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Fiscal Policy and Economic Growth, Empirical Evidence in European Union

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Abstract. The role of Fiscal policy in the long run growth process has been crucial in macroeconomics since the appearance of endogenous growth models. Additionally, a significant debate among economists involves whether several types of spending or taxation enhance economic growth. The main objective of this paper is to highlight the relationship between fiscal policy and economic growth in the EU-15, and make an attempt to determine which of the fiscal policy instruments enhance economic growth.We deployed panel data techniques and included both sides of budget, spending and taxation, in our regressions and used the most recent dataset data for fiscal variables from Eurostat. We made a new classification of public expenditures into homogeneous groups in order to reduce the explanatory variables and increase the efficiency of our model and results since we have data for only 14 years. In our empirical analysis we included OLS, fixed effects models, random effects models and GMM estimators, the Arellano & Bond (1991) and the Arellano & Bover (1995) - Blundell & Bond (1998) estimators.On the first round of our regressions we find a negative impact of spending on human capital accumulation on economic growth. Our empirical results also indicate that an increase on government spending on infrastructure has a significant positive impact on the economy growth of a country. Additionally, in our regressions the variable government spending on property rights protections include spending on defence and spending on public order safety. Our empirical results from the first round of regressions imply a strongly negative relationship between these two variables. However, on the second round of our regressions we aggregate defence spending from spending on property right protection and we did not find any relationship between economic growth and defence spending. Moreover, we found a non-significant relationship between government spending on social protection and economic growth. On the second round of regressions, when we allow for non-linear growth effects we find a positive relationship with deficits and economic growth, which is in contrast with Ricardian Equivalence. We also included the employment growth and business investment in our model because labour and capital are very important factors of production in growth models. In our empirical results we do not find a significant impact of employment on economic growth, but when we allow for non-linear growth effects we find a strongly positive impact. However, we found that gross fixed capital formation of the private sector as a percentage of GDP in both rounds of our regressions, has no significant impact on economic growth. Finally, our empirical results do not support any evidence of relationship between openness and economic growth.

Keywords. Panel Data. Fiscal Policy. Taxation. Government Expenditures.
JEL. C23, C33, E62, H2, H5.

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1. Introduction

The The role of Fiscal policy in the long run growth process has been crucial in macroeconomics since the appearance of endogenous growth models. Kongsamut et al. (2001) implied that the endogenous growth models or balanced growth models are used extensively in macroeconomics because they are consistent with the Kaldor (1960) facts regarding to economic growth. The Kaldor facts are the followings: Per capita output rate is approximately constant, the capital-output ratio is approximately constant, the real rate of return to capital is approximately constant and the shares of labour and capital in national income are approximately constant.According to Afonso & Alegre (2007) the role of fiscal policies on economic growth has driven several studies both on the theoretical and empirical fronts. Governments need to acknowledge whether their public activities serve as an incentive to growth or if they pose an obstacle, since the development of appropriate fiscal policies could lead to a persistent increase of economic growth.

A significant debate among economists (Levine & Renelt, 1992; Folster & Henrekson, 2001; Kneller, Bleaney & Gemmel, 2001; Barro & Sala-i Martin, 2004) involves whether several types of spending or taxation enhance economic growth. In addition, the global recession and financial crisis, especially during the last 2 years, produced new interests and disagreements in the Fiscal policy in European Union countries. Nowadays, the public finances of most countries in the European Monetary Union (EMU) are in the worst position since the industrial revolution.

The main objective of this paper is to highlight the relationship between fiscal policy and economic growth in the EU-15, and make an attempt to determine which of the fiscal policy instruments enhance economic growth. However, there are several difficulties in order to examine whether there is support of endogenous or neoclassical growth models. Firstly, there are limited data (only 14 years) on government spending and taxation for European Union countries and more specifically in the dissagregation level required for our analysis. The limited data is one of the reasons that we could not apply a model for individual countries such as Greece. During 1990s the majority of European Union countries made the decision to give up their national currencies, and used a new currency the euro. European Monetary Union have joined by 12 countries (Belgium, Germany, Spain, France, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland and Greece) and adopted euro as its common currency. The decision of European leaders for a single European currency made at 1979 when the members of European Union set up the European Monetary System (EMS).

A common problem of many studies that examined the relationship between economic growth and fiscal policy is that they do not pay attention to separate the effects of fiscal policy on the transition from them on steady-state. Benos (2005) claimed that this separation is essential, since the difference between neoclassical and endogenous growth models are their predictions about the long-run effects of policy. Most of the existing literature is based on cross section or panels of five-year averages and according to Knerrel et al. (2001) it allows only for the contemporaneous effects within each five year period. He claimed that five-year averaged data are insufficient to capture the long-run effects of fiscal policy and that longer lags are required. Finally, the endogeneity of regressors in growth equations does not take into account the effects of fiscal policy on growth. Knerrel et al. (2001) attempted to answer the question if faster growth induce larger government expenditures and taxes (via Wagner's law), or vice versa, or both[i].

However, according to Benos (2005) the empirical results do not change even if these reggressors are taken into account.

In this paper we used panel data techniques because they offer several advantages over cross-section and time series analysis. First of all, panel data refer to data which contains time series observations of a number of individuals, consequently these observations involve at least two dimensions: a cross sectional dimension and a time series dimensional. According to Baltagi (1996) panel data refers to the pooling of observations on a cross section of countries, firms, households, etc. over time periods. It can be achieved by surveying a number of individuals (countries) and following them over time. Hsiao (2003) argued that when time series data are non-stationary, the large sample estimation of the distributions of the least-squares or maximum likelihood estimators are no longer normally distributed, (e.g. Dickey & Fuller, 1979; Phillips & Durlauf, 1986). However, if panel data are available, and observations between cross-sectional units are not dependent, subsequently someone can apply the central limit theorem across cross-sectional units to explain that the limiting distributions of many estimators stay asymptotically normal (Levin, Lin & Chu, 2002; Phillips & Moon, 1999). Panel data analysis allows for more accurate inference of model parameters and usually contain more degrees of freedom and more sample variability than time series and cross section data, hence improving the efficiency of econometric estimates (Hsiao, Mountain & Hollman, 1995). In our case we want increase the efficiency of our model and results since we have data for only 14 years.

Additionally, we control the impact of omitted variables. Hsiao (2003) stated that it is regularly implied that the most common reason that researchers find (or do not find) specific effects, is because they ignore the impacts of certain variables in the model specification which are related with the incorporated explanatory variables. Panel data include informations on the intertemporal dynamics and the independence of the entities might allow one to control the impacts of missing or unobserved variables. With panel data, we can rely on the inter-individual differences to reduce the collinearity between current and lag variables to estimate unrestricted time-adjustment patterns (Pakes & Griliches, 1984). Generate more accurate predictions for individual outcomes by pooling the data instead of generating predictions of individual outcomes using the individual data (Hsiao, Appelbe & Dineen, 1993).

2. Literature review

2.1. Previous theoretical work

Many authors examined the predictions of these theoretical models; however, their results do not following a common pattern. Many studies used cross-country regressions to search for a linkage between economic, political and institutional factors with long-run economic growth. For instance, Landau (1983), Barro (1990), Barro (1991) and Feder (1983) examined the relationship between fiscal policy and economic growth but excluded the trade indicators, while Edwards (1989) tested the trade policy with economic growth but excluded the fiscal indicators. However, there are studies such as Kormendi & Mequire (1985) which included both trade and fiscal factors and probably obtained more accurate empirical results.

Levine & Renelt (1992) used data for 119 countries during the period of 1960-1989 (but exclude the oil exporters) and examined whether the conclusions from existing studies are robust or fragile to small changes in the set of control variables. They stated that "many candidate regressions have equal theoretical status, but the estimated coefficients on the variables of interest in these regressions may depend importantly on the conditioning set of information" (Levine & Renelt, 1992).

Finally they found a positive, robust relationship among economic growth and investment as a share of GDP, as well as between investment and international trade as a share of GDP.

Knerrel et al. (1999) followed Helms (1985)[ii] among others and showed that studies which do not take into account both sides of the budget suffer from substantial biases of the coefficient estimates. Agell et al. (1997) used data from 23 OECD countries during the period of 1970-1990 and found that the relationship between the average annual growth rate and tax revenues as a share of GDP is negative. On the other hand, when they incorporated the initial GDP per capita and the share of population younger than 15 and older than 65 as explanatory variables, the relationship among economic growth and taxes was positive. Finally, Devarajan et al. (1996) and Easterly & Rebello (1993) tested only the expenditure side.

In the past, many economists (Solow, 1956; Cass, 1965) suggested that growth was a function of exogenous factors to government policy such as technological progress and population. After 1980s, authors such as Romer (1986; 1990), Lucas (1988) and Barro (1990) made an attempt to endogenise the growth rate of output. They presented the importance and mechanisms by which some policy variables affect not only the growth rate but also the steady-state growth rates. It is important to mention that, Barro (1990) made one of the first attempts to endogenise the relationship between fiscal policies and economic growth. He made a distinction of productive-unproductive government spending and distortionary-non distortionary taxation.

