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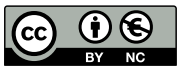

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Tax and spend, spend and tax, fiscal synchronisation or institutional separation? Examining the case of Greece.

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ABSTRACT

One of the most controversial issues in public finance and macroeconomics is the nature of the relationship between government spending and revenues. The debate between economists and politicians has been emphasised recently because of the increased budget deficits and defaults in many developed and developing countries. Many economists (Friedman, 1978; Payne, 1997; Darrat, 1998; Albatel, 2002) argued that it is very important to investigate whether the government spending determines the revenues and/or whether government revenue determines the government spending. We are applying an empirical analysis of the spend-tax or tax-spend hypothesis, in order to identify the direction of the causality between government spending and revenues in Greece for the period 1833-2009, a period of industrialisation, urbanisation, increased growth, increased government spending, and enormous budget deficits during the last decades and a serious problem with the public debt. In order to investigate the relationship between government revenues and spending we used the Dickey and Fuller (1979) and Phillips and Perron (1988) unit root tests, the Chow (1960) test and Zivot and Andrews (1992) unit root tests which allow structural changes, the Johansen (1988) cointegration approach and finally the Granger (1969) causality tests. We found strong evidence of long-run relationship between government spending and revenues. Additionally, we used the Granger-causality test which indicates that the causality runs from spending to revenues, thus support of the spend-tax hypothesis. The spend-tax hypothesis maintains that a political system somehow determines how much to spend and then makes the adjustments in tax policy and revenue sources in order to finance the government spending so limitations in spending will be effective for the economy of Greece, but no one could argue that limitations of taxation will be ineffective. It is very important for Greek government to identify the causal direction between government spending and tax revenues, because the direction of causality provides useful insights into how the country can manage their unsustainable budget deficits in the future.

Keywords: Government Spending, Government Revenues, Applied Economics, Greece, Spend-Tax Hypothesis.

JEL Codes: C01, C12, C22, E61, E62, E63, H0, H61

1. Introduction

The dynamic relationship between government spending and revenues is widely discussed because of the dramatic increase of the public sector growth and debt after the World War II and the increase of the budget deficits. The ever increasing size of the public sector and the permanent increase of deficits are the results of the increased government spending leading to higher taxation. From a supply side economics' point of view to finance the deficit via tax increases is not an appropriate tool to improve the budget balances and decrease the budget deficits, especially, if the deficit was caused by infrastructure investments, for example.

Another reason why the relationship between spending and revenues is very important is the commitment to meet the fiscal target that deficits have to be less than 3% as a share of GDP, set out by the Stability and Growth Pact for the European Union countries and has the requirement of an adequate fiscal consolidation strategy that guarantees permanent reduction of deficits. Fiscal policy has to support price stability and economic growth, provide employment, and stimulates capital formation. Hence, it is very important that the policymakers understand the relationship between spending and revenues, because there are impacts on budget deficits.

Moreover, when a government runs large budget deficits, then this automatically increases the debt burden. As we can see by recent events, this debt burden is threat to the continued membership in the Eurozone for countries such as Greece, Spain, Portugal, Italy and Ireland. However, some developing countries (Chile, Bolivia, Philippines, and Morocco) face the similar problems concerning their debt burden. Thus, research focussed on finding a way to solve these problems. It is argued (Vamvoukas 1997a,Vamvoukas 1997b, De Castro et al. 2004) that the optimal solution is the reduction of government spending instead of increased taxation, because an increase in taxes will have a negative effect on consumption spending (decrease) which in turn reduces aggregate demand so that deficits may not shrink. Some others (Payne 1997, Darrat 2002, Konstantinou 2004) denied this hypothesis and suggested as an optimal policy the increase of taxes, which will affect deficits and not government spending. Another solution they proposed is the simultaneous changes in government spending and taxation, because if policymakers focus only on one component of budget, they will ignore the interdependence with the other component.

It is widely accepted (Hughes Hallett et al. 2004, Hughes Hallett et al. 2005) that the lack of structural reforms in European Union countries is one of the most important factors behind the relatively disappointing economic performance of the most EU countries. Here, we have to add, that within the European Monetary Union any national monetary changes or exchange rates policies are not available. Thus, the main alternative actions of EMU countries are to make the labour and product market more flexible.

Nowadays, many EMU countries have problems with public economics and probably the solution is the structural reform. According to Delors Committee (1989) the structural reform is a prerequisite for a successful monetary union. The Lisbon strategy (2005) had the objective to lead national policies towards microeconomic flexibility and macroeconomic stability. According to Amable et al. (2010): "The Lisbon strategy was launched in 2000 to promote growth and employment by developing a highly competitive European economy. The philosophy underlying the strategy was that the 'knowledge-based society' would require substantial transformations of Europe's economic model(s)".

