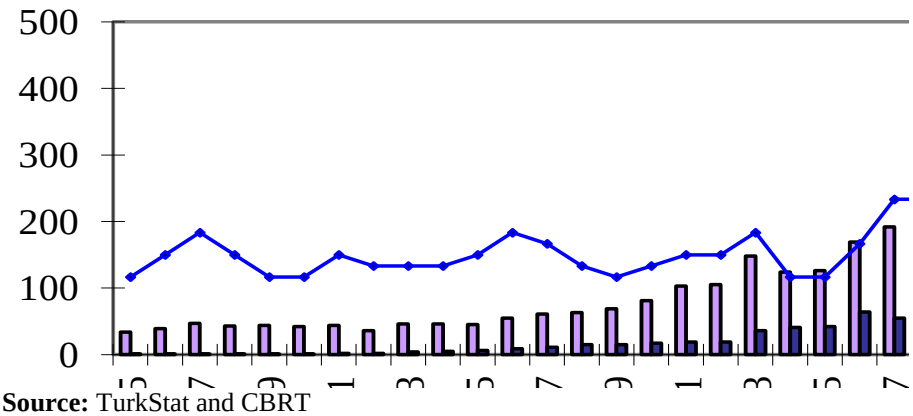
1. Introduction

Although the relation between government expenditures and private investment has been investigated substantially in the literature, impact of government expenditure on private investment is a controversial issue. There are two schools of thought concerning this issue. Classical and Neoclassical economists advocating free markets and minimal intervention of government in the economy argued that increased government expenditure is met by borrowing from capital market which causes rise in interest rate (Atukeren, 2005) as a consequence of competition of available funds. Increased interest rate will rise cost of capital for private sector and reduce private investment. That the increased government expenditures reduce private investments is called "crowding-out" hypothesis.

On the other hand, Keynesian economists argued that increased government expenditures bring about better infrastructure, health and education stimulating private investment (Hussain et al, 2009). The government sector can afford costs of large scale investments and projects requiring long time to become profitable that private sector cannot. Spillovers effects of such investments of public sector may be beneficial for private sector such as reducing transportation costs by developing infrastructure in roads and railways (Atukeren, 2005). In this context, government expenditures may stimulate private investment. That the increased government expenditures increase private investments is called "crowding-in" hypothesis.

It can be seen in Graph 1 that the change in government spending according to previous year has experienced a tendency for decreasing despite occasional increases for the period of 1976-2006 for Turkey. It was 16 % in 1976 whereas it was -7% in 2006. In this period, the change in investment and change in interest payment according to the previous year has shown an oscillating character. Whereas investment spending was 29.42% in 1976, it was -22.82% in 2006. In addition, it experienced a significant drop of -37.50% in 1994. The financial crisis of 1994 is the major factor in this drop (23.77% in 1993). The highest interest payment occurred in the years 1983 and 1993 (88.84% and 86.18% respectively).

Graph 1: Government Investment Spending, Real Interest Payment and Government Investment Spending in Turkey



Source: TurkStat and CBRT

There is a vast literature investigating impact of government spending on private investment for different countries, such as Aschauer (1989a and 1989b), Monadjemi (1993), Nazmi and Ramirez (1997), Ghali (1998), Everhart and Sumlinski (2000), Pereira (2000), Greene and Villanueva (1991), Chakraborty (2007), Khan and Gill (2009) and Ahmed and Miller (1999). Studies concerning impact of government expenditures on private investment in Turkey have controversial results. Şimşek (2003) investigated impact of military and nonmilitary government expenditures on private investments in Turkey using annual data for the period of 1970-2001 and error correction model. According to results of this study, infrastructure expenditures of government such as health and education and government interest spending crowded out private investments. On the other hand, expenditures for public services and military expenditures had positive impact on private investments. Altunç and Şentürk (2010) used autoregressive distributed lag models and annual data for the period of 1980-2010 to analyze effects of public investments on private investments in Turkey. Results of time series analysis showed that government expenditures supported private investments both in long run and short run. Atukeren (2005) analyzed the relationships between public and private investments in a sample of 25 developing countries including Turkey by cointegration analysis and Granger-causality tests for the time period 1970-2000. Results of this study indicated that public investment crowded out private investment in 11 countries including Turkey and crowded in in eight countries. For the rest of six countries, no statistically significant results were found. Kuştepeli (2005) analyzed the effectiveness of fiscal policy in the context of crowding-

