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## Chapter 12

# Crowding–Out Effect in the European Union and Candidate Country Turkey: Panel Causality Analysis

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### **ABSTRACT**

*The effects of the government investments and private sector investments on the production, is an important academic argument subject between the Neo-classical school and the Keynesian school. Subject to the financing way of the government sector investments, accruing possibility of private sector investments decreases and crowding-out effect occurs with the behaviours of government sector which restricting the investment area of private sector or changing the investments plans. On the other hand Keynesian economist suggest that the economy is not always in the full employment level. By the hand of Keynesian multiplier mechanism which is increasing the public expenditures and decreasing the taxes, private sector would enhance its investments and crowding-in effect occurs. In this study, we aimed to test the existence of crowding out/in effects of the public sector investments on the private investments in the European Union and a candidate country Turkey with the panel causality tests, over the period 1970-2014.*

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## **INTRODUCTION**

Investments are in the center place of capital accumulation. Capital accumulation is the most important and the most strategical factor of the economic growth with a qualitatively and quantitatively sufficient population and technological development. Private sector investments are the essential determinant of long term economic growth and for the expansion of production capacity, from the point of view of Neo-Classical thought.

In the countries which adopted the mixed economy, both of public sector and private sector are each producers and consumers in the economic and social life and have their own decision and choice possibilities. These two sector sometimes became opponent for each other or sometimes became component of each other in their activities. Therefore, determining the relationship between public and private sectors as the most accurate form, measuring the effects of them on each other and maintain the relationship between these two sector in a regular way, are important in terms of economic growth.

There are positive effects of public sector investments on the private sector investments. Public investment expenditures are able to increase the productivity of private sector investments. Especially, implementing the important infrastructure investments by the hand of government is an “invitation” for the private sector investments. The investments of public sector which are directed to the Human capital have an effects on the increasing the factor productivity. By that way, a complementary relationship occurs between these two type of investment expenditures. In this case an increase in the public expenditures enables an increase in the private investments. Besides, public sector supplies the public goods which are not proper to leave to the hand of private sector as defense and justice services and generates important positive externalities.

The economic rationale behind most of these studies resides in the idea that public sector investment is confined, by and large; to those goods and services that the private sector investment will not produce in optimal amounts, because it is both hard to ration their use and benefits to paying customers (the free rider problem) and they are subject to substantial short-up costs. These public goods are subject to substantial start-up costs. These public goods are, nevertheless, of critical importance to the proper functioning of a market system because they tend to generate large and widespread spillover benefits (Ramirez, 1994: p. 6).

However, public sector investments may crowding-out private investments if the relationship between them is based on substitutability. Hence, the relationship between public sector investment and private sector’s productivity may provide additional information about the relationship between public spending and private investment.

According to Neo-Classical perspective, subject to the way of financing the public investment expenditures, increases in the government investments can occur a crowding-out effect on the private sector investments. This crowding-out effect realizes directly or indirectly. The increases in the taxes because of enhancing government investments, restrict the fiscal and physical sources of private sector investments. In that case there is a competition between public sector and private sector and direct crowding-out effect occurs.

As a results of implementation of public investment expenditures in the fields which are also the activity area of private sector, government investments will be subsidized and acting without efficiency. (Ramirez, 1994: p. 6). In the scope of producing competitive products with the private sector, crowding-out effect deepens.

If the government finance its investments by increasing the tax load of private sector, in the short and mid-term, will have the crowding-out effect on the private sector. (Buiter, 1997: p. 310).

In other words, crowding-out effect occurs if the private sector changes its investments plans as a result of expectations directed to increases in the taxes because of inefficient public investment expenditures. The high taxes which are necessary for the public expenditures make the private sector hesitant to take risks and broke its investments enthusiasm. (Gwatney, 1998: p. 3).

As it is seen fiscal policy provides additional spending in a world of sparse spending opportunities. But it does not provide a new source of finance in a world where spending is constrained by sources of finance. Time public sector investments are financed in debt markets in competition with private investments. The case least favorable to fiscal policy is that in which the additional government borrowing simply crowding-out of the market an equal (or conceivably even greater) volume of borrowing that would have financed 'private expenditures (Spencer & Yohe, 1970: p. 13). In contrast, the Barro-Ricardian neoclassical approach to fiscal policy assumes forward-looking behavior of private agents and predicts the equivalence between public debt and taxes. This is because the individuals today think that the existing budget deficit will be financed by taxes collected from future generations.

## **OBJECTIVE OF THE STUDY**

In this study, we aimed to test the existence of crowding out/in effects of the public sector investments on the private investments in the European Union and a candidate country Turkey with the panel causality tests, over the period 1970-2014.

