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ECONOMIC GROWTH IN EASTERN, CENTRAL AND SOUTHERN EUROPEAN COUNTRIES. AN ECONOMETRIC ANALYSIS OF THE COMPONENTS OF THEIR PUBLIC SPENDING

Abstract. Since the entry into force of the Stability and Growth Pact, European countries with "weak fiscal policy fundamentals" have been forced to introduce fiscal measures for controlling public spending to achieve and maintain the objectives required by the Maastricht Treaty. The financial crisis of 2008 and 2009 caused a strong reduction in GDP and investments, and an increase in social disparities. Consequently, the gap between European Southern countries (as well as Central Eastern countries) and the rest of the European Union became wider in several ways. The need of financial resources for multi-annual reforms and investments makes it crucial for these governments to reflect on the relevance of public spending in terms of the economic effects of redistributive politics of pure transfers to households versus dynamic adjustments of public capital accumulated in the recipient economy. The present paper aims at empirically verifying the economic effect of two public spending components such as social transfers and public gross fixed capital formation, in Eastern, Central and Southern European countries, in a compliance context with public spending control. The econometric analysis is based on a dynamic panel regression. The main finding is that public gross fixed capital formation and, to a lower extent, social benefits other than transfers in-kind have significant effects on economic growth (positive and negative, respectively).

Keywords: dynamic panel regression, economic growth, fiscal discipline, public spending.

1. Introduction

The theoretical debate on the economic growth of European Member States (EMS) has been very heated in the last few decades. On the one hand, some authors have highlighted that the run-up to the European Monetary Union (EMU) would have generated the integrative and internal forces necessary to realize economic growth among all the Member States. On the other hand, other authors have affirmed that particularly the Southern European countries, not prepared for continuous fiscal discipline (especially in terms of spending control) would have worsened their economic position. In effect, average GDP per capita growth index remained negative or close to zero for several European countries between 2008 and 2013. Even investments in EU countries have fallen dramatically since the crisis, and although there have been clear signs of divergence, the European-led investment plan and structural funds alone have not been able to correct this very worrying trend. In fact, the financial crisis of 2008 and 2009 acted as a detonator of the imbalances accumulated, leading to a compression of domestic demand, and a drastic reduction of bank exposure, especially in the emerging European economies whose financial systems were little affected initially (European Commission, 2009). This raised domestic questions about the validity of economic and political reforms implemented until now.

According to Bartlett and Prica (2013), the Eurozone crisis can be understood as the "outcome of a structural imbalance between *Core* and *Periphery* countries" (Lapavitsas et al., 2010). Germany is at the

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centre of the core countries; Greece, Italy, Portugal and Spain, on one side, and Latvia, Lithuania, Estonia, Slovakia, on the other, could be considered periphery and semi-periphery countries, respectively.

In this framework, fiscal policy could play a more significant role in giving impulse to the economy taking in particular account the economic effect of public spending components. However, among others factors the political choice between capital investments versus pure transfers to help households (immediately available) is particularly relevant also for the strong implication on the electoral consensus.

In terms of public spending components in Central and Eastern Europe, public expenditure levels resemble those of advanced Europe, reflecting arguably historical reasons, geographic and cultural proximity, and a similar understanding of the role of government (IMF, 2015). In these countries, public spending cuts exceeded those released in the other European Member States by a full percentage point of potential GDP on average (1.4 percent vs. 0.4 percent). In particular, the public sector wage suffered the largest consolidation and, to a lesser extent, public investments; in fact, in 1999, salaries of civil servants were well above the EU average in Estonia, Cyprus, Lithuania, Malta and Portugal (Latvia and Portugal, followed by Spain and Estonia, showed the largest decreases; see European Commission, 2014).

The present paper analyses the economic and fiscal situation of the aforementioned countries, suggesting a potential long run association between two public spending components and GDP. It complements the literature by looking at the economic effects of specific spending components, with a particular focus on social transfers and public investment. The literature aimed at highlighting the effects of redistributive transfers on growth is not wide, considering that decisions about social transfers depend on policy priorities, history, composition of the overall social protection systems and contingency.