2.2. Exogenous growth models

The basic neoclassical growth models was developed during 1950's and assumed that an economic policy that allows consumers to save more, provide higher levels of education, drive more investments in infrastructure and generate additional job opportunities, will ultimately enhance economic growth. This was the starting point of many discussions and debates between economists regarding the relationship of fiscal policy and economic growth. The neoclassical model highlighted the importance of savings and capital formation for growth, in both short and medium term perspective, while the growth in the long run is constant and is not dependent on the savings ratio. In the long run, the economic growth is determined by exogenous to the model factors, such as technological change and population growth.

According to Agell et al. (1997), the neoclassical model explains why economic policy can change the level of the long-term growth path, and that appropriate policies shift the path upwards, while inappropriate policies shift this path downwards. On the other hand, the slope of the path is unaffected and suggested that the differences between countries in economic and political institutions has very limited value in explaining persistent differences across countries.

Jorgenson & Yun (1986) used annual data of the U.S economy for the period 1955-1980 and examined the impact of the U.S tax policy on the efficiency of capital allocation. They used a model of the provisions of the U.S. tax law applicable to income from capital and concluded that there will be dramatic gains in economic welfare if there will be a shift from direct taxation (taxation of income from capital) to indirect (taxation through a consumption-base tax). Jorgenson & Jun (1990) found that the largest welfare gains from tax reform will be obtained by transferring part of the tax burden on business capital to household capital or replace tax system with a new one based on consumption.

Barro (1990) and Benos (2005; 2009) implied that the latter models classify the fiscal instruments into four categories:

- Distortionary taxation, which reduces the growth through the weakness of the incentives to invest in physical/human capital.
- Non-distortionary taxation, which does not affect the incentives to invest, hence not reducing growth.
- Productive expenditures, which increases growth, through positive externalities (education spending).
- Unproductive expenditures, which does not affect the marginal product and growth, but boosts household utility directly.

2.3. Predictions of endogenous models

Several studies have applied endogenous growth models with fiscal policy and indicating evidence that public goods are productive is stock and/or in flow (Turnonsky, 1997; Tsoukis & Miller, 2003; Ghosh & Roy, 2004; Agenor, 2008). Futagami et al. (1993) introduced the stock of public capital as a purely public good that affects the productivity of firms in Barro's (1990) model. They examined a decentralized economy and found that it features transitional dynamics, in contrast to models in which public expenditure enters production as a flow, when the economy is always on its balanced growth path. Turnovsky (1997) extends the model of Futagami et al. (1993) to consider overcrowding and a more complete range of fiscal instruments.

An investigation of the role of fiscal policy when combined (non-utility-enhancing) public services balance private capital in production is made by Tsoukis & Miller (2003). They also examined the optimal tax/spending rate and its allocation between flow expenditures (such as payment of salaries in education, health and justice) and public investment to enhance infrastructure in the same sectors. They stated that their paper "confirms the importance of such a policy prescription and fiscal policy more generally for growth and societal welfare. The significance of the Barro rule ultimately lies in its being a normative criterion, against which existing policy practices can be evaluated. For instance, earlier work of our own has found evidence of seriously suboptimal employment of fiscal policy in the world economy" (Tsoukis & Miller, 2003).

The study of Ghosh & Roy (2004) tested the fiscal policy, long-run growth and welfare in a stock-flow model of public goods. Moreover, they introduced public capital and public services as inputs in an endogenous growth model. Their empirical results support the view that growth rate is subject to the distribution of tax revenues among the accumulation of public capital and the provision of public services. Finally, they stated that "the latter policy tool can be used not only to affect the rate of the economy's growth but also to partially bridge the divergence between equilibrium and optimum" (Ghosh & Roy, 2004).

The optimal allocation of goevrnment spending between health and infrastructure was tested by Agenor (2008) in an endogenous growth framework. An important characteristic of his model was that infrastucture had an impact not only in the production of goods but in addition to the supply of health services. He illustrated that there is a trade-off in growing government expenditures on infrastructure: it raise the share of infrastructure services to production of both goods and health services, which boost growth. However, it reduses the resources allocated to health and reduce productivity, hence decline growth. There was evidence that the long-run impact on steady-state growth is uncertain, because it depends on the various parameters of the economy, a revenue-neutral increase in spending on infrastructure which can in fact decline the growth rate. The growth-maximizing tax rate was illustrated to be time with to the summary of the elasticities of output with regard to infrastructure services and effective labour, while the optimal allocation of spending among health and infrastructure was based

on the factors that characterized the technology for producing goods and health services.

Other authors focused on whereas differents forms of spending are productive (Glomm & Ravikumar, 1992; Karaganovich & Zilcha, 1999; Zagler & Durnecker, 2003; Gomez, 2008) and investigated the relationship between education, social security and economic growth in the long run. They examined the role of government's allocation of tax revenues between two expenditure functions, public investment in education (a transfer to the young generation) and social security benefits to the older generation. They implied that more resources should be shifted to education needs and there is a necessity of examination in models with heterogenous families and consideration of fully-funded social security system as an alternative.

Zagler & Durnecker (2003) tested the relationship between economic growth and fiscal policy, and presented a unifying framework for the analysis of long run growth implications of government expenditures and revenues. They divided the expenditures into productive and unproductive (where the unproductive have an impact on economic growth). There was evidence that education expenditures and the growth rate of public infrastructure investment have a positive impact on economic growth. They also included in the examination the taxation and found that several tax rates, such as taxes on savings, on intermediate input goods, on research and development expenditures, a tax on profit income and a tax on manufacturing labour, have a direct influence in the division of labour between the manufacturing sector and the research and development sector. Thus, alter the innovation and increase the growth rate.

The effect of public investment in an endogenous growth model with private, public physical capital, and human capital is observed by Gomez (2008). He found evidence that long-run growth is invariant to fiscal policy and that an increase in absolute congestion reduces the long-run growth, while relative congestion does not affect growth. Similarly, Ortiqueira (1998) presented an endogenous growth model with physical and human capital accumulation and investigated the implication of tax policies. The empirical results supported the view that capital income taxation plays a crucial role along the convergence to the balanced growth path.

Finally, Glomm & Ravikumar (1992), Chang (1998) included assymetric equilibria ex-post. Glomm & Ravikumar (1992) examined the implications of public investment in human capital on growth and the evolution of income inequality in an economy in which individuals have different income and skill levels. They applied a model where the human capital investment through fromal schooling is the engine of growth. They implied that income inequality decreased more rapidly under public education, private education acquiesces greater per capita incomes except the initial income inequality is suffuciently high. Finally, societies will choose public education if a majority of agents have incomes below average.

Chang (1998) investigated the establishment of the rate of growth in an economy in which we have the presence of two political parties. The political parties represent different social classes, while they settle the magnitude and allocation of taxation. He implied that if taxes finance public services may increase growth, but when taxes used to redistribute income between classes, the economic growth is reduced. Different social classes have different indications about growth and distribution, this disagreement is resolved through tax negotiations between political parties

On the other hand, Turnovsky (1996) checked the link between fiscal policy, adjustment costs and endogenous growth. He developed a one-sector endogenous

growth model in which investment incurs convex adjustment costs (while in the previous studies investment being determined residually). Government uses the tax revenues to finance productive expenditures and assumed that these expenditures have impact on productivity of the existing capital stock and on the costs of installing new capital. He implied that the adjustment costs play a crucial role in the determination of optimal fiscal policy. These costs decrease the impacts of capital taxes on economic growth and increase the productive government spending under lump-sum tax financing to enhance growth. He suggested that while government adjustment costs are responsive to productive government spending, the welfare maximizing level of the spending will now be not as much as the growth-maximizing level.

Likewise, Zhang (2000) examined the assumption that the production function displays social constant return to scale, by creating a simple model with public inputs. The dynamics that generated from his model do not arise with constant returns. He also noted two features for the case of moderate increasing returns: Firstly, the dynamic path diverges from an interior equilibrium in expanding oscillations, suggesting that self-fulflling expectations play an essential role in determining the long-run position of the economy. Secondly, economic cycles take place, which mean that the endogenous government spending is also periodic when the system in the neighbourhood of the equilibrium.

Cazzavillan (1996) used a simple one-sector model of capital accumulation; endowed with inelastic labour supply in which the public goods create positive externalities in both production and consumption (he followed the models of Arrow & Kurz (1970) and Barro (1990)). The results of the increasing returns are the perpetual and indeterminacy growth of the economy and hence endogenous stochastic growth fluctuations.

The conjection effects attracted the interest of Eicher & Turnovsky (2000), Ott & Turnovsky (2006). Eicher & Turnovsky (2000) made a one-sector non-scale growth model and tested the relationship of conjection, returns on scale and economic growth. He introduced two notions of conjection: the aggregate conjection (which reduces the effective productivity of capital) and relative conjection (which reduces the effective productivity of labour). They found supportive evidence that both forms of conjection affect the economic growth.

Ott & Turnovsky (2006) tested the role of excludability by introducing excludable and non-excludable inputs into an endogenous growth model. Their empirical results provide evidence about the role of conjection in determining the optimal structure and the consequences for the government budget. He claimed that if congestion is not arising; a user fee set at marginal cost yields the optimal amount of the excludable public input, while the non-excludable input must be financed via a growth neutral tax.