## **DATA AND METHODOLOGY**

### **Literature Review**

The idea of existence of a relationship between public sector investments and private sector investments firstly suggested by Adam Smith (1776) and after that several studies examined the relationship between public sector investments and private sector investments, public spending and private sector investments, budget deficits and private sector investments.

The aim of this study is, to research the existence of the effects of public sector investments on the private sector investments. There are two possible effects of public sector investments on the private sector investments. First one is public sector investments' crowding out effect on the private sector investments. Second one is crowding in effect. There is not a consensus about the relationship and the public sector investments' crowding out or crowding in effects. A review is listed below among the country groups which is similar with our study because of the existence of numerous study with different groups in this literature (see Table 1).

As seen in the literature review, crowding out or crowding in effects varies among to sample countries, groups, terms or econometric methods.

**Variables and Dataset**

In this paper, the existence of crowding-out effect of the public sector investments on the private sector investments in the 12 EU Countries and Turkey for the years of 1971-2014 are examined. IG indicates government gross fixed capital formation/GDP and IP indicates private sector gross fixed capital formation/GDP. Data are collected from Annual Macro-economic Database (AMECO) for 12 EU Countries and from Ministry of Development for Turkey.

*Table 1. Literature review*

Study	Period	Country	Variables	Econometric Methods	Result
Kuştepli (2005)	1963-2003 and 1967-2003	Turkey	Budget Deficit – Private Sector Investments	Johansen cointegration test	Crowding out
Mahmoudzadeh, Sadeghi and Sadeghi (2013)	2000-2009	28 countries		Panel data regression	Crowding out for developed countries and crowding in for developing countries
Afonso and Sousa (2011)	1979-2007	Portugal	Public Spending – Private Sector Investments	VAR analysis	Crowding out
Heppke-Falk, Tenhofen, and Wolff (2006)	1974-2004	Germany		VAR analysis	Crowding out
Başar and Temurlenk (2007)	1980-2005	Turkey		VAR analysis	Crowding out
Kuştepli (2005)	1963-2003 and 1967-2003	Turkey		Johansen cointegration test	Crowding in
Bilgili (2003)	1988-2003	Turkey		VECM Analysis	Crowding in
Laopodis (2001)	1960-1997	Spain, Greece, Ireland, Portugal		Cointegration test and error correction model	Crowding out for Spain and Crowding in for Portugal, Greece and Ireland
Afonso and Sousa (2009)	Different terms	USA, UK, Germany, Italy		VAR analysis	Crowding out
Alesina, Ardagna, Perotti, and Schiantarelli, (2002)	1960-1996	18 OECD Countries		Panel VAR analysis	Crowding out
Furceri and Sousa (2011)	1960-2007	145 Countries		panel data regression	Crowding out
Şen H., Kaya A., (2014)	1975-2011	Turkey		VECM analysis	Crowding out for transfer spending, government current spending, and government interest spending and Crowding in for government capital spending

*continued on following page*

*Table 1. Continued*

Study	Period	Country	Variables	Econometric Methods	Result
Bilgili (2003)	1988-2003	Turkey	Public Sector Investments – Private Sector Investments	VECM analysis	Crowding out
Afonso ve Jalles (2011)	1970-2008	95 countries		panel data regression	Crowding in
Easterly and Rebelo (1993)	1970-1988	100 countries for CSDA and 28 countries for PDA		cross sectional data and panel data regressions	Crowding in
Argimon, Gonzalez-Paramo and Roldan (1997)	1979-1988	14 OECD Countries		panel data regression	Crowding in
Atukeren (2005)	1970-2000	25 Countries		cointegration test, granger causality test and probit analysis.	Crowding in
Mitnik and Neumann (2001)	1955-1994	Canada, France, UK, Japan, Netherlands and Germany		VAR analysis	Crowding in
Afonso and Aubyn (2010)	1960-2005	14 EU Countries and Canada, Japan and USA		VAR analysis	Crowding out for Belgium, Ireland, Canada, UK and Netherlands and crowding in for Austria, Germany, Denmark, Finland, Greece, Portugal, Spain and Sweden
Ahmed and Miller (1999)	1975-1984	39 countries		panel data regresyon	Crowding out for spending on social security and welfare (both developed and developing countries) and drowing in for government spending related to transport and communication (developing countries)

## **Econometric Method**

In this section, the effects of the public sector investments on the private sector investments will be researched for the years of 1971-2014 for the EU Countries and Turkey. In the literature about this subject, there are not several study which are focused on the EU Countries by the way there are plenty of study which are explaining the crowding-out relationship of the public sector and private sector investments in the developed countries. Each of them uses different econometric techniques for their researches. Some of them handle only one country and uses time series models, some of them uses cross-sectional or panel data analyses for the different groups of countries. Beside the regression analyses, there are different techniques could be observed in this kind of studies such as VAR analysis, causality and cointegration analysis, VECM model. In the bases of the terms and country groups, the econometric methods take a serious place in the difference of the results.