Narayan and Narayan (2006) gave three reasons why the nature of the relationship between government expenditure and revenue is very important. Firstly, if the tax-spend hypothesis is supported, budget deficits can be avoided by implementing policies that stimulate government revenue. Secondly, if the bi-directional causality does not hold, it means that government revenue decisions are made independent from expenditure decisions. This can cause high budget deficits and government expenditure rise faster than government revenue. Finally, if the spend-tax hypothesis is

supported, it means that the government spends first and pays for this spending later by raising taxes. This will have as a result a fear of paying more taxes in the future and will encourage the outflow of capital.

It is widely accepted that an improvement in the long-run economic efficiency can be achieved by reducing significantly government activities. Greece is a country where the government spending to GDP is extremely high and creates significant inefficiencies in the operation of the Greek economy such as unemployment, high inflation and huge public debt.

According to OECD Survey for Greece (2011), the country has to modernise its economy by implement structural reforms that will change the public sector, the labour and product markets and will be closer to international best practice. The efficiency, effort and innovation of Greek workers have to be restored. "Over a year after a fiscal crisis and the beginning o/IMF/EU/ECB support, Greece is still in a serious recession. The sizeable, but vital, fiscal retrenchment, has significantly reduced its large budget deficit. Considerable advances have also been made with structural reforms both in the public sector and in labour and product markets. Despite this progress, persistent market scepticism concerning the capacity of the country to restore sustainable public finances and to renew economic growth has left sovereign interest spreads at record highs" OECD (2011, pp23).

During the last 2 years the country had made major structural reforms that had to be implemented in previous years and were in accordance to the Lisbon agreement. The main objectives of the Greek government authorities are to improve the competiveness of the Greek economy and the long run growth prospects. The main areas of these structural reforms are the areas:

- Reform of tax administration
- To strengthen labour market institutions
- Opening up closed professions
- To upgrade the education system
- To modernise public administration
- To improve the business environment and strengthen competition in open markets (promoting exports and new licensing law)
- To raise the absorption rates of structural and cohesion funds

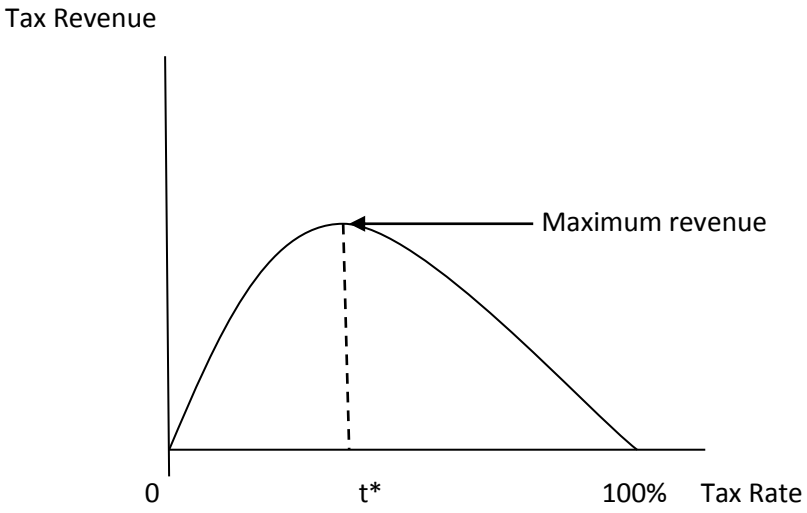
One of the most crucial challenges of the Greek economy is to ensure that there will be a reduction of the government deficit in order to make the government debt stable and be in line with the IMF and EU recommendations. In order to succeed in this objective, the Greek government took strict measures. According to the Hellenic National Reform Programme 2011-2014: "Fiscal adjustment is achieved through a combination of measures drawing on both the expenditure and the revenue side".

According to this reform plan, on the revenue side, the most important measures that have been employed are: raise in VAT rates in taxes on luxury goods and in excise taxes on fuel, tobacco and alcohol; an implementation of a unified progressive tax scale and elimination of special taxation rules; the creation of a Single Payment Authority of wages in the public sector and a "green tax" on CO2 emissions. On the expenditure side, the most important measures are: the considerable wage cuts in the public sector wages, suspension of recruitment in 2010 (with some exceptions for education, health and security) and the application of the rule "1 person recruited for every 5 retired" for 2011, without sectoral exceptions.