Kneller et al. (1999) concluded that the equation that estimated from most of the researchers that tested the relationship between economic growth and fiscal policy is the following:

$$g_{it} = a + \sum_{i=1}^{k} b_i E_{it} + \sum_{j=1}^{l-1} (c_j - c_i) F_{it} + u_{it} \quad (1)$$

They supposed that g_{it} is the growth rate of a country i at time t is a function of conditioning (non-fiscal) variables, E_{it}, and a vector of fiscal variables F_{it}. Moreover, a represent the constant term of the non fiscal variable i, while the b represents the slope of coefficient of the same variable (there are k such variables). Additionally, c_j is the coefficient of the growth impact of the fiscal variable F_{it} (there are l-1 such variables), and finally c_i measures the effect on growth of the lth

fiscal variable, which finances the change in one of the l-1 fiscal policy instruments.

From the equation (1) we can see that the standard hypothesis test of a zero coefficient of F_{it}, and is in fact testing the null hypothesis that $c_j - c_i = 0$ rather than $c_j = 0$. According to Kneller et al. (1999) the correct analysis of the coefficient on each fiscal category is as the effect of a unit change in the relevant variable offset by a unit change in the omitted category, which is the implicit financing element.

2.4. Previous empirical work

The first generation of studies made by economists, political scientists and sociologists, used bivariate regression analysis, possibly expanded by some individual control variable. Katz et al. (1983) used cross country data for 22 developed countries and tested the impact of taxes on growth and distribution. They found that fiscal instruments (especially personal income taxes) can lead to better income equality but on the other hand there exists automatic trade-off between an active public sector and a dynamic expanding economy.

Korpi (1985) examined 17 capitalist countries (for the period 1950-1973) into the relationship of economic growth and welfare state. Their empirical results do not give any support that an increased public sector expands the welfare state programs, but lower income inequality, or higher potentials for political and organizational penetration into markets, and have negative effect on product and productivity growth.

According to Agell (1997) the second generation of studies tightened the methodological requirements, and the main tool of their studies was a relatively systematic multivariate regression analysis, which was combined with a more developed statistical testing methodology.

The study of Kormendi & Mequire (1985) used cross section data for 47 countries on total government consumption expenditures and other variables exclude public investment and transfers but includes education and defence. They did not find any relationship between average growth rates of real GDP and average growth rates of the government consumption spending as a share of GDP for the post –World WAR II period.

In accordance, Marlow (1986) tested the relationship between economic growth and public sector by using cross country data for 19 industrialized countries during the period of 1960-1980. Their empirical evidence supports the view that the size of public sector has a negative impact on economic growth. They also stated that the initial level of the public sector share in the economy and the share of social expenditures have also a negative impact on economic growth.

Before the construction of the relevant endogenous growth models many researchers since early 1980's investigated the relationship between fiscal policy and economic growth. Landau (1983) used cross section data of 104 countries and found negative correlation among the government consumption spending as a share of GDP and the rate of growth per capita GDP for six sub-periods. He suggested that government spendingmight help increase economic welfare even if it decreases the growth of per capita GDP. Furthermore, the relationship between the level of per capita GDP in the initial year of the period and economic growth was negative (against predictions due to the fact that most of the countries had low income). Finally, he found positive relationship between the growth rate and total investment in education.

Ram (1986b) derived an equation for economic growth from two separate productions functions, one for the public sector and one for the non-government sector. He implied that is difficult not to conclude that the government size has a

positive effect on economic growth and performance. He found evidence that there was a harmony between the results from both of techniques that used (cross section and time series) and that the externality effect of government size is always positive. Finally, after the comparison of the two sectors he found that the productivity in public sector was higher (especially in 1960's).

The study of Landau (1986) used cross section and time series in order to assess the impact of a wide variety of government expenditure variables. He did not include only measures of government expenditure but also human, physical capital variables, historical-political factors, the level of per capita product, geo-climatic factors.

A debate involving the results of Landau & Ram started when Rao (1989) commented on both previous studies and claimed that Ram's model had a better theoretical foundation compared with multiple regression of Landau, but on the other hand Landau used a variety of expenditures variables that Ram did not. Furthermore, he made a re-examination of Ram's model and found that Ram assumptions had not been adequately established and that there was no strong basis to separate the economic growth into productivity and externality. Finally he concluded that Ram found a positive relationship due to specification problems. Carr (1989) also argued that the results of Ram had statistical data problems (spurious). However, Ram (1989) claimed that the comments of Carr (1989) and Rao (1989) did not significantly alter his results in the study of 1986 and concluded that the relationship between government size and growth is positive.

Grier & Tullock (1989) extended the analysis of Kormendi & Manquire (1985) on government consumption spending and some other variables that they took from Summers & Helston (1994). Their analysis supported the view that there is a significant negative relationship between the growth of real GDP and the growth of government share of GDP.

A new approach applied by Barro (1990; 1991), who tested the impacts of government consumption and taxation in economic growth. In his cross country analysis found that both, saving and growth rates fall with an increase in non-productive government service spending. Both rates had increased with productive government expenditures but subsequently declined (1990). He claimed that the coefficient of the non-productive government service spending to the average annual growth rate of per capita GDP is negative.

The third generation of studies has attained a new level of reflection and methodological sophistication. Helms (1985) used annual data for 48 states for the period 1965-1979 and used as explanatory variables taxes, public expenditures and demographic and labour force characteristics. The key feature of this approach was that he recognized that is meaningful to evaluate the effects of expenditures or taxes in isolation and claimed that both the sources and the uses of funds must be considered.

Conte & Darrat (1988) made a re-examination of the link between economic growth and growing public sector for 22 OECD countries for the period 1960-1984. He used the Granger causality approach to test if there is causal relationship between the two variables. They found evidence that the impact of expanding public sector on economic growth is mixed.

Additionally, Alexander (1990) used data for 13 OECD countries and tried to determine the relationship between the major macroeconomic aggregates and economic growth. He concluded that the growth rate of the ratio of government spending to GDP, the ratio of money supply to GDP and inflation have a negative impact to economic growth, while the growth rates of the ratio of the deficit to GDP has no significant impact on growth.

The empirical examination of Easterly & Rebello (1993) used cross country data for 100 countries for the period 1970-1988 and panel data for 28 countries for the period 1870-1988 and investigated the link between economic growth and fiscal policy. They found that public transportation, communicational and educational investments have a positive impact on economic growth, while aggregate public investment has negative. However, they implied that the relationship between economic growth and fiscal variables is fragile and is a result of multicollinearity. Moreover fiscal variables tend to be highly correlated with the level of income in the beginning of the period and highly correlated among them. They found no significant differences in the fiscal policies adopted by democracies and non-democracies (once they controlled the level of income). Hsieh & Lai (1994) examined the interactions between the growth rate in per capita real GDP, the share of government spending and the ratio of private investment of GDP for 7 countries (Canada, France, Germany, Italy, Japan, United Kingdom and the United States). They found that government do not have any effect in growth.

Likewise, Lin (1994) investigated the relationship between economic growth and government spending in developed and non-developed countries based on single and simultaneous equations and found that the government size has a positive impact on economic growth in the short-run but not in the medium run. He claimed that capital and labour stock have a positive effect on economic growth and that there is a significant structure difference between the developed and less developed countries with respects to the impacts of non-productive government expenditures (exclude the military and education expenditures).

At the same time, Devarajan et al. (1996) used data of 43 developing countries over a period of 20 years. They established that a raise in current spending will have positive and significant growth effects. There was also evidence that the correlation between the capital component of productive spending and the economic growth per-capita is negative.

A synthesis of published articles for the period 1983-1998 presented by Poot (2000) and tested the relationship economic growth and government policies. Five policy areas considered in his study: education, military, infrastructure spending, tax rates and general government consumption. He claimed that there is a positive relationship with education and infrastructure spending and economic growth. He didn't find any evidence of interaction between government consumption and growth, while the link between defence spending and growth seems to be strongly negative. Finally, he found empirical evidence of negative growth effect of tax and suggested that the potential endogeneity of fiscal variables can be resolved through the selection of appropriate variables.

Finally, the last generation of studies consisted by several studies that tested the relationship between economic growth and fiscal variables. Angelopoulos & Philippopoulos (2005) investigated the relationship between fiscal policy and economic growth for Greece in the period 1960-2000. They found that a smaller public sector is good for growth and that it is very important to see not only the size but the quality and efficiency. When they used the government consumption share in GDP to measure the public sector found the negative relationship (growth-public sector). However, when they used for measurement the total government expenditures or the tax revenues the results were not significant. They implied that only public investment and wages-salaries affect significantly the growth rate, while other expenditures do not affect the growth. Finally they used regressions to explain the quality of public sector and implied that bigger public sectors decline growth.

In addition, the empirical examination of Gupta et al. (2005) used data of 39 low income countries during the period 1990-2000 and tested the effects of fiscal

policy and expenditure composition on economic growth. They found that fiscal consolidations were not harmful for short and long-run growth and that there is a significant correlation between fiscal adjustment and economic growth. A shift of public spending to more productive uses is very important to boost economic growth, while the reduction of public sector wage bill will not decrease the growth. One very important factor that affects the economic growth in low income countries were the composition of deficit finance and concluded that changes derived from declining the domestic financing, have 1½ times the impact on growth as changes derived from reducing domestic and external financing.