According to some traditional economic literature, a reallocation of public spending towards infrastructure can raise GDP over the long run; supporting these ideas, our research empirically verifies that, in a context of spending control, public investment could be the key lever to boost demand and stimulate the economy for the euro area countries with weak economic growth (Graziano and Guagnano, 2016). It also highlights that potentially high payoffs to greater infrastructure and public goods spending would seem to make a lot of sense now: the surfeit of idle resources in the economy ensures that there is no competition for loanable funds (Bivens, 2012). On the contrary, social transfers may cause lower economic growth (Connolly and Li, 2016; Gemmell et al., 2016). Moreover, while some opportunistic politicians have attempted to signal their competence to the electorate by shifting spending on transfers from investment expenditure (Morozumi and Veiga, 2016), the reorientation of spending under the same overall deficit or surplus, could also address the need for more inclusive growth that should characterize a more responsible spending.

Keeping in mind the aforementioned studies and the literature briefly recalled in Section 2, our analysis aims to shed light on the economic effect of two components of public spending: social transfers other than transfers in-kind[1] and public gross fixed capital formation.[2] We consider that the spending decisions are made in a compliance context with a public spending control, where the financing of a public spending component can be obtained only with the reduction of another spending category. The analysis refers to the following twelve Eastern, Central and Southern European countries: Cyprus, Estonia, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Portugal, Slovakia, Slovenia and Spain; the time period is 1998-2013.

The data used for the econometric analysis come from several databases, namely: Eurostat, the European Commission Ameco, OECD, UNESCO. Furthermore, the data on government expenditure, taken from the European Commission Ameco database, are in terms of ESA 2010[3] to allow a more homogeneous analysis of economic and fiscal data. We also assume that the budgetary fiscal processes are comparable, although only

[1] Social benefits other than social transfers in-kind paid by government (ESA2010, code D.62) are transfers to households, in cash or in-kind, intended to relieve them from the financial burden of several problems or needs (by convention: sickness, invalidity, disability, occupational accident or disease, old age, survivors, maternity, family, promotion of employment, unemployment, housing, education and general neediness), made through collective schemes, or outside such schemes by government units.

[2] Public gross fixed capital formation consists of the value of acquisitions of new or existing fixed assets (fixed assets are produced assets used in production for more than one year) by governments less disposals of fixed assets (ESA2010, code P.51).

[3] In the ESA 2010 system, recording is in principle on an accrual basis, that is, when 'an economic value is created, transformed or extinguished' (Eurostat, 2013, p. 17).

since 2011 the EU Member States have been forced to define fiscal process procedures according to the same timetable.

To pursue the goal of our study, we analyse two different datasets: the first one is based on four-year interval averages, the second one on annual data. Given the panel structure of our data, we employ the static and dynamic panel regression estimators.

The main finding of the analysis is that public gross fixed capital formation and, to a lesser extent, social benefits other than transfers in-kind, record significant effect on economic growth (positive and negative, respectively).

The paper is organized as follows: in Section 2 we present a brief review of the econometric and economic literature on these topics. In Section 3 we provide a descriptive analysis of our data, aimed at highlighting the differences between the periphery and semi-periphery countries on one side, and the core countries on the other side; this different behaviour motivated our choice to exclude core countries from the subsequent econometric analysis. Section 4 illustrates the econometric model, whose estimates and results are described in Section 5. Some concluding remarks complete the analysis.

2. Literature review

Many macroeconomic studies deal with the economic effects of Fiscal policy, according to several points of view. Exogenous growth models of Solow (1956, 1957) and Swan (1956) represent the first attempt of the Neoclassic Theory to study economic growth in a systematic way. They underlined that, in the long run, all economies will converge to the same growth rate according to the hypothesis that all countries in the world have similar production functions, saving rates, and growth rates of population and technology. Consequently, in the long run, a poor economy will catch up with the more developed countries because its growth will be faster on average. The assumption under this theory is a strong one, as the investment rate, the institutional set-up, and macroeconomic and financial variables vary across countries.

Against this background, endogenous growth theories underline the presence of persistent differences in per capita income across countries (rich economies may retain a constant gap with poorer regions or may even increase it), and models based on these theories emphasise mechanisms that generate divergence across economies. Furthermore, these theories underline that public intervention, especially in terms of infrastructure endowment, makes private capital more productive in the long run.

In general, stylised facts derived from international datasets showed the absolute convergence prediction to be untrue. Consequently, the concept of conditional convergence, which takes into account differences among countries, has become the most tested proposal of growth theory (Barro, 1990, 1991a, 1991b; Barro and Sala-i-Martin, 1992; Mankiw et al., 1992).