2. Previous work

Since 1980 there has been a growing concern over the relationship between government spending and revenues which some economists call the “tax-spend debate” or the “revenue-expenditure nexus”. During this debate economists outlined four different hypotheses. The first one is the tax-spend hypothesis and has two alternative views, the Friedman (1978) and Buchanan and Wagner (1977) hypothesis. Friedman (1978) claimed that if the government authorities increase the taxes, the resources that will be available for the government will be increased in the attempt to reduce the budget deficits and there will only be results in increased government spending. Payne (2003) commented on this view and suggested that indeed if revenues have a positive effect on expenditures, reductions in revenues will in turn reduce government expenditures. The second view is the spend-tax hypothesis, which suggests that a political system somehow determines how much to spend and then makes the adjustments in tax policy and revenue sources in order to finance the government spending. Ricardian equivalence argues that a cut in present taxes leads to higher future taxes with the same value as the initial cut. This happen because the government cannot change the present values of taxes but can change the present spending. Later Roberts (1978) and Peacock and Wiseman (1979) suggested that temporary increases in government spending because of a crisis or a war, will have higher permanent taxes as a result. So, according to the spend-tax hypothesis, when the government decides to reduce the government spending, the deficits will be reduced also.

Figure 1 The Laffer Curve



In 1974, the American economist Arthur Laffer proposed that the reduction of the taxes in the United States will lead to increased government revenues (tax revenues). He claimed that the taxes were so high and has reached extreme levels. He used the Figure 1 to explain his theory, The Laffer curve shows how much tax revenue is raised at each possible tax rate.

At a zero tax rate the government gets zero revenue. At the opposite side, with 100% tax rates there is no incentive to work and produce and again the tax revenues are zero. According to Begg et al. (2003) beginning from a zero rate, a small increase in the tax rate yields some tax revenue. Initially tax revenue rises with the tax rate, but beyond the tax rate t* higher taxes have major disincentive effects on work effort and revenue falls.

Laffer's main idea was that big government with big tax were above of the t*, so they had to decrease the tax rates. By reducing the tax distortion and increase the amount of work, the lower taxes will be offset by higher income to tax. By cutting the income tax rates probably there will be also a decrease in the deadweight burden of distortionary taxation. In economics the deadweight burden of taxation, is one of the economic losses that economies suffers as the consequence of the taxation.

The third hypothesis is the fiscal synchronization which argues that the government decisions about spending and revenues are made simultaneously (or jointly). Musgrave (1966) and Meltzer and Richard (1981) suggested that a government may change spending and revenues simultaneously and thus adhere to the tax-and-spend and spend-and-tax scenarios. Moreover, the voters compare the marginal costs and benefits of government programs when deciding the appropriate level of spending and taxation. Finally, the institutional separation hypothesis is examined, which argues that a government decides separately about spending and revenues. Baghestani and McNown (1994) tested the tax-spend and the spend-tax hypothesis and found evidence that none of the revenues and spending are related with the budget expansion.

There are two types of analyses used to examine the spend-tax or tax-spend hypothesis; time series and panel data analysis. Studies using time series analysis (Blackley 1986, Jones, Manuelli & Rossi 1993, Jones, Joulfaian 1991, Hasan, Lincoln 1997, De Castro, González-Páramo & De Cos 2004, Baharumshah, Lau 2007, Saunoris, Payne 2010, Puah, Lau & Teo 2011) examined the long run relationship between government spending and revenues for a particular country over time. The panel data analysis (Marlow, Manage 1987, Ram 1988, Chowdhury 1988, Dahlberg, Johansson 1998) investigated the relationship between revenues and spending across different countries over time. The majority of studies (De Castro, González-Páramo & De Cos 2004, Hatemi-J, Shukur 1999, Hatemi-J 2002b, Ewing et al. 2006) used time series data and tested the spend-tax hypothesis for a single country, while only a few studies (Baharumshah, Lau 2007, Kollias 2000, Oshikoya, Tarawalie 2009, Konukcu-Önal, Tosun 2008) have examined a group of countries. Furthermore, some of these studies examined developing countries (Darrat 2002, Payne, Ewing & Cebula 2003, Wahid 2008, Eita, Mbazima 2008). However, the majority of studies have focused on developed countries, the case of U.S.A. (Blackley 1986, Jones, Joulfaian 1991, Ewing et al. 2006, Anderson, Wallace & Warner 1986), the U.K. (Hasan, Lincoln 1997, Saunoris, Payne 2010), or Canada (Payne 1997).