In accordance, Schaltegger & Torgler (2006) used panel data and found a negative relationship between the government size and economic growth. They stated that this happened only in rich countries with a large public sector and not in developing countries. They examined the government spending of the operational budget separately from the impact of investment spending and from the capital budget. They stated that an increase in public spending operating budgets has a negative impact on growth while capital budgets do not have significant impact on growth. Likewise, Afonso & Alegre (2007) used panel data of 27 European Union countries for the period 1970-2006 and tested whether a reallocation of government budget items can boost the long-term GDP growth. They used three alternative dependent variables: economic growth, total factor productivity and labour productivity. Their empirical results suggest a negative impact of social security and public consumption on economic growth, while public investment boosts economic growth. Moreover there is a negative impact of health and social protection expenditures on production and the positive effect of increasing public spending to education. Finally they concluded that "the decomposition of public expenditure attending to the level of government could also yield interesting results, since the level of fiscal decentralisation and structures are still very heterogeneous in our set of European countries" (Afonso & Alegre, 2007).

Angelopoulos et al. (2007) used a panel data of 23 OECD countries and made an endogenous growth model in order to examine the growth effects of the composition of government expenditure and tax burden for the period 1970-2000. They found that these countries could improve their economic growth with a reallocation of public expenditures towards productive activities. They claimed that labour income tax rates have negative relationship with economic growth, while capital income and corporate income tax rates have positive (tax reform is needed).

Finally, Romero-Avila and Strauch (2008) investigated the relationship between public finances and economic growth in the European Union-15 during the period of 1960-2001. The main findings from their empirical results were that the expenditure side of the budget affect the long run economic growth over the business cycle. More specifically they stated that the impact of government size and government consumption to economic growth is negative, while the public investment boosts economic growth. On the revenue side, they found negative impact of direct taxation on economic growth and on physical capital accumulation.

The relationship between fiscal policy instruments and economic growth cannot be investigated without theories and an appropriate time series or panel data set, incorporated with the most recent econometric techniques. According to Landau (1986) "there are virtually no empirical studies of the general impact of government on economic growth. An extensive literature search turned up only three papers" (Landau, 1986, pp. 35).

A very important weakness of previous studies, which made the attempt to analyse the impact of public or taxation on economic growth of a country, is that they did not take into account the government budget constraint. Kochelakorta &

Yi (1997) point out the importance of including the government budget constraint into the analysis, because failure to incorporate it leads to inconclusive empirical results.

2.5. Government spending on social protection

Government spending on social protection can have a positive impact on economic growth of a country through many channels. Firstly, government funds can used in order to finance the health or education systems, encourage risk taking, and promote participation of individuals in the labour market. Additionally, if tax-payers realise that when government revenues increased, more funds will be used on social protection, they will have less incentive to work and save. Furthermore, increased government spending on social protection may lead to a more stable environment when there is a reduction on poverty and inequality.

In the literature, the previous studies that examined the relationship between government spending on social protection and economic growth, advocated mixed results. Cashin (1995), Belletini & Ceroni (2000), Cashin (1994), Castles & Dowrick (1990), Korpi (1985), McCallum & Blais (1987) and Perotti (1992; 1994) implied a positive relationship between social spending and growth.

Atkinson (1999) made a survey on literature and found mixed results for the relationship between the size of welfare state and growth, while Bleaney et al. (2001) included the social spending in unproductive spending and found insignificant effect on growth. According to Mirlees (1971) if social protection spending discourages people to work, there will be a reduction in the workforce, hence there will be a reduction on national output. He also mentioned that the reduction of savings will also affect the available capital for re-investment. These results have been in contrast with Gwartney et al. (1998), Hansson & Henrekson (1994), Atkinson (1999), Nördstrom (1992) and Weede (1986b; 1991).

2.6. Openness and economic growth

The relationship between trade opens and economic growth is one of the most debated issues in economics, since this relationship is highly complex. The empirical results of endogenous models are diversified and do not have common pattern on their results (Romer, 1990; Rivera-Batiz & Romer, 1991). Additionally, probably one reason for mixed results is the specific country factors such as different technologies across different countries (Young, 1991; Lucas, 1988).

Romer (1990) examined the relationship between export volumes and economic growth for a number of industrialized countries. He found a strong positive correlation between these variables. However, he included only exports and clearly excluded the impacts of imports. Ram (1989) found that imports are positively correlated with economic growth; however, he did not include exports.

Previous studies of Krueger (1978) and Feder (1983), applied time series data and examined the relationship between openness and growth suffered from methodological problems, since they applied Granger causality tests without firstly provided a unit root tests for stationarity.

One of the most important problems of examining the relationship between trade and economic growth is the measurement of openness. The most common method is introducing the variable of total trade volume to GDP which is equal with total exports minus total imports. However, especially in OLS estimation there is a possibility of obtaining biased and inconsistent results due to endogeneity of the trade volume. Thus, some authors (Pritchett, 1994) applied a measure of trade policies.

2.6. Infrastructure spending and economic growth

The majority of previous studies such as Ratner (1983), Easterly & Rebelo (1993), Kocherlakota & Yi (1997), Lau & Sin (1997), Kneller et al. (1999),

Angelopoulos et al. (2007) and Benos (2009), examined the impact of government spending on infrastructure and found positive impact on growth. There are two different strands of literature in this topic, the first one apply the flow of government expenditures on infrastructure and the second one compares the productivity of public capital (roads airports), with the private capital. Thus, it is very difficult to make generalisation across different countries and future research is warranted in both types of government expenditures.

Easterly & Rebelo (1993) found a positive impact of investment in transport and communication on economic growth. Canning et al. (1994) found evidence which support a positive impact of telephones on economic growth. Similarly, Sanchez-Robles (1998) found a positive effect of road length and electricity generating capacity in growth. On the other hand, there are several studies (Hulten & Schwab, 1991; Tatom, 1991; Tatom, 1993; Holtz-Eakin, 1994; Garcia-Mila, McGuire & Porter, 1996) which found little evidence that infrastructure enhance growth.

2.7. Taxes and economic growth

Many studies have focused on the correlation between tax rates and economic growth. These studies can be divided in two categories: assessments of the magnitudes of tax costs and statistical analyses of the relationship between tax rates and growth. Taxation has a negative or positive impact on economic growth. The negative impact (Helms, 1985; Gale & Potter, 2002) occurs from the distortions to choice and the disincentive effects. The positive impact according to Katz et al. (1983) arises indirectly through the expenditures financed by taxation. The endogenous growth models with a public good as an input, provide a positive channel through growth. However, this relationship is not monotonic, because increases in the tax rate above the optimum level would reduce the growth rate.

The first attempt to examine the growth effects of taxation made by Solow (1956). In his growth model he assumed that the growth is not affected by tax policy. However, Romer (1986) made another growth model in which government spending and tax policies may have a long-run impact of economic growth.

Devereux & Love (1994) analysed the effects of income and expenditure taxation in a two-sector endogenous growth model which allowing for endogenous labour supply. They explored the quantitative and qualitative effects of tax changes on growth and welfare in a growth model with growth arising from human and physical capital. They found that capital income, wage and consumption taxes have a negative impact on economic growth. Finally they concluded that the capital tax is much more inefficient than other forms of taxation.

In addition, Johansson et al. (2008) investigated the design of tax structures to support economic growth on the OECD countries using data on industrial sectors and individual firm.

One reason that leads to inconclusive results for the effects of taxes is that they do not take the implications for the government budget constraint into account. Poot (2000) claimed that "an increase in government spending or taxes has implications for public debt that are likely to affect the behaviour of firms or households so that the revenue and cost side of budgetary decisions should be considered simultaneously" (Poot, 2000, pp. 533). Some authors, like Barro (1990), found that taxes leads to a low rate of capital accumulation and economic growth because they create a wedge between net and gross returns on saving.

2.8. Education spending and economic growth

One of the most important decisions made by government authorities in every country is the amount of expenditures on education. This type of spending might help to enhance economic growth by increasing productivity, individual or social

improvement and development, or reduction of inequalities. The majority of previous studies (Landau, 1983; Barro, 1991; Evans & Karras, 1994; Hansson & Henrekson, 1994) indicated that there is significant positive impact of education spending on economic growth. However, we cannot make any generalisation since all these studies used different methodologies and several statistical proxies to measure the level of education spending. For instance, Barro (1992) used years of upper-level average schooling of the male workforce, while Hansson & Henrekson (1994) applied the education spending as a share of GDP. On the other hand, Evans & Karras (1994) deployed the elasticity of education expenditures.

2.9. Gross capital formation and economic growth

The gross capital formation is very important for the economy, because it contributes to the sustainable economic growth. In theory, capital information is the fraction of present income saved and invested in order to enhance output and income. Gross fixed capital formation has two categories: gross private domestic investment and gross public domestic investment. Many authors (Beddies, 1999; Ghura & Hadjimichael, 1996; Ghura, 1997) found that capital formation had a significant impact on economic growth. While, Benos (2009), Levine & Renelt (1992) and Bond et al. (2004) found that the relationship between Gross capital formation has a positive effect on economic growth.