In particular, Barro (1991b) developed a long run growth rate model, which used multiple explanatory variables to explain conditional convergence. The author studied 98 countries over a time period of 26 years (1960-1985). The results of this model suggested that the growth of poorer countries increases faster than that of richer countries, if their human capital (approximated by school enrolment) exceeds that of more developed countries. Mankiw et al. (1992) augmented equation made human capital endogenous to the model, based on the theory that the accumulation of physical capital and population growth would have a greater effect on income levels when human capital is taken into account; they found that savings, education, and population growth are the major explanatory factors for differences in international income. Their analysis also reinforced the theory that countries converge at the rate predicted by the model (if population growth and physical capital are held constant), suggesting that the Solow model may explain international differences in GDP per capita. Sala-i-Martin (1996) employing various empirical tests concluded that endogenous growth models should be adopted in place of the neoclassical model.

Referring to European countries, the conditional convergence hypothesis, for groups of countries or in regional terms, has been confirmed by a large body of empirical research, using various datasets and econometric techniques (see, among others: Quah, 1995; Monford, 2009; Borys et al., 2008; Afonso and Jalles, 2014).

Considering the specific literature focused on the effects on long run growth of single public spending components, we can recall the seminal works of Grier and Tullock (1989), Barro (1990, 1991a, 1991b, 2003), Devarajan et al. (1996) and Sala-i-Martin (1997). Epstein and Gintis (1995) provided a review suggesting that governments, via appropriate policies, can foster productive activities and decrease unproductive ones. Particularly interesting is the Nelson and Singh (1994) study, where 70 developing countries are analysed for two distinct time periods (1970-79; 1980-89), finding that the effects of public investment on growth are mixed. On the one hand, higher public investment raises the national rate of capital accumulation above the level chosen (in a presumed rational fashion) by private sector agents. Therefore, public capital spending may crowd out private expenditures on capital goods on an ex-ante basis as individuals seek to re-establish an optimal inter-temporal allocation of resources. On the other hand, public capital – particularly infrastructure capital – is likely to bear a complementary relationship with private capital (in private production technology). Thus, higher public investment may raise the marginal productivity of private capital and thereby crowd-in private investment and affect output growth in net terms (Afonso and Aubyn, 2009). We must also mention the studies of Gemmell and Kneller (2003), Creedy and Gemmell (2005) and Gemmell, Kneller and Sanz (2016). In particular, these last authors for a sample of OECD countries over the time period 1972-2008, examined the changes in total government expenditure and in the shares of different spending categories, taking into particular account the methods of financing. They stated that, for any spending increase, what matters is whether this involves higher taxes (with differing distortionary characteristics), higher deficits, or reductions in alternative spending categories. The authors explored both short-run dynamics and long run equilibrium relationships too and also highlighted that social welfare spending may have a moderate GDP-reducing effect (on this issue see also Connolly and Li, 2016). Finally, Morozumi and Veiga (2016) showed that capital spending innately has a large growth-fostering potential through the accumulation of public capital; inefficiencies in this type of spending are due to unaccountable public officials that can mitigate its positive effect.

In contrast, some contributions assert that, from a theoretical point of view, the sign and magnitude of the impact of discretionary fiscal policy on aggregate demand depend on a number of key assumptions (among which, the existence of nominal rigidities in the economy, the elasticity of the labour supply, the interest-rate elasticity of investment, the interest-rate and income elasticities of money demand, the degree of openness of the economy, the exchange-rate regime, the magnitude of the wealth effects, the presence of forward-looking agents and, more generally, the role played by rational expectations). However, econometric analyses based on these ideas often offer opposite conclusions and empirical evidence does not provide a common picture. In particular, most recent works are based either on structural macro models or on VAR analysis; although they show positive short-term output multipliers that stem from public expenditure increases and tax cuts, the estimated magnitude and duration of these effects is very disperse. The strand of literature that analyses the response of output to dynamic effects of shocks in government spending, comprises among others the works of Fatás and Mihov (2001), Blanchard and Perotti (2002), Perotti (2005), Mountford and Uhlig (2009), Auerbach and Gorodnichenko (2013a, 2013b), Furceri and Li (2017).

More precisely, Blanchard and Perotti (2002) and Fatás and Mihov (2001), by means of a structural VAR (SVAR) approach verified that an exogenous shock to government spending generates a positive response for output, consumption, and real wages and a negative effect for investment (indeed, in Fatás and Mihov investments do not show significant effects). Perotti (2005) implemented a SVAR approach to analyse the effects of fiscal policy on output, prices and interest rates in five OECD countries, finding that these effects have become substantially weaker in the last 20 years. More recently, Mountford and Uhlig (2005) found a negative effect about residential and non-residential investment. Auerbach and Gorodnichenko (2013a, 2013b) identified government spending shocks as the forecast errors in government spending. Using data for Denmark, Ireland and Sweden, Giavazzi and Pagano (1990, 1996) have uncovered the presence of "non Keynesian effects" (i.e., negative spending multipliers), with output rising significantly despite large cuts in government spending (Favero and Giavazzi, 2012). Successively they also highlighted that such interventions are less harmful to growth than plan based on taxes hikes (Alesina et al., 2018).