Numerous studies with different methods and approaches developed to investigate whether the government spending determines the revenues and whether government revenue determines the government spending. The majority of these studies applied Johanshen (Eita, Mbazima 2008, Payne 1997, Hondroyiannis, Papapetrou 1996, Katrakilidis 1997, Park 1998) and Engle-Granger (Jones, Joulfaian 1991, Kollias 2000, Kollias, Mylonidis & Palaiologou 2007, Miller, Russek 1989) cointegration techniques to test for long run relationship between government spending and revenues. Consequently, they deployed Granger causality test (Oshikoya, Tarawalie 2009, von Furstenberg, Green & Jeong 1985, von Furstenberg, Green & Jeong 1986, Konstantinou 2004) in order to identify the direction of causality. Hatemi-J and Shukur (1999) deployed the Rao's F-test, while Ewing et al. (2006) used the TAR and M TAR models developed by Enders and Granger (1998).

Many studies examine the tax-spend and spend-tax debate at the national level, however, there is a fewer number of studies examining the long-run relationship between spending and expenditures at the sub-national level. There are several key differences between budgetary processes at national and sub-national level (especially for the United States (Von Fuerstenberg 1986, Marlow, Manage 1987, Ram 1988). Firstly, the state and local governments do not have the ability to institute inflationary policies as means to raise revenues as in the case of national governments. Secondly, most of the local and state governments operate under legislative and constitutional requirements that attempt to constrain budget deficits. Finally, the budgets of local and state governments are influenced more than national governments form changes in grants. Most of the studies examined

the sub-national level (state and local governments) for the United States (Marlow, Manage 1987, Ram 1988, von Fuerstenberg, Green and Jeong 1986), Joulfaian and Mookerjee (1990) used annual data for the period 1960-1986 and made a multi-country study of spend-tax debate for local and state governments. They followed Sims (1980) methodology and their results are mixed. Evidence of the spend-tax hypothesis is supported in the cases of Greece, Ireland, France, Japan, Netherlands and the United Kingdom, tax-spend hypothesis is supported in Canada, Portugal and the United States of America. Finally, they found evidence of institutional separation for Australia, Luxembourg, Germany, Belgium, Finland and Sweden. Dahlberg and Johansson (1998) tested 265 municipalities in Sweden. Miller and Russek (Miller, Russek 1989) examined the case of Greece, while Puah et al. (2011) investigated the Sarawak state.

Many authors_examined the tax-spend hypothesis in Greece. The majority of the studies applied time series analysis in order to examine the relationship between government spending and revenues. There is no clear pattern on empirical results of previous studies, however, most of studies (Hondroyiannis, Papapetrou 1996, Kollias, Makrydakis 1995, Vamvoukas 1997b, Vamvoukas 1997a) found support of unidirectional causality running from spending to taxation. Konstantinou (2004) found evidence of Tax-spend hypothesis. Finally, Katrakilidis (1997) concluded that there is Fiscal synconization, while Miller and Russek (1989), and Kollias and Makrydakis (2000) found mixed results.

In the presence of interdependence between the two sides of government policy, government spending and revenues, four possible outcomes can be emerged from an empirical investigation: firstly a bi-directional causality between the two variables, secondly an absence of any causal relationship, thirdly a unit-directional causality from government revenues to spending and finally a unit-directional causality from government spending to revenues.

There are several studies (e.g. Ewing et al. 2006, Darrat 2002, Park 1998, Konstantinou 2004) found support of the tax-spend hypothesis. For instance, Blackley (1986) used annual data for the period of 1929-1983 and tested the case of the United States of America. He followed the approach of Sims (1972) and used Granger causality tests between government spending and revenues with GNP as a control variable of macroeconomic changes. His empirical results indicate that tax leads government spending. Another article, consistent with the tax-spend hypothesis is Ahiakpor and Amirkhalkhali (1989) study. They tested the case of Canada during 1926-1985, by using Granger causality tests between government spending and revenues, and found evidence of tax-spend hypothesis. Similarly the study of Payne (1997) examined the long-run relationship between spending and revenues in Canada during 1950-1994. He used Johansen and Juselious cointegration approach and found that revenues follow a time path independent from revenues and GDP, while expenditures respond to budgetary disequilibrium in that budget imbalances would be corrected by expenditure changes. He used also the GDP in order to capture the overall movements in the economy and found support of the tax-spend hypothesis in Canada.