2.10. Military spending and economic growth

The study of Benoit (1973) was the starting point for many researchers to investigate the relationship and the interaction between military spending and economic growth. Benoit found evidence of a positive relationship in LDCs. There are a number of studies (Deger & Smith, 1983; Deger, 1986; Lim, 1983) that found empirical evidence of a negative relationship between military spending and economic growth. They focused on two kinds of trade-offs: the allocation effect (the guns and butter trade-off) and the growth effect (the guns vs. growth effect).

Another strand of literature (Benoit, 1978; Kaldor, 1976: Kennedy, 1983: Weede, 1986a) found a positive relationship between military spending and economic growth. They suggested that military spending stimulates economic growth directly and indirectly by increasing the purchasing power, producing positive externalities, and finally enhancing aggregate demand. Moreover, military spending through the defence programs increases the employment, the education and technological training. Finally, several studies do not find any empirical evidence of the relationship between economic growth and military spending (Biswas & Ram, 1986; Hill, 1978; Mintz & Stevenson, 1995).

3. Data and Methodology

3.1. Data

The endogenous growth models assume that fiscal instruments classified into 4 main types: productive and unproductive expenditures, distotrionary and non-distortionary taxation. According to Benos (2009) the theoretical literature is not clear about the clarification of the functional categories. In his empirical research he left the estimation results to determine if these categories are productive or not. We will use the classification of European Union about the fiscal variables as shown in Table 1 and will have a functional classification because it corresponds better to theoretical literature.

Table 1. *Theoretical/Functional classification of Fiscal Policy Instruments*

Theoretical/Functional classification of Fiscal Policy Instruments	
Theoretical classification	Functional classification
Distortionary taxation	Current taxes on income, wealth
	Capital taxes
	Actual social contribution
Non-distortionary taxation	Taxes on production and imports
Productive / Unproductive expenditures	Expenditure on education
	Expenditure on health
	Expenditure on housing-community amenities
	Expenditure on environment protection
	Expenditure on social protection
	Expenditure on economic affairs
	Expenditure on general public services
	Expenditure on public order-safety
	Expenditure on defence
	Expenditure on recreation-culture-religion

Source: Adapted from Benos (2009)

We used annual unbalanced panel data of 15 European Union countries (Belgium, Denmark, Germany, Ireland, Greece, France, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland, Sweden, the U.K), for the period 1995-2008 that obtained from Eurostat.

Table 2 demonstrates the basic descriptive statistics for the variables used in our estimations. For the variables definitions see Appendix. From the table we can see that growth rate of real GDP grew at about 0.04% per year. Government expenditures on public order safety (PUBLICORDER) and defence (DEFENC) were increase approximately 1.5% and 1.4 of GDP respectively.

Table 2 : *Descriptive statistics*

Variable	Mean	Std Deviation	Minimum	Maximum
ACTUALCON	11,322	4,299	1	18,6
DEFENC	1,462	0,68	0,2	4
DISTRICTTAX	26	4,828	16	38
ECCONAFFAIRS	4,389	1,128	1,7	11,1
EDUCAT	5,43	1,234	2,5	8,8
EMPLOGROWTH	1,542	1,529	-1,3	8,5
ENVIRONM	0,678	0,244	0,2	1,3
EXPORTS	50,142	32,177	20	177,3
GHY	14,281	2,342	7,5	18,2
GINFAST	11,777	2,84	6,4	20,6
GPROPERTRIGHT	2,981	0,8	1,1	5,2
GROSSCAP	18,18	2,614	12,1	26,9
HEALTH	6,146	1,097	3,4	8,4
HOUSING	0,92	0,92	-0,3	6,3
HUMANRESOURSE	17,224	4,94	7,2	28
IMPORTS	46,551	25,615	20,1	143,8
NETBOR	-1,33	3,129	-9,7	6,8
OPEN	96,734	57,65	44,4	321,1
PUBLICORDER	1,519	0,401	0,6	2,6

PUBSERV	7,388	2,389	2,7	16
RECREAT	1,106	0,397	0,2	2,3
SOCIAL	18,25	3,816	9	26,6
TAXCAPIT	0,247	0,197	0	1,5
TAXIMPORTS	14,777	8,864	10,2	140,2
TAXWEAL	14,591	5,447	6,4	31,7
TOTGOVSPPEND	47,53	6,269	29,1	65,1
YOUTH	5,966	11768,78	16	10045
YG	4.63	3.87	-11.64	24.84
Y0	42500	92168,44	8900	38600

Source: Eurostat

Government spending on education was 5.4% of GDP, while public spending on economic affairs (ECCONAFFAIRS) was around 4.4%. The largest component of public expenditures was the social spending (SOCIAL) with about 18.2% of GDP, while spending on health was 6.1% of GDP. Government spending on housing-community amenities (HOUSING), on recreation-culture-religion (RECREAT), on environment protection (ENVIRONM) were equal to 0.9%, 1.1% and 0.7% of GDP respectively. Finally, public spending of general public services (PUBSERV) was approximately 7.4% of GDP.

These government expenditures, as we analysed in the theory of the previous chapter, were financed mainly by taxes. Taxes on income and wealth (TAXWEAL) and taxes on production and imports (TAXIMPORTS) were accounted for approximately 14.6% and 14.7% of GDP respectively. Taxes on social security contribution (ACTUALCON) amounted for 11.3% of GDP. Moreover, capital taxes accounted for only 0.2% of GDP. Finally, the budgets (NETBOR) were on deficit of approximately 1.3%.

Most of the countries of our data set present large variation across countries and over time. The growth rate of real GDP ranges from -1.3% to 8.5% of GDP, public spending on defence was between 0.2% and 4%, while spending on recreation-culture-religion was between 0.2 and 2.3%. Government spending on health was from 3.4% to 8.4% and spending on education ranges between 2.5% to 8.8% of GDP. Moreover, spending on social spending measured between 9% and 26% of GDP, while spending on environment protection ranges between 0.2% and 1.3%. Finally, taxes on income and wealth range between 6.4% and 31.7% of GDP, taxes on imports between 10.2% and 140.2%, capital taxes between 0% and 1.5% and finally we observe surplus of 6.8% and deficit of 9.7%

In the specification of our model we follow the work of Kneller et al. (1999) and Benos (2005, 2009) with some changes. Firstly, we use the latest data for fiscal variables from Eurostat, after the change in the construction and classification of these variables after 2001. Secondly, we use data for general government and not for central government such as Kneller et al. (1999). Thirdly, we make a new classification of public expenditures into homogeneous groups in order to reduce the explanatory variables and increase the efficiency of our model and results since we have data for only 14 years. The new variables that we classify are the general government expenditure on human capital accumulation (GHY), which include general government spending on education (EDUCAT), on health (HEALTH), on housing and community amenities (HOUSING), on environment protection (ENVIRONM) and finally spending on recreation, culture and religion (RECREAT). This new variable represents the 14.3% of GDP and amounts from 7.5% to 18.2%.

Moreover, we construct a new variable that represents the government expenditures on infrastructure (GINFAST), and includes government expenditures on economic affairs (ECONAFFAIRS) and expenditures on general public services (PUBLIC). Government expenditures on infrastructure represent approximately 12% of GDP and ranges between 6.4% and 20.6%. Finally, in government spending size of budget constraint we construct another variable that correspond to government expenditures on property rights protection (PROPERTRIGHT) and contains expenditures on public order and safety (PUBLIC) and expenditures on defence (DEFENC). This variable represents approximately 3% of GDP and ranges between 1.1% and 5.2%.

On the other side of budget, we construct the variable distortionary taxation (DISTRICTAX) which includes taxes on wealth and income (TAXWEAL), capital taxes (TAXCAPIT) and actual social contribution (ACTUALCON). This new variables corresponds to 26% of GDP and ranges between 16% and 38%. We follow Benos (2009) and assume that non-distortionary taxes are the implicit financing elements of change in the rest of fiscal variables and therefore we omit it from ourregressions. Fourthly, we allow for differential growth impact of fiscal policy instruments across countries.

With regard to non-fiscal variables we incorporate initial level of GDP to isolate possible convergence effects. We include employment growth and business investment in our model because labour and capital are very important factors of production in growth models. Moreover the employment growth helps to control for business cycle effects on growth.

In order to take into account the growth effects of human capital in the economy we include the variable human recourses in science and technology (HUMANRESOURSE) which represents the persons who have completed tertiary education and are employed in science and technology occupations(professionals, technicians and associate professionals). Finally we include the sum of imports and exports of a country as a percentage of GDP (OPEN) and take into account external effects on the economy.

3.2. Methodology

Firstly, we estimate our models by Ordinary Least Squares and decide on the appropriate model specification by using the R^2 -adjusted, Akaike Information Criterion and Swartz Bayesian information Criterion as selection criteria and taking under consideration the efficiency of the parameter estimations of the different models. Additionally, when we estimate our regressions, in order to avoid perfect collinearity, at least one of the fiscal variables is omitted.

We apply also fixed and random effects models (See appendix 9) and carry out the F-tests and Hausman (1978) specification tests for the selection of the appropriate model. The main premise of performing the present study is the effect of fiscal variables to GDP per capita growth, but the association according to Benos (2009) does not mean that causality runs exclusively in one direction. He claimed that if this not taken into account, there will be obtained biased and inconsistent estimates. The modern approach to system instrumental variables estimation is based on the principle of generalized methods of moments (GMM), Wooldringe (2002) claimed that these methods have long history in statistics for obtaining simple parameter estimates when maximum likelihood estimation requires nonlinear optimization. We apply two estimators, the Arellano & Bond (1991) and Arellano & Bovver (1995) - Blundell & Bond (1998). In order to examine the validity of the instruments we use the Saran test.