out hypothesis for Turkey for the period of 1963-2003 by using Johansen cointegration test. The results verify both the Keynesian and Neoclassical views. While increases in government spending are found to crowd-in private investment, government deficits are found to crowd the investment out. Karagöl (2004) investigated whether disaggregated measures of government expenditures such as government consumption and public investment had crowding-out or crowding-in impact on private investment in Turkey over the period 1968-2000. Results of cointegration analysis of a multivariate system of equations indicated that public investment and government consumption tended to crowd out private investment.

The purposes of this paper are to determine which approach mentioned above receives empirical support for Turkey and whether or not there is any different effect between government investment spending and government transfer payments on private investments. In the next section, model and data used in this study are explained briefly. In the third section, methodology and empirical results are given. In the fourth section, results of analysis are discussed.

2. Model and Data

The estimated two models in this study are as follows;

$$PI=f(GDP, RIR, GI, GR) \quad (1)$$

$$PI =f(GDP, RIR, G) \quad (2)$$

Where; *PI*, *GDP*, *RIR*, *GI*, *GR* and *G* represents fixed private investment, gross domestic product, annual rediscount interest rate, government investment spending, government interest payment, total government spending respectively. Data of all variables are quarterly for the period of 1987Q1–2007Q3 and obtained from internet sites of the State Planning Organization of Turkey (SPO), Turkish Statistical Institute (TurkStat) and Central Bank of the Republic of Turkey (CBRT). All data are converted into real terms using the Wholesale Price Index (1968=100). All calculations were carried out using Eviews 5 program.

3. Methodology

The long-run equilibrium relationship between variables of model (1) and (2) was investigated by the Johansen-Juselius cointegration technique developed by Johansen (1988) and applied by Johansen and Juselius (1990). Johansen (1988) developed a procedure basically depending on a cointegration analysis in the vector autoregressive (VAR)

representation.

Johansen (1988) developed a VAR-based cointegration test defining a distributed lag model of a vector of variables, X as:

$$X_t = \pi_1 X_{t-1} + \pi_2 X_{t-2} + ... + \pi_k X_{t-k} + \varepsilon_t \qquad (3)$$

where *x* denotes a vector of *N* stationary, *I(0)*, variables. If variables of X vector are stationary at first order, *I(1)*, equation (3) can be rearranged as follows:

(4)

where $\Gamma_i = -I + \pi_1 + \pi_2 + ... + \pi_i$ and $\pi = -(I - \pi_1 - \pi_2 - ... - \pi_k)$. π is the long-run or cointegrating matrix (*N X N)* including number of *r* (rank of π) cointegrating vectors. If α and β are defined as two matrices (both *N X r* and $\pi = \alpha\beta'$), the *r* cointegrating vectors will be formed by the rows of β. The hypothesis that there are at most r cointegrating vectors by carrying out the two likelihood tests statistics known as the *trace* and the *λ-max* tests was proved by Johensen and Juselius (1990) (Bahmani-Oskooee, 1999).

4. Empirical Results

Prior to testing cointegration of series, various unit root tests were conducted in order to establish the order of integration of series. To this end, Augmented Dickey Fuller (ADF) (Dickey and Fuller, 1979), Phillips-Perron (PP) (Phillips and Perron, 1988) and Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) (Kwiatkowski et al, 1992) were carried out on the levels and difference forms of time series. Results of unit root tests are given in Table 1. According to the ADF and KPSS unit root test results, all variables are stationary, it can be seen that all of the variables are integrated of order 1, *I(1).* PP unit root test results are similar to others, but government investment spending variable. Government investment spending series found to be stationary at level, *I(0).*