### **Crowding-Out Effect in the European Union and Candidate Country Turkey**

In the first phase of our econometric analyses, stationary of the private sector investments and the public sector investments are examined. The existences of unit root in the panel data can be tested with handling basic Augmented Dickey Fuller (ADF) specification.

$$\Delta Y_{it} = \rho Y_{it-1} + \sum_{L=1}^{p_i} \theta_{iL} \Delta Y_{it-L} + \alpha_{mi} d_{mt} + u_{it} \quad (1)$$

There are several unit root tests using different null and alternative hypotheses:

Hypotheses (A)  $H_0: \alpha_{i1}=0$  for all  $i$  versus  $H_1: \alpha_{i1}<0$  for all  $i$

Hypotheses (B)  $H_0: \alpha_{i1}=0$  for all  $i$  versus  $H_1: \alpha_{i1}<0$  for some  $i$

Hypotheses (C)  $H_0: \alpha_{i1}<0$  for all  $i$  versus  $H_1: \alpha_{i1}=0$  for all  $i$

While hypotheses (A) is used for Levin et al. (2002) panel unit root test; hypotheses (B) is assumed in Im et al. (2003) and Fisher type tests (ADF–Fisher and PP–Fisher) proposed by Maddala and Wu (1999) and Choi (2001). Hypotheses (C) is used in Hadri (2000) panel unit root test. LLC and Hadri unit root tests among aforementioned tests are known as first generation tests which do not allow correlation between units and do not also allow autoregressive term ( $\rho$ ) to take value according to units as well. IPS and Fisher type tests on the other hand allow autoregressive term to take value according to units. As the CADF test of Pesaran is designed so as to take the correlation between units into consideration, it is assumed as second generation test and its null hypothesis indicates the existence of unit root.

We can decide to use which generation tests could be used for our study by making a inter-units correlation test. If there is a correlation between units, it will be appropriate to use second generation tests. Departing from the thought of there would be similar behaviors for long term between two series which are including unit roots at level and stationary for the same rank; we have applied cointegration tests at the second phase of analyses. Westerlund (2007), suggested 4 panel cointegration tests depending on error correction model in order to test the existence of cointegration in panel data. While autoregressive parameter is not allowed to be changed according to units in panel variance ratio statistics, autoregressive parameter changes from unit to unit in group average variance ratio statistics. The basic hypothesis is the non-existence of cointegration for all tests.

At the last phase, we estimated error correction model for the aim of observing long and short term relations of the two cointegrated series. The error correction model set up like below;

$$\Delta Y_{it} = \phi_i Y_{it-1} + \beta'_i x_{it} + \sum_{j=1}^{p-1} \lambda_{ij} \Delta Y_{it-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta X_{it-j} + \varepsilon_{it}$$

Here  $\varphi_i$  is error correction parameter and if it is significant and negative, there is a long term relation between  $Y_{it}$  and  $X_{it}$ . Long term parameters as Mean Group Estimator MGE which are offered by Pesaran and Smith (1995) is an feasible estimator allow evaluation of short term parameters and error variance according to units, because of that this estimator's results took place in this study.



## RESULTS

First, we have applied several panel unit root tests for the series, the pooled and individual panel unit root tests results are shown in Table 2 and Table 3 respectively. The lag orders are chosen by Schwarz information criterion.

Before the evaluation of the results of panel unit root tests, the results of cross sectional correlation test must be discussed. The test statistic which is applied for the test the existence of cross sectional correlation, is 124.403 for the IG serie, and 396.727 for the IP serie. For both tests the basic hypotesis which indicate the non-existence of inter-unit correlation is rejected. For that reason, a second generation unit root test result which allows existence of cross sectional correlation is more reliable than others. Pesaran CADF results shows us that the IG and IP series are stationary for the first difference.

After the determining both series as stationary for the first difference, the existing of a long term relation between the series can be examined by the panel cointegration tests.

Westerlund Panel Cointegration Test result are shown in Table 3. Lag length is chosen with Akaike information criterion and at all tests the basic hypothesis set up as non-existence of cointegration.