4. Empirical results

4.1. Public expenditures on human capital accumulation (GHY)

From our empirical results we note that public expenditures on human capital accumulation seem to affect negative the economic growth statistically significant in the first round of our regressions (Table 3). These results are in contrast to the findings from previous researchers. One justification for this result is probably because we include spending on education, health, housing and community amenities, environment protection and spending on recreation, culture and religion. Some elements of them may have positive (education) and some others negative effect. Benos (2009) found no impact of this government spending on economic growth and stated that this happen probably because the effects of spending on human accumulation are non-linear. Moreover the observations that we have are not enough to include these variables separately in our models.

In order to solve these problems we disaggregate public expenditures on human capital accumulation into public expenditures on education (EDUCAT) and the rest of expenditures on human accumulation to correct for possible aggregate bias. Moreover we multiply these two variables (GHY and EDUCAT) with initial level of human capital (HUMANRESOURSE0) and construct two new variables GHYHUM and EDUHUM. The findings support a significant positive impact of education spending on economic growth (as expecting) and negative impact from GHYHUM. The positive impact of education spending we found is consistent with empirical results made by Evans & Karras (1984), Baffes & Shan (1998), Hanson & Henrekson (1994), Landau (1983) and Barro (1991). Hence, we can conclude that the more educated is the population of a country, the more beneficial is an increase in government spending on education on economic growth.

4.2. Public expenditures on infrastructure (GINFAST)

Our empirical results indicate that an increase of government spending on infrastructure has a significant positive impact on the economic growth of a country. Barro (1990) implied that these types of spending imply positive externalities to private customers and increase the economic growth. The positive relationship maybe occurs also because these spending include spending on transportation, communication and energy. Government spending on infrastructure (GINFAST) includes government expenditures on economic affairs (ECONAFFAIRS) and expenditures on general public services (PUBLIC).

Our empirical evidence is in accordance with Ratner (1983), Easterly & Rebelo (1993), Kocherlakota & Yi (1997), Lau & Sin (1997), Kneller et al. (1999), Angelopoulos et al. (2007) and Benos (2009). However, some other researchers such as Landau (1985), Evans & Karras (1994) and Devarajan et al. (1996) found a significantly negative effect of this type of spending on economic growth, while Landau (1986), Barro (1991), Hanson & Henrekson (1994), Hulten & Schwab (1991), Tatom (1991; 1993) and Holtz-Eakin (1994), Garcia-Mila, McGuire & Porter (1996) found inconclusive, complex, or no effect between economic growth and infrastructure spending.

Easterly & Rebelo (1993) found a positive impact of investment in transport and communication on economic growth. Canning et al. (1994) found evidence which supported a positive effect of telephones on economic growth. Similarly, Sanchez-Robles (1998) found a positive effect of road length and electricity generating capacity in growth. Benos (2009) used an alternative explanatory variable to examine the relationship between economic growth and infrastructure spending, he multiplied the variable GINFAST with the initial length of motorways of each country (measured in kilometres). He implied that the infrastructure

spending is more effective on economic growth in countries with higher initial infrastructure stock.

4.3.Public expenditures on property rights protection (GPROPERTRIGHT)

In our regressions the government expenditures on property rights protections include spending on defence (DEFENC) and spending on public order safety (PUBLIC). Our empirical results from the first round of regressions implied a strongly negative relationship between these two variables. These results are in contrast with the theory of Barro and Sala-I Martin that this category of expenditures that supports to the protection of property right increases the possibility that the citizens keep this right to their goods and services. Benos (2009) found a significant positive impact and concluded that the increased expenditures on public order and safety, the stronger the incentive agents have to accumulate human/physical capital and increase economic growth.

On the second round of our regressions (Table 4) we aggregate defence spending (DEFENC) from spending on property right protection and multiply it with the initial per capita income (Y0) and construct a new variable DEFENC0. In our new empirical results we do not found any relationship between economic growth and defence spending. Our results are in contrast with Antonakis & Karavidas (1990), Antonakis (1997), Andreou et al. (2002), Kollias (2004), who found a significant negative impact of military spending on economic growth.

4.4. Social spending

Our empirical results imply a non-significant relationship between government spending on social protection and economic growth, which is consistent with the previous mixed results of theoretical and empirical work of this subject. Feldstein (1974) suggested a depressing effect of redistributive policies on physical capital accumulation and growth, while Cashin (1995), Belletini & Ceroni (2000) implied a positive relationship between social spending and growth. Atkinson (1999) made a survey on literature and found mixed results for the relationship between the size of welfare state and growth, while Bleaney et al. (2001) included the social spending in unproductive spending and found insignificant effect on growth. The positive impact is in contrast with studies made by Gwartney et al.(1998), Hansson & Henrekson (1994), Atkinson (1999), Nördstrom (1992) and Weede (1986b; 1991).

In our second round of regressions we included a new explanatory variable, SOCIAL0, which is social expenditure multiplied by initial per capita income (Y0). We found again insignificant relationship between these this variable and economic growth.

4.5. Government revenues

Examining the other side of budget, we found a statistically negative impact of distortionary taxes (DISTRICTAX) on economic growth. This is consistent with the previous studies such as Barro (1990), Jones et al. (1993), Turnovsky (2000), Helms (1985), Canto & Webb (1987), Kocherlakota & Yi (1997) and Garrison & Lee (1995). In most recent studies that tested both sides of budget (Kneller et al. (1999) and Bleaney et al. (2001)), support our empirical results.In the other explanatory variable that we include in our regressions, budget deficit or surplus (NETBOR), we find no significant impact of NETBOR on economic growth, while the previous empirical results are mixed. Our results are in contrast to the Ricardian Equivalence which implies that since a current surplus will finance future deficits through cuts in distortionary taxation or increases in productive spending, it causes an increase in growth and investment.

The Ricardian equivalence suggests 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. If we suppose that the demand for goods depends on the present expected taxes, as a result its household subtract from the expected income this expected taxes to be in a wealth position. Therefore, the government has to change the present taxes but cannot do that if doesn't change the present spending. So the effects from budget deficits and taxes to the economy are the same, that's why the name "equivalence". Barro (1974) made an analysis whether an increase in government dept constitutes an increase in perceived household wealth. He examines the effect of finite lives and found that the households would act as they were infinitely lived and there would be no marginal net-wealth effect of bonds (that happens because the intergenerations transfers). Feldstein (1974) accepted the conclusion of Barro (1974) that government dept will not add to net wealth in a model with operative intergenerational transfers ,but only in static economy and he said that is incorrect in economy that growing.

When we allow for non-linear growth effects we find a positive relationship between NETBOR and economic growth, which is in contrast to Ricardian Equivalence. This is in accordance to Benos (2009). The justification of our findings probably lies in the fact that most of the countries in our data set do not have excessive budget deficits. Moreover we have to put emphasis on the fact that when a country runs a deficit for many years will require more distortionary taxes in the future (has negative impact on economic growth).

4.5. Non-fiscal policy variables

As we mentioned before, we include employment growth (EMPLOGROWTH) and business investment (GROSSCAP) in our model because labour and capital are very important factors of production in growth models. Moreover, the employment growth helps to control for business cycle effects on growth. In our empirical results we do not find a significant impact of employment on economic growth, but when we allow for non-linear growth effects we find a strongly positive impact. Azariadis & Drazen (1990) concluded that returns to education tend to be higher in countries with better educated labour force. Benos (2009) stated that "employment controls for business cycle effects on growth, so we can be reasonably confident, that the estimated growth effects on the rest of the variables included in our model are not contaminated by short-run factors" (Benos, 2009, pp. 18). Concerning the gross fixed capital formation by the private sector as a percentage of GDP we find in both rounds of our regressions no significant impact on economic growth which is in contrast to Benos (2009), Levine & Renelt (1992), Bond et al. (2004) who found positive effect.

In order to test the impact of human capital on economic growth we include the explanatory variable HUMANRESOURSE which represents the persons who have completed tertiary education and are employed in science and technology occupations (professionals, technicians and associate professionals). In both rounds of our regressions we do not find any evidence of impact on economic growth. Finally we include the sum of imports and exports of a country as a percentage of GDP (OPEN) and take into account external effects on the economy. Our empirical results do not support any evidence of relationship between OPEN and economic growth.

The relationship between trade openness and economic growth is very complex. The empirical results of previous models such as Romer (1990), Rivera-Batiz & Romer (1991) are diversified and do not follow pattern on their results. Additionally, another probable reason for mixed results is the specific country

factors such as different technologies across different countries (Young, 1991; Lucas, 1988).