There is also another strand in literature (e.g. De Castro, González-Páramo & De Cos 2004, Saunoris, Payne 2010, Wahid 2008, Vamvoukas 1997a) supported the spend-tax hypothesis. Anderson et al. (1986) used annual data for the period 1948-1983 and tested the case of the United States of America. They followed the procedure of Hsiao (1981) and McMillin et al. (1984) and used Granger causality tests between government spending and revenues. They also included into their analysis real GNP and inflation rate. Their empirical results support the spend-tax hypothesis and suggest that limitations in spending will be effective for the economy of the United States but they cannot say that limitations of taxation will be ineffective. Von Fürstenberg et al. (1985) tested the case of the USA during the period 1954-1982 by using quarterly data. In this study they used GDP in order to control the macroeconomic effects instead of potential GNP but their results indicate also support of spend tax hypothesis in the case of the USA. Another article, consistent with the spend-tax hypothesis made by Kollias and Makrydakis (1995), who examined the validity of the proposition

that there is a causal relationship between government expenditure and government revenue for Greece over the period 1950-1990 by using annual data. They used Engle Gragner (1987) cointegration approach between government spending and revenues. There was a strong evidence of spend-tax hypothesis, concluding that a political system somehow determines how much to spend and then makes the adjustments in tax policy and revenue sources in order to finance the government spending.

Some studies (e.g. Hasan, Lincoln 1997, Katrakilidis 1997, Manage, Marlow 1986, Hatemi-J 2002a) found support of Fiscal synchronization (a bi-directional causality between spending and revenues). Manage and Marlow (1986) extended the data period (1929-1982) of Anderson et al. (1986) and tested the case of the USA. They followed the procedure of Granger (1969) and used the Granger causality test between spending and revenues. Their empirical results indicate either support of the fiscal synchronization hypothesis or the tax-spend hypothesis, depending upon the number of lags in the VAR. This supposition is consistent with Katrakilidis (1997), who made an attempt to re-evaluate the long-run relationship between government spending and revenues in Greece for the period 1974-1991. In his empirical analysis he followed Liu and Maddala (1992) and used Johansen's (1990) cointegration approach and error correction models. Furthermore, he included the variable of real income. The results indicate evidence of a bi-directional effect between the government spending and revenues and support the fiscal synchronization hypothesis.

There are studies (e.g. Baghestani, McNown 1994, Hoover, Sheffrin 1992) that found an absence of any causal relationship (Institutional separation), Baghestani and McNown (1994) used quarterly data of the United States during the period of 1955-1989. They used Johansen-Juselious (1990) cointegration approach and error correction models. In order to take into account any macroeconomic change they included real GNP. They did not find any evidence of a respond of revenues or spending to the budgetary equilibrium, and they concluded that there is evidence of the institutional separation of the allocation and taxation of government. Moreover, they found strong evidence of long run relationship (cointegration) between spending and revenues. However, both of the variables do not respond to budget disequilibrium and reject the tax-spend and spend-tax hypotheses.

Some studies found mixed results in the relationship between public spending and revenues. These studies used data from different countries and found results indicate that causality is running from spend to tax, while in other countries the directions is the opposite (e.g. Kollias & Makrydakis, 2000; Narayan, 2005; Baharamshauh, 2007). Furthermore, there are several studies found different results for state and local governments (e.g. Marlow & Manage, 1987; Ram, 1988; Miller & Russek, 1989). Finally, Jones and Julfaian (1991) had mixed results for short run and long run.

Finally, there are studies (Wilcox 1989, Hakkio, Rush 1991, Tanner, Liu 1994, Quintos 1995, Makrydakis, Tzavalis & Balfoussias 1999, Jayawickrama, Abeysinghe 2006) investigating the sustainability of public deficits in many countries. These studies mainly examined the long-run relationship between government spending and revenues. However, one very important feature that can be linked with the existence of a cointegration relation between spending and revenues is the direction of the causality between these variables. This causality will help us to understand how fiscal policy is set-up in practice.There are several studies examined the sustainability of budget deficits and the spend-tax hypothesis(e.g. Konstantinou 2004,Baharamshauh 2007, Puah et al. 2011). Hatemi-J (2002) examined the fiscal policy in Sweden and the effects of EMU criteria convergence for the period 1963-2000. Firstly, he examined the sustainability of fiscal policy and found that the Swedish government is not in violation of its intertemporal budget constraint and that a fiscal policy is feasible with respect to the EMU criteria. He could not reject the hypothesis of bi-directional causality between spending and revenues for the entire sample, thus he confirmed that spending and revenues changes simultaneously in Sweden. Oshikua and Tarawalie (2009)

investigated the sustainability of fiscal policy in the West African Monetary Zone and the direction of the causality between government spending and taxation for the period of 1980-2008.