Table 1 ADF, PP and KPSS Test Results

			PI	GDP	RIR	GI	GR	G
ADF	**Level**	τ_c	-.64	-.09	1.20	-1.82	-1.54	-1.74
			(-3.52)	(3.52)	(-3.51)	(-3.52)	(-3.52)	(-3.66)
		τ_t	-1.40	-1.19	-1.99	-2.11	-1.10	-1.13
			(-4.08)	(4.08)	(-4.08)	(-4.08)	(-4.08)	(-4.08)
	1 st Difference	τ_c	-8.79[a]	-9.26[a]	-5.06[a]	-13.34[a]	-12.59[a]	-12.44[a]
			(-3.51)	(3.51)	(-3.52)	(-3.51)	(-3.51)	(-3.51)
		τ_t	-8.73[a]	-9.20[a]	-5.18[a]	-13.25[a]	-12.59[a]	-12.40[a]
			(-4.08)	(4.08)	(-4.08)	(-4.08)	(-4.07)	(-4.08)
PP	**Level**	τ_c	-1.56	-2.94	1.52	-10.37[a]	-2.75	-5.40[a]
			(-3.51)	(-3.51)	(-3.51)	(-3.51)	(-3.51)	(-3.51)
		τ_t	-3.02	-9.26[a]	2.20	-10.69[a]	-2.62	-5.44[a]
			(-4.07)	(-4.07)	(-4.07)	(-4.07)	(-4.07)	(-4.07)
	1 st Difference	τ_c	-10.64[a]	-24.36[a]	-11.25[a]	-	-16.67[a]	-
			(-3.51)	(-3.51)	(-3.51)		-3.51	
		τ_t	-10.50[a]	-	-11.27[a]		-18.18[a]	-
			(-4.07)		(-4.22)		(-4.07)	
KPSS	**Level**	τ_c	.80	1.26	.91	.51	.60	.52
			(.74)	(.74)	(.74)	(.46)	(.46)	(.46)
		τ_t	.13	.14	.29	.18	.38	.38
			(.12)	(.12)	(.22)	(.15)	(.22)	(.22)
	1 st Difference	τ_c	.14[a]	.20[a]	.14[a]	.13[b]	.27[a]	0.36[a]
			(.74)	(.74)	(.74)	(.46)	(.46)	(.74)
		τ_t	.14[a]	.20[a]	.04[a]	.13[b]	.08[a]	.08[a]
			(.22)	(.22)	(.22)	(.15)	(.22)	(.22)

Notes: *a* and *b* denote significance at 5% and 1% levels, respectively. τ_c and τ_t represent "Intercept" and "Trend and Intercept" respectively.

Optimal lag length in VAR model was investigated by Akaike Information Criteria (AIC), Final Prediction Error (FPE) and Hannan and Quinn Criterion (HQ) using maximum 7 lags, since Johansen-Juselius cointegration test is sensitive to lag length. Results of AIC, FPE and HQ tests are shown in Table 2. Appropriate order of VAR was chosen as five lags according to results for both models

Table 2 AIC, FPE and HQ Results

Lags	FPE	AIC	HQ
0	171603.9	26.24232	26.30360
1	51.86572	18.13640	18.50408
2	47.72793	18.04467	18.71876
3	16.59187	16.96634	17.94684
4	3.464463	15.35821	16.64512
5	**2.054423***	**14.76568***	**16.35899***
6	3.272298	15.12299	17.02271
7	3.231328	14.95102	17.15715

Note: * indicates significance at 1% level.

After choosing lag length, cointegration analysis conducted and the results of Johansen-Juselius cointegration analysis for models were shown in Table 3 and 4. Both maximum eigenvalue and trace tests found statistically significant one cointegrating vector between the variables.

Table 3 Johansen-Juselius Cointegration Results for Model 1.