Model 1 (first round of regressions)

$$YG_{it} = a_0 + a_1 \sum_{b=0}^{c} GHY\,(-b) + a_2 \sum_{b=0}^{d} GINFAST\,(-b) + a_3 \sum_{b=0}^{e} GPROPERTRIGHT\,(-b) + a_4 \sum_{b=0}^{f} HOUMANRESOURSE\,(-b) + a_5 \sum_{b=0}^{g} NETBOR\,(-b) + a_6 \sum_{b=0}^{h} DISTRICTAX\,(-b) + a_7 \sum_{b=0}^{j} EMPLOGROWTH\,(-b) + a_8 \sum_{b=0}^{k} SOCIAL\,(-b) + a_9 C + a_{10} GROSSCAP_{it}\,(-b) + a_{11} OPEN_{it}\,(-b) \quad (2)$$

Table 3. *Results of Model 1*

	ESTIMATES							
Explanatory variables	OLS	FIXED EFFECTS	A-B1	A-B2	B-B1	A-B3	B-B2	B-B3
GHY	-0,166	-1,167	-0,85	-0,83	-0,83	0,69	-0,63	-0,68
t-statistic	-1,2	-2,96*	-3,776*	-3,74*	-3,54*	-3,1*	-2,84*	-2,95*
GINFAST	0,327	0,514	0,32	0,301	0,386	0,433	0,52	0,44
t-statistic	2,428*	1,27	1,69	1,714	1,927*	1,99*	2,3	1,944*
GPROPERTRIGHT	0,65	0,474	-3,03	-2,93	-2,99	-2,1	-1,93	-2,011
t-statistic	1,116	0,39	-3,078*	-3,01*	-3,03*	-2,411*	-2,16*	-2,28*
GROSSCAP	-0,248	-0,11	0,26	0,25	0,255	0,006	0,002	-0,005
t-statistic	-1,87*	-0,53	1,56	1,53	1,51	0,004	0,145	-0,003
HOUMANRESOURSE	-0,123	-0,158	-0,117	-0,176	-0,18	-0,25	-0,28	-0,258
t-statistic	-1,7*	-0,92	-1,51	-1,49	-1,55	-2,26*	-2,39*	-2,18*
NETBOR	0,5	0,3	0,311	0,31	0,366	0,364	0,43	0,355
t-statistic	3,25*	1,02	1,962*	1,981*	2,165*	2,12*	2,44*	1,968*
OPEN	-0,002	0,02	-0,022	-0,023	-0,024	0,005	0,01	0,008
t-statistic	-0,3	1,03	-0,75	-0,78	-0,84	0,22	0,37	0,338
DISTRICTTAX	-0,353	-0,37	-0,24	-0,227	-0,271	-0,29	-0,4	-0,29
t-statistic	-2,957*	-1,52	-1,97*	-1,81*	-2,24*	-1,76	-2,3*	-1,71
EMPLOGROWTH	1,01	0,75	0,32	0,32	0,318	0,78	0,75	0,86
t-statistic	4,173*	2,61*	1,37	1,366	1,33	3,929*	3,72*	3,638*
SOCIAL	0,079	0,037	-1,12	-1,091	-1,068	-0,17	-0,106	-0,12
t-statistic	0,56	0,1	-3,86*	-3,7*	-3,67*	-0,61*	0,7161*	-0,44*
C	15,01	24,43						
t-statistic	2,631*	2,03						
Observations	185	185	134	134	134	134	134	134
R-Squared	0.357	0.434						
J-Stat			68	72	71	72	69	70
Instrument rank			73	73	73	73	73	73
Hausman test (F-test)		1.56						
Sargan Test			0.31	0.204	0.228	0.2	0.28	0.254
Autocorellation of 2nd order			0.864	0.856	0.55	0.57	0.865	0.254

Note: Dependent variable is the GDP per capita growth in country i (i=1,15) during the period t (t=1995-2008). We also report the t-statistics and * devote 5% level significance. We employed the Hausman specification test in order to examine the significance of the above correlation and shows that the random effect estimator is not appropriate ($x^2 = 17{,}95$, while the critical value for 10 d.f and a=0.005 is $x^2 = 18.30 > 17{,}95$). When we applied the Likelihood ratio specification test for fixed effects we found that the fixed effect estimator is appropriate (F-stat=1,56 while the critical value for 14, 160 d.f is 3,04). The null hypothesis is that the difference between RE/FE is not systematic. Additionally, we deployed the Sargan test in order to test on the validity of the instruments, with the null hypothesis that the instruments that we used in our regressions are not correlated with the residuals. If we cannot reject the null hypothesis the instruments are valid, if we reject it means that at least one of our instruments is correlated with the error term (residuals). We cannot reject the null

hypothesis. Finally, we found that the errors exhibit no second order serial correlation. FE: fixed effects, RE: random effects, A-B: Arellano & Bond (1991) estimator, B-B: Arellano & Bover (1995) - Blundell & Bond (1998) estimator.

Model 2. (second round of regressions)

$$YG_{it} = \beta_0 + \beta_1 \sum_{b=0}^{c} GHY0\,(-b) + \beta_2 \sum_{b=0}^{d} GHYHUM\,(-b) + \beta_3 \sum_{b=0}^{e} EDU0\,(-b) + \beta_4 \sum_{b=0}^{f} EDUCAHUM\,(-b) + \beta_5 \sum_{b=0}^{g} NETBOR\,(-b) + \beta_6 \sum_{b=0}^{h} DISTRICTAX\,(-b) + \beta_7 \sum_{b=0}^{j} EMPLOGROWTH\,(-b) + \beta_8 \sum_{b=0}^{k} SOCIAL0\,(-b) + \beta_9 \sum_{b=0}^{l} HOUMANRESOURSE\,(-b) + \beta_{10} \sum_{b=0}^{m} PUBLIC0\,(-b) + \beta_{11} \sum_{b=0}^{n} DEFENC0\,(-b) + \beta_{12} C + \beta_{13} GROSSCAP_{it}\,(-b) + \beta_{14} OPEN_{it}\,(-b)$$

Table 4. *Results of Model 2*

	ESTIMATES							
Explanatory variables	OLS	FIXED EFFECTS	GMM1	GMM2	GMM3	GMM4	GMM5	GMM6
GHY0	0,00006							
t-statistic	-3,49*							
GHYHUM	0,00003	-0,0001	-9E-05	-9E-05	-9E-05	-5E-05	-5E-05	-5E-05
t-statistic	1,56	-3,34*	-3,58*	-3,54*	-3,52*	-2,28*	-1,99*	-2,22*
EDU0	0,0001							
t-statistic	2,33*							
EDUCAHUM	-9E-05	0,00001	0,00006	0,00006	6E-05	0,00004	0,00003	4E-05
t-statistic	-1,48	0,16	2,06*	1,94*	2,08*	1,31	1,11	1,33
DEFENC0	-4E-06	0,00003	-0,0001	-0,0001	-0,0001	-7E-05	-7E-05	-5E-05
t-statistic	-0,184	0,48	-1,38	-1,466	-1,32	-1,13	-1,11	-0,74
SOCIAL0	0,00002	-0,0000008	-5E-05	-5E-05	-5E-05	0,00002	0,00002	2E-05
t-statistic	7,89*	-0,03	-3,07*	-3,12*	-2,93*	1,34	1,53	1,53
HUMANRESOURSE	-0,22	-0,16	-0,14	-0,143	-0,14	-0,28	-0,27	-0,31
t-statistic	-4,63*	-0,91	-1,33	-1,28	-1,34	-2,44*	-2,13*	-2,6*
PUBLIC0	-2E-05	0,0003	-0,0001	-0,0001	-0,0001	-0,0001	-0,0001	-0,0001
t-statistic	-1,4	2,17*	-1,58	-1,49	-1,69	-1,47	-1,55	-1,19
DISTRICTAX	-0,33	-0,24	-0,14	-0,153	-0,154	-0,3	-0,3	-0,48
t-statistic	-7,85*	-1,17	-1,4	-1,44	-1,38	-2,04*	-1,96*	-3,1
NETBOR	0,34	0,12	0,15	0,141	0,167	0,3	0,25	0,364
t-statistic	5,72*	0,58	1,33	1,18	1,4	2,22*	1,77	2,59*
EMPLOGROWTH	0,75	0,91	0,47	0,5	0,455	1,001	1,16	0,99
t-statistic	6,81*	3,23*	2,34*	2,14*	2,25*	4,86*	4,81*	4,74*
GROSSCAP	0,153	-0,15	0,32	0,32	0,33	-0,02	-0,05	0,01
t-statistic	2,36*	-0,75	2,02*	1,79	2,06*	-0,16	-0,32	00,06
OPEN	0,001	0,019	-0,03	-0,03	-0,03	0,0156	0,01	0,01
t-statistic	0,364	0,65	-1,132	-1,151	-1,124	0,55	0,56	0,64
C	12,16	26,33						
t-statistic	6,82*	2,4*						
Observations	185	185	134	134	134	134	134	134
R-Squared	0.302	0.435						
J-Stat			72	72	73	69	66	68
Instrument rank			74	74	74	74	74	74
Hausman test (F-test)		1.56						
Sargan Test			0.23	0.24	0.206	0.312	0.407	0.342
Autocorellation of 2nd order			0.93	0.934	0.929	0.647	0.632	0.63

5. Conclusion

Nowadays, the public finances of most countries in the European Monetary Union (EMU) are in the worst position since the industrial revolution. The main objective of this chapter is to highlight the public finances, fiscal policy and economic growth in the EU-15, and make an attempt to determine which of the fiscal policy instruments enhance economic growth. We included both sides of budget, spending and taxation, in our regressions and used the most recent dataset data for fiscal variables from Eurostat. The composition of both spending and revenues is very important according to endogenous growth models. We make a new classification of public expenditures into homogeneous groups in order to reduce the explanatory variables and increase the efficiency of our model and results since we have data for only 14 years. In our empirical analysis we included OLS, fixed effects models, random effects models and GMM estimators, the Arellano & Bond (1991) and the Arellano & Bover (1995) - Blundell & Bond (1998) estimators.