A potential problem with the VAR approach, when used to estimate the effect of public investment, is that impulse responses at very long horizons are likely to have large standard errors (Perotti, 2007), consequently implying not significant parameter estimates.

Given this limitation and the panel structure of available data, and considering that the main interest of the present analysis is the potential long run association between two particular public spending components and GDP in the presence of annual fiscal information, from now on the reference literature will be limited to the contributions dealing with conditional convergence hypothesis and with the effects of public spending components on long run growth.

3. Data analysis

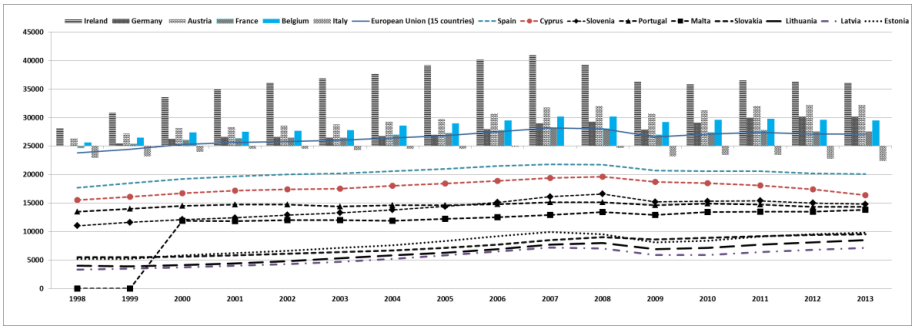
In this section we present a descriptive analysis of the main characteristics of each country, highlighting the substantial little variation in living standard from 1998 onwards for the periphery countries and, after 2008, for semi-periphery country respectively. This descriptive analysis, confirming Bartlett and Prica's (2013) claims on the structural imbalance between *Core* and *Periphery* countries, highlights differences between these groups of countries, thus motivating our choice to exclude core countries from the subsequent econometric analysis. The analysis therefore refers to the following sixteen European countries: the twelve Central, Eastern and Southern European countries already listed in Section 1 (periphery or semi-periphery countries), and the four core countries (that is, Austria, Belgium, France and Germany).

The data used for the present analysis come from the European Commission, Eurostat and Ameco databases, except for the predicted value of GDP per capita levels and the years of schooling, which are taken from OECD and, respectively, UNESCO and Barro & Lee databases. They cover the time period 1998-2013.

The regressors considered in the analysis, all in real terms, are the following: investments; inflation differentials;[4] fiscal deficits and public debts; imports and exports; total public spending; specific components of public spending as gross fixed capital formation, social benefits other than social transfers in-kind and social transfers in-kind; annual growth rate and annual level of per capita income; mean years of schooling.

The graphical analysis suggests that the absolute value of per capita real income differs considerably among the selected European countries (Figure 1): the distance between each Eastern and Central European country and the European average is relevant over the whole time period considered, especially due to the high levels recorded by Ireland and the euro area core countries (a little less by France).

Figure 1. GDP per capita in sixteen European Countries (1998-2013)



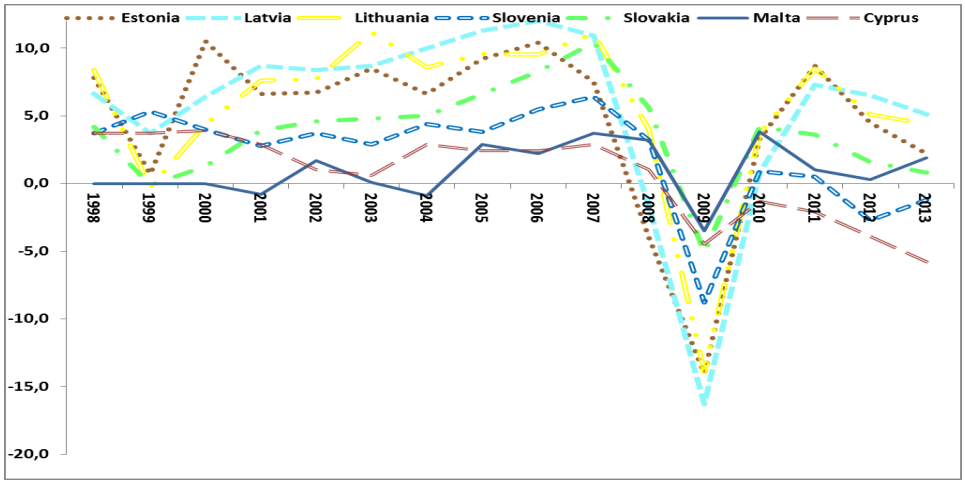
Source: Our elaboration on Eurostat data