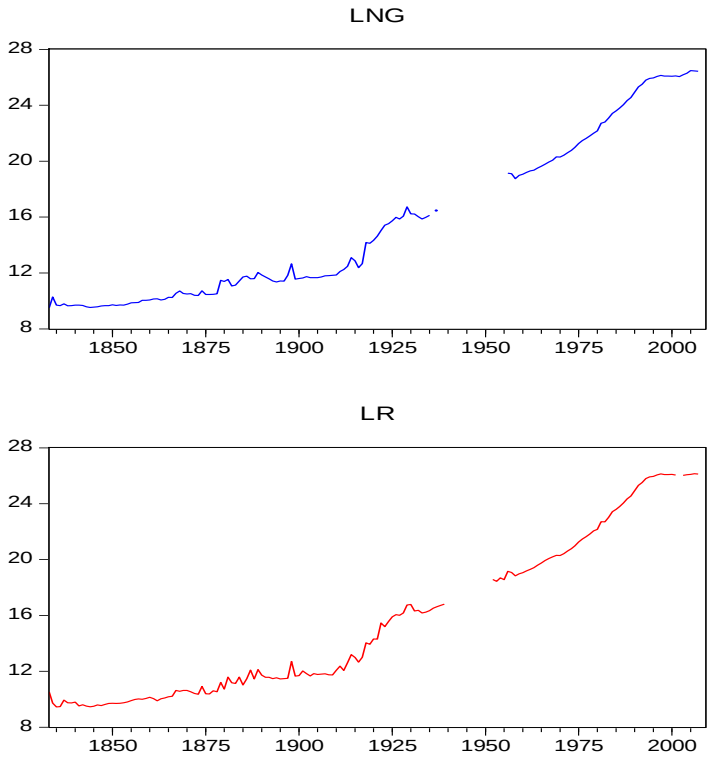
3. Data

Our empirical analysis has been carried out using annual data for Greece for 1833-2009. This is the first attempt of investigating the issue of Spend-tax hypothesis during the last 2 centuries (1833-2009). Several studies examined the case of Greece found mixed results, hence, an empirical investigation for this period is necessary.

The tested series are LG (real government spending), LR (real government revenues) and LGDP (real gross domestic product) for 1833-2009. The data that we use in our paper is for the period 1833-2009 and has been obtained from several issues of the National Accounts of Greece published by the National Statistical Service of Greece while the overall government expenditures and the overall revenues of the general government are obtained from several issues of the "Budget Proposal" which is published from the Ministry of Finance on annual basis, Dertilis (2005) and Kostelenos et al. (2007).

The following graph shows the real government spending and revenues for the period 1833-2009 During the last decades, the revenues path always lies below the public expenditure. Both series are shown to grow practically together until 1973, when the expenditure ratio shifted up to a higher level, the margin between them again widened in 1981, implying an exceedingly higher budget deficit as ratio of GDP . This gap between spending and revenues of total government further increased in 1989, as revenues sharply decreased. The same happened after 2000 as revenues sharply decreased again and spending enormously increased.

Figure 2 Government spending and Revenues (in logs) during 1833-2009



4. Empirical Results

As pointed in the previous section in the presence of interdependence between the two sides of government policy, government spending and revenues, four possible outcomes can be emerged from an empirical investigation: firstly a bi-directional causality between the two variables, secondly an absence of any causal relationship, thirdly a unit-directional causality from government revenues to spending and finally a unit-directional causality from government spending to revenues. In this chapter we are using the same data and methods we used in the previous chapters, thus we do not analyse them again.

4.1. Unit Root Test

Given that the causality test validity depends whether the tested variables are co-integrated (integrated of the same order), we begin our analysis by checking for the presence of a unit root in the variables, LG (government spending), LGDP (real GDP) and LR (revenues). We use the augmented Dickey-Fuller (1979) and Phillips-Perron (1988) tests. It is very important all the tested variables ensure stationarity by passing both the tests, the results are reported in Table 1 (ADF) and 2 (PP). Our empirical results of ADF and PP unit root tests indicate that all the series are non-stationary at level[1] and stationary at first difference. Both unit root tests conducted with intercept and with intercept and trend on the logged values of the tested series. Thus, all the tested series are integrated of first order (I (1)).