Firstly, on the first round of our regressions we find a negative impact of spending on human capital accumulation on economic growth. We imply that these results made probably because we include spending on education, health, housing and community amenities, environment protection and spending on recreation, culture and religion, some elements of them have positive (education) and some others negative effect. In order to solve these problems we disaggregate public expenditures on human capital accumulation into public expenditures on education (EDUCAT) and the rest of expenditures on human accumulation to correct for possible aggregate bias. Our findings support a significant impact of education spending on economic growth (as expecting) and negative impact from GHYHUM. The positive impact of education spending we found is consistent with Evans & Karras (1984), Baffes & Shan (1998), Hanson & Henrekson (1994), Landau (1983) and Barro (1991). This type of spending might help to enhance economic growth by increasing productivity, individual or social improvement and development, or reduction of inequalities. Hence, we can conclude that the more educated is the population of a country, the more beneficial is an increase in government spending on education on economic growth.

Our empirical results also indicate that an increase on government spending on infrastructure has a significant positive impact on the economy growth of a country. This positive relationship is existed probably because these spending include spending on transportation, communication and energy.

Additionally, in our regressions the variable government spending on property rights protections include spending on defence (DEFENC) and spending on public order safety (PUBLIC). Our empirical results from the first round of regressions imply a strongly negative relationship between these two variables. There are a number of studies such as Deger & Smith (1983), Deger (1986), Faini et al. (1984), Lim (1983) which found empirical evidence of a negative relationship between military spending and economic growth. They focused on two kinds of trade-offs: the allocation effect (the guns and butter trade-off) and the growth effect (the guns vs. growth effect). However, on the second round of our regressions we aggregate defence spending from spending on property right protection and we did not find any relationship between economic growth and defence spending.

Moreover, we find a non-significant relationship between government spending on social protection and economic growth, which is consistent with the previous mixed results of the theoretical and empirical work of this subject. Government spending on social protection can have a positive impact on economic growth of a country through many channels. Firstly, government funds can used in order to

finance the health or education systems, encourage risk taking, and promote participation of individuals in the labour market. However, if tax-payers realise that when government revenues increased, more funds will be used on social protection, they will have less incentive to work and save. Furthermore, we find a statistically negative impact of distortionary taxes on economic growth. This is consistent with the previous studies such as Barro (1990), Jones et al. (1993), Turnovsky (2000), Helms (1985), Canto & Webb (1987), Kocherlakota & Yi (1997) and Garrison & Lee (1995). The negative impact occurs probably from the distortions to choice and the disincentive effects.

In the other explanatory variable that we includ in our regressions, budget deficit or surplus, we find no significant impact on economic growth, while the previous empirical results are mixed. Our results are in contrast to the Ricardian Equivalence which implies that since a current surplus will finance future deficits through cuts in distortionary taxation or increases in productive spending, it causes an increase in growth and investment. On the second round of regressions, when we allow for non-linear growth effects we find a positive relationship with deficits and economic growth, which is in contrast with Ricardian Equivalence. The same conclusion found in the study of Benos (2009). Our findings are probably due to the fact that most of the countries in our data set do not have excessive budget deficits. Moreover, we have to emphasize the fact that when a country runs a deficit for many years will require more distortionary taxes in the future (has negative impact on economic growth).

We also include the employment growth and business investment in our model because labour and capital are very important factors of production in growth models. The employment growth helps to control for business cycle effects on growth. In our empirical results we do not find a significant impact of employment on economic growth, but when we allow for non-linear growth effects we find a strongly positive impact. Finally, the gross capital formation is very important for the economy, it contributes to sustainable economic growth. In theory, capital formation is the fraction of present income saved and invested in order to enhance output and income. However, we found that gross fixed capital formation of the private sector as a percentage of GDP in both rounds of our regressions, has no significant impact on economic growth which is in contrast to Benos (2009), Levine & Renelt (1992).

In order to test the impact of human capital on economic growth, we include the explanatory variable which represents the persons who have completed tertiary education and are employed in science and technology occupations (professionals, technicians and associate professionals). In both rounds of our regressions we do not find any evidence of impact on economic growth. Finally we include the sum of imports and exports of a country as a percentage of GDP and take into account external effects on the economy. Our empirical results do not support any evidence of relationship between OPEN and economic growth. The relationship between trade opens and economic growth is one of the most debated issues in economics, since this relationship is very complex. The empirical results of endogenous models such as Romer (1990), Rivera-Batiz & Romer (1991) are diversified and do not have common pattern on their results. Additionally, probably one reason for mixed results is the specific country factors such as different technologies across different countries.

An update of the dataset used including extended dataset which will include more years and countries, would be considerably useful and insightful. Additionally, an examination of each spending or revenue category in detail is warranted. Governments need to know whether their public activities serve as an incentive to growth or if they are an obstacle, because the development of

appropriate fiscal policies could lead to a persistent increase of economic growth. Thus, they have to determine which of their activities are productive or unproductive.

Notes

[i]Knerell et al. (2001) concluded that if fiscal variables are strictly exogenous, the evidence that based on cross-section or static panel approaches may be misleading.

[ii] Helms (1985) used annual data for 48 states for the period 1965-1979 and used as explanatory variables taxes, public expenditures and demographic and labour force characteristics. The key feature of this approach was the fact that he recognized that is meaningful to evaluate the effects of expenditures or taxes in isolation and claimed that both the sources and the uses of funds must be considered.

Appendix 1. Variable definitions

Y: GDP at market prices, Euro per inhabitant (at 1995 prices and exchange rates)
YG: growth rate of real GDP per capita equal to $\ln Y_t - \ln Y_{t-1}$
Y0: initial GDP at market prices, Euro per inhabitant (at 1995 prices and exchange rates)
EDUCAT: General government expenditure on Education (Percentage of GDP)
HEALTH: General government expenditure on Health (Percentage of GDP)
HOUSING: General government expenditure on Housing and Community amenities (Percentage of GDP)
ENVIRONM: General government expenditure on Environment Protection (Percentage ofGDP)
RECREAT: General government expenditure on Recreation, Culture and Religion (Percentage of GDP)
SOCIAL: General government expenditure on Social protection (Percentage of GDP)
ECCONAFFAIRS: General government expenditure on Economic Affairs (Percentage of GDP)
PUBSERV: General government expenditure on General Public Services (Percentage of GDP)
PUBLICORDER: General government expenditure on Public Order and Safety (Percentage of GDP)
DEFENC: General government expenditure on Defence (Percentage of GDP)
TAXWEAL: Current taxes on income, wealth (Percentage of GDP)
TAXCAPIT: Capital taxes (Percentage of GDP)
TAXIMPORTS: Taxes on production and imports (Percentage of GDP)
ACTUALCON: Actual social contributions (Percentage of GDP)
DISTRICTTAX: Distortionary taxation as share of GDP (TIWY+ CAPTY+ ACSCY)
NETBOR: Net lending (+)/Net borrowing (-) under the EDP (Excessive Deficit Procedure) (Percentage of GDP)
GHY: EDUCAT+HEALTH+HOUSING+ENVIRONM+RECREAT, General government expenditure on human capital accumulation (Percentage of GDP)
GINFAST: ECCONAFFAIRS + PUBSERV, General government expenditure on infrastructure (Percentage of GDP)
GPROPERTRIGHT: DEFENC+ PUBLICORDER, General government expenditure on property rights protection (Percentage of GDP)
DISTRICTTAX: TAXWEAL+ TAXCAPIT+ ACTUALCON: Distortionary taxation (Percentage of GDP)
YOUTH: Youth education attainment level - total - Percentage of the population aged 20 to 24 having completed at least upper secondary education
HUMANRESOURSE: Human recourses in science and technology-core, i.e. persons who have completed tertiary education and are employed in S&T19 occupations, percentage of active population
EMPLOGROWTH: Employment growth - total - Annual percentage change in total employed population
GROSSCAP: Business investment - Gross fixed capital formation by the private sector as a percentage of GDP
EXPORTS: Exports of goods and services (Percentage of GDP)
IMPORTS: Imports of goods and services (Percentage of GDP)
OPEN: EXPORTS+IMPORTS, index of openness
YOUTH0: initial YOUTH
HUMANRESOURSE0: initial HUMANRESOURSE
EDUCATY0: EDUCAT*Y0
GHYY0: GHY*Y0
EDUCATYOUTH0: EDUCAT*YOUTH0
GHYYOUTH0: GHY*YOUTH0
EDUCATHUMANRESOURSE0: EDUCAT*HUMANRESOURSE0
GHYHUMANRESOURSE0: GHY*HUMANRESOURSE0
DEFENCY0: DEFENC*Y0
PUBLICORDERY0: PUBLICORDER*Y0
SOCIALY0: SOCIAL*Y0

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