3 of 4 test statistics in Table 3 shows us there is a cointegration between public sector investments and public sector investments. In this case, study can progress to the estimation procedure of long term relation.

The long term relation between public sector investments and private sector investments is examined by the mean group estimator and the results are listed in Table 4 for whole panel and country-by-country.

*Table 2. Pooled unit root tests*

Test	IG <sub>it</sub>	IP <sub>it</sub>	ΔIG <sub>it</sub>	ΔIP <sub>it</sub>
Levin, Lin & Chu t-stat	-3.96*	-1.66***	-20.24*	-17.86*
Lm, Pesaran & Shin W-stat	-3.15*	-2.59*	-17.34*	-13.78*
ADF-Fisher Chi-square	52.87*	47.24*	426.9*	347.17*
PP-Fisher Chi-square	51.73*	29.59*	624.5*	337.47*
Breitung	0.73	-4.43*	-11.85*	-8.95*
Pesaran CADF	-1.989	-1.945	-3.465*	-1.989*
Hadri Z-stat	8.24*	7.80*	2.86	-1.83

The null hypothesis in Hadri-Z test that series are stationary and in other tests the null hypothesis that series are non-stationary.

\*, \*\* and \*\*\* indicates significance level %, 5% and 10% respectively.

*Table 3. Panel cointegration results (IG<sub>it</sub>, IP<sub>it</sub>)*

Statistic	Z-Value
Gt	-1.637***
Ga	-.1178
Pt	-1.952**
Pa	-4.011*

## Crowding-Out Effect in the European Union and Candidate Country Turkey

Table 4. Error correction model

	Short Run Coefficient	EC Term	Long Run Coefficient	Constant
Pooled	-4.51	-0.08*	-0.34**	2.45*
Belgium	-5.11	-0.05	-1.10***	1.83
Denmark	-2.37	-0.14	-1.29	3.55**
Ireland	-17.00	-0.02	0.13	2.03
Greece	9.44	-0.05	-0.02	-1.72
Spain	-1.88	-0.08	-0.04	2.35
France	-11.78	-0.05	-0.04	3.60**
Italy	14.09	0.01	-0.44	0.38
Netherlands	-3.10	-0.13***	-0.13	4.07*
Portugal	1.23	-0.07	-0.18	0.95
Finland	-37.70	-0.03	0.32	5.41***
Sweden	-2.89	-0.12	-1.18**	3.81**
United Kingdom	-1.24	-0.05	-0.50	0.93
Turkey	-0.31	-0.26**	0.01	4.70**

## Econometric Conclusion

When the results of 12 EU countries' and Turkey's error correction model results of panel data set examined, it has seen that error correction term is negative and significant. This result indicates that there is a long term relation between the variables. The long term coefficient is significant but negative. Therefore, for whole panel it can be said that public sector investment's crowds out the private sector investments. When the countries examined individually, Turkey's and Netherland's error corrections term are significant and negative. A long term relation between public sector investments and private sector investments can be observed also in these two countries. But the long term parameter is insignificant. Therefore, there is no finding for crowding in or crowding out.

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## **KEY TERMS AND DEFINITIONS**

**Crowding-In:** Crowding-in effects explains that if government spending increase, demand for goods and services increase. This situation causes a need for enhancing production capacity of private sector and private sector investments increases.

**Crowding-Out:** With contrast to crowding-in, in the crowding-out effect, government spending increases the interest rates for tax rates, at this point private sector firms do not enhance their investments, they increase their savings subject to the way of financing the public sector spending. These government spending may be investment, current or transfer spending.

**Fiscal Policy:** The policies that the government pursues to response economic fluctuations with the fiscal tools which are hold only by the government such as taxation, debt policy and government expenditures.

**Income Effect:** The effect that occurs after the obtaining of debts. People or governments act like their revenues increased but actually the debts create a tax burden on the next generations.

**Private Sector Investment:** This term explains in the classical thought, regular investments which are realized by the free market firms.

**Public Investment Expenditure:** This term explains the investment expenditures which are realized by the hand of government. This may be for public goods and services which the private sector does not bear or must not bear because of their positive externalities. But the expenditures may include investments for private goods or services which private sector has to product, but the government intends to product them by the hand of Public Economic Enterprises.

**Ricardian Equivalence Hypothesis:** This hypothesis is stated by Barro, it explains that for the rational human, there is no difference to finance the public expenditures by taxes or by debts. Because individuals know the debts mean taxes for their next generations so they save their money and sources for the time that debts return.

**Tax Burden:** The ratio of the taxes that paid to the government in a particular term and the revenues that earned in the same term.