[4] Inflation differential (Borys et al., 2008; Mongelli, 2008; Crespo and Silgoner, 2014) is calculated on the basis of price level indices, which provide a comparison of country price levels relative to Eu average and are calculated using purchasing power parity. They indicate how many currency units a particular quantity of goods and services cost in different countries. Eurostat provides data on purchasing power parities referred to individual consumption in the euro area. We refer to the theory of relative Purchase Power Parity, according to which the percentage change in exchange rate is assumed equal to the percentage change in the domestic price level minus the percentage change in foreign price level; alternatively, percentage change in exchange rate is assumed equal to the inflation differential between the home and the foreign country.

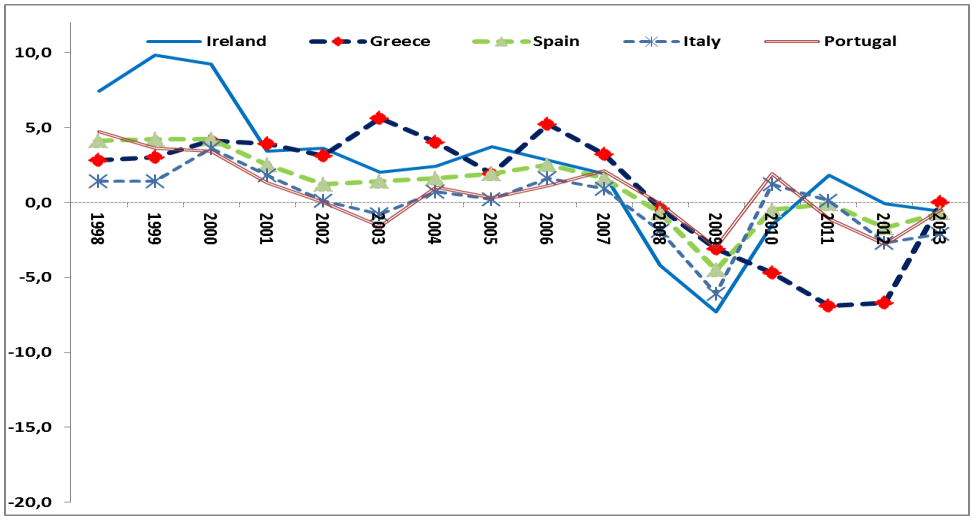
Instead, if we consider per capita income growth rates, Estonia, Latvia, Lithuania, Slovakia and Slovenia show higher values than those of other European countries (especially the core countries; see Figure 2).

Figure 2. Year-over-year variation of GDP per capita in sixteen European countries (1998-2013)

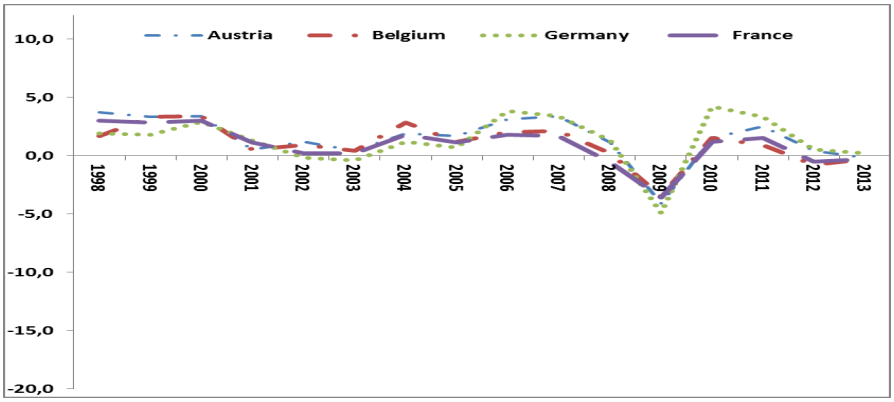
a) Eastern peripheral and semi-peripheral countries



b) Central and Southern peripheral and semi-peripheral countries



c) Core countries