Table 1 ADF Unit Root Test, Spend-Tax hypothesis

Intercept						
1833-2009						
Variables	ADF	P-value	Variables	ADF	P-value	Critical value (5%)
LG(0**)	1,73	0,99	ΔLG(0)	-12,5*	0	-2,88
LR(1)	2,48	1	ΔLR(0)	-16,9*	0	-2,87
LGDP(3)	2.05	0.99	ΔLGDP(2)	-4.66*	0.0002	-2.87

Intercept and trend						
1833-2009						
Variables	ADF	P-value	Variables	ADF	P-value	Critical value (5%)
LG(0)	-1.56	0.80	ΔLG(0)	-13.49*	0	-3.43
LR(1)	-1.87	0.66	ΔLR(0)	-17.72*	0	-3.43
LGDP(3)	-1.22	0.90	ΔLGDP(2)	-5.36*	0.0001	-3.43

[1] The hypothesis of existence of a unit root cannot be rejected.

Table 2 PP Unit Root Test, Spend-Tax hypothesis

Intercept						
1833-2009						
Variables	P-Perron	P-value	Variables	P-Perron	P-value	Critical value (5%)
LG(2***)	1,95	0,99	ΔLG(5)	-12,87*	0	-2,88
LR(4)	2,26	1	ΔLR(7)	-16,27*	0	-2,88
LGDP(8)	2.68	1	ΔLGDP(8)	-10.31	0	-2.88

Intercept and trend						
1833-2009						
Variables	P-P	P-value	Variables	P-P	P-value	Critical value (5%)
LG(1)	-1.54	0.8	ΔLG(3)	-13.59*	0	-3.43
LR(4)	-2.43	0.36	ΔLR(6)	-17.57*	0	-3.43
LGDP(8)	-1.39	0.85	ΔLGDP(7)	-10.97*	0	-3.43

Note: * *indicate rejection of the null hypothesis at the 5% level of significance. .** number in parentheses of ADF indicates the lag length based on SIC.***number in parentheses in PP indicates the Bandwidth, Newey-West using Barlett kernel.*

4.2 Co-integration test

By using ADF and PP tests we have established that we can reject the null hypothesis of existence of a unit root in the first differences of our variables and ensured stationarity, the next step is whether the variables are co-integrated.

In Table 3 are reported the results of Johansen-Juselious co-integration tests, we found evidence from both the Eigenvalue and trace test that there is at least one co-integrating vector in the multivariate system (LR, LG, LGDP, D1905[2]), so there is strong co-integration between the variables. In the previous multivariate system we included GDP in order to capture any macroeconomic effects, but we cannot identify if the cointegration between spending and revenues depend on the presence of other macroeconomic variable such as GDP (or interest rates in other studies). Thus, we performed also a trivariate system[3] with government spending, revenues and a dummy variable (1905) a date that we found a structural break in our series), and we found again evidence of strong co-integration between spending and revenues, thus the long-run relationship between the two variables appears to be genuine and not simply induced by business cycles, financial market conditions or other macroeconomic effects (Table 4).

[2] We applied the Zivot and Adrews (1992) and the recursive Chow test (1960) in order to examine for possible structural changes in our series. We found that LG and LR for the tested period 1833-2009 have structural changes at 1905 and 1917.

[3] The final prediction procedure selects the lag length (1 lag in VAR-1 and 7 lags in VAR-2) that the one-step ahead forecasting error is minimized.

Table 3 Johansen Cointegration Method, Spend –Tax hypothesis (LG, LR, LGDP, D1905)

1833-2009

Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
r=0	0.201	48.26*	40.17	0.0633	r=0	0.201	31.26*	24.15	0.0046
r=1	0.0755	16.99	24.27	0.3118	r=1	0.075	10.91	17.79	0.3938
r=2	0.038	6.079	12.32	0.426	r=2	0.038	5.39	11.22	0.4248
r=3	0.004	0.685	4.129	0.467	r=3	0.004	0.685	4.12	0.4671

Table 4 Johansen Cointegration Method, Spend –Tax hypothesis (LG, LR, D1905)

1833-2009

Unrestricted Cointegration Rank Test (Trace)					Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
r=0	0.203	45.11*	29.797	0.0004	r=0	0.203	31.648*	21.131	0.0012
r=1	0.0711	13.47	15.494	0.0986	r=1	0.0711	10.258	14.264	0.1955
r=2	0.022	3.212	3.841	0.0731	r=2	0.022	3.212	3.841	0.0731

The VARs satisfy all the statistical assumptions required for the Johanshen approach and we can continue with the cointegration analysis and Granger Causality tests. In table 5 are reported the diagnostic tests for heteroskedasticity and autocorrelation in all the VARs.