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix				
Null	**Alternative**	**Statistic**	**95% Critical**	**99% Critical**
r=0	r=1	54.72*	37.52	42.36
r<=1	r=2	18.52	31.46	36.65
r<=2	r=3	16.34	25.54	30.34
r<=3	r=4	11.67	18.96	23.65
r<=4	r>=5	7.52	12.25	16.26
Cointegration LR Test Based on Trace of the Stochastic Matrix				
r=0	r>=1	108.78*	87.31	96.58
r<=1	r>=2	54.05	62.99	70.05
r<=2	r>=3	35.53	42.44	48.45
r<=3	r>=4	19.19	25.32	30.45
r<=4	r>=5	7.52	12.25	16.26

Note: * denotes significance at 1% level. *r* is the number of cointegrating vector(s).

Coefficients are given in Equation (5) and (6). Values in parenthesis imply *t*-statistics of relevant variables. All coefficients are statistically significant at 1% level, but coefficient of *GI* variable in Model (1).

$$\underset{(-5.98)\quad(4.70)\qquad(6.90)\qquad(8.04)\qquad(-1.25)}{PI = -0.10 + 7.476GDP - 0.028RIR + 0.643GR - 0.227GI} \tag{5}$$

$$\underset{(-3.85)\quad(3.82)\qquad(3.75)\qquad(5.23)}{PI = -0.76 + 70.75\,GDP - 0.15RIR + 7.43G} \tag{6}$$

Table 4 Johansen-Juselius Cointegration Results for Model 2.

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix				
Null Ho	**Alternative H1**	**Statistic**	**95% Critical Value**	**99% Critical Value**
r=0	r=1	33.64**	31.46	36.65
r<=1	r=2	21.81	25.54	30.34
r<=2	r=3	9.23	18.96	23.65
r<=3	r=4	5.50	12.25	16.26
Cointegration LR Test Based on Trace of the Stochastic Matrix				
r=0	r>=1	70.18*	62.99	70.05
r<=1	r>=2	36.54	42.44	48.45
r<=2	r>=3	14.73	25.32	30.45
r<=3	r>=4	5.50	12.25	16.26

Note: * and * denote significance at 1% and 5% levels, respectively r is the number of cointegrating vector(s).

According to results of calculated coefficients in Model (1) shown in Equation (5), coefficient of *GDP* and *GR* variables found to be positive indicating that 1% increase in *GDP* and *GR* caused approximately 7.5% and 0.6% increase in *PI* respectively in the period of analyzed. On the other hand, sign of coefficient of *RIR* found to be negative indicating that 1% increase in *RIR* caused approximately 0.03% decrease in *PI* in the period of analyzed. Obtained results of calculated coefficient in Model (2) shown in Equation (6), sign of coefficients of *GDP* and *RIR* are similar to those in Model (1). Coefficient of *G* variable in Model (2) found to be positive, indicating that 1% increase in *G* caused 7.4% increase in *PI*.

4. Conclusion

Although the relation between government expenditures and private investment has been investigated substantially in the literature, impact of government expenditure on private investment is a controversial issue. This debate is increased in Turkey especially after 1980. The purpose of this paper is to determine impacts of government spending on private investments in the context of crowding-out and crowding-in hypothesis using Johansen-Juselius cointegration analysis and quarterly data of Turkey for the period of 1987Q1-2007Q3.

Results of this study showed that total government spending and government interest payments had positive effects on fixed private investments confirming crowding-in hypothesis for the period of analyzed. Crowding-in effect of total government spending on fixed private

investments indicates that total government spending contributed fixed private investments in the period of analyzed as mentioned in Keynesian view which was also found by Yavuz (2005), Kuştepeli (2005) and Altunç and Şentürk (2010). In this context, policies increasing total government spendings should be implemented to stimulate fixed private investments for economic growth in Turkey. In accordance with expectations, it was found that gross domestic product had positive and annual rediscount interest rate negative effect on private investment in both models. Increased gross domestic product can lead capital accumulation for future investments of private sector. That annual rediscount interest rate had a crowding-out impact on fixed private investments indicates return on private investments were under interest yield during the period of analyzed. Crowding-out effect of annual rediscount interest rate should be evaluated in monetary policies to avoid suspending fixed private investments.

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