Table 5 Diagnostic Tests, Spend-Tax Hypothesis

	Heteroskedasticity	F-critical		Heteroskedasticity	F-critical
VAR 1	F(12,134)= 2,23	2,34	VAR 2	F(10,137)= 1.44	1.91
	Chi-sq(12)=24,47	26, 21 (10%)		Chi-sq(10)=15.91	18.30

	Autocorrelation			Autocorrelation	
	LM-STAT	Critical (Chi-sq)(df=9)		LM-STAT	Critical (Chi-sq)(df=9)
VAR 1	14,36	16,91	VAR 2	14,88	16,91

4.3 Granger causality test

We found in the previous section that there is one cointegration vector for all the models, so we can define the Granger causality tests as joint test (F-tests) for the significance of the lagged value of the assumed exogenous variable and for the significance of the error correction term. The results are reported in table 8 and indicate that Granger causality is running from spending to taxation, which provide support of the validity of spend-tax hypothesis.

Table 6 Granger Causality test, Spend-Tax Hypothesis

1833-2009					
	F-stat	P-value		F-stat	P-value
LR causes LG	1.52	0.2214	LG causes LR	6.41*	0.021

Our empirical results indicate a uni-directional causality running from expenditure to taxation. As a result, reducing the size of government spending may improve fiscal budget deficits without having to undergo changes in the overall strategy. These results suggests that the Greek political system somehow determines how much to spend and then makes the adjustments in tax policy and revenue sources in order to finance the government spending.

5. Conclusion

Recent large deficits of developed and developing countries have intensified public debates between economists and politicians about the long-run relationship between government spending and revenues. This chapter examined the case of Greece for the period 1833-2009, a period of industrialisation, urbanisation, increased growth, increased government spending, and enormous budget deficits during the last decades and a serious problem with the public debt.

There are different hypotheses about the long run relationship between spending and revenues, each of them with different policy implications about the solution of large deficits and public debt.

There are four main hypotheses in the literature about this causality:

1. Spend-tax hypothesis, there is a uni-directional causality running from government spending to revenues (taxation). This hypothesis implies that the government authorities and policy makers adjust taxation to the level of planned expenditures.

2. Tax-spend hypothesis, there is a uni-directional causality running from taxation to government spending. According to Friedman (1978), government authorities adjust government spending to the level of the revenues in order to limiting growth in the public sector.

3. Fiscal synchronization, which implies that the government decisions about spending and revenues (taxation) are made simultaneously (or jointly). Hence, the two macro-variables mutually reinforce each other.

4. Institutional separation, which argues that the government decides separately about spending and revenues, so there is no long-run relationship between government spending and revenues. Thus the fiscal policy is unsustainable.

Our empirical results indicate, first of all, evidence that the time series that we have used are stationary in the first difference. Secondly, when we performed two multivariate systems, VAR1 (spending, revenues, D1905 and GDP) and VAR2 (spending, revenues, D1905) to test for co-integration, we found strong evidence of long-run relationship between the series. Finally we used Granger-causality test that points out that if there is a cointegrating vector between spending, revenues and GDP, there must be causality among these variables at least in one direction. Our results indicate that the causality runs from spending to revenues and this supports the spend-tax hypothesis. Furthermore, our results are in accordance with Kolias and Makrydakis (1995), Hondroyiannis and Papapetrou (1996) and Vamvoukas (1997a, 1997b). However, there are some studies examining the case of Greece and the results of which are in contrast. For instance, Ram (1988), Julfaian and Mookenjee (1991) found support of the tax-spend hypothesis, while Katrakilidis (1997) and Kollias and Makrydakis (2000) found evidence of fiscal synchronization.

The spend-tax hypothesis maintains that a political system somehow determines how much to spend and then makes the adjustments in tax policy and revenue sources in order to finance the government spending so limitations in spending will be effective for the economy of Greece, but no one could argue that limitations of taxation will be ineffective. It is very important for Greek government to identify the causal direction between government spending and tax revenues, because the direction of causality provides useful insights into how the country can manage their budget deficits in the future. Furthermore, when the government authorities identify the direction of causality, they know whether there is control over one variable or not. The government authorities can identify the source of fiscal imbalances that might exist and lead to unsustainable fiscal policies.

Additionally, our empirical results indicate that the development of high levels of deficits and public debt, over the last 5 decades is mainly produced as a result of bad spending decisions of Greek government and not by the dynamics of government revenues. Authorities and policy makers should understand that in order to make the public sector more efficient, it is necessary to reduce significantly the government spending. Moreover, we suggest that any attempt to reduce public deficits without firstly reducing the public spending will fail. Finally, this policy will strengthen the budget framework and has as main objective to reduce spending rather than raising revenues. This will help Greece to bring back a sustainable fiscal path without reducing essential and productive expenditure and lead the economy to a long run growth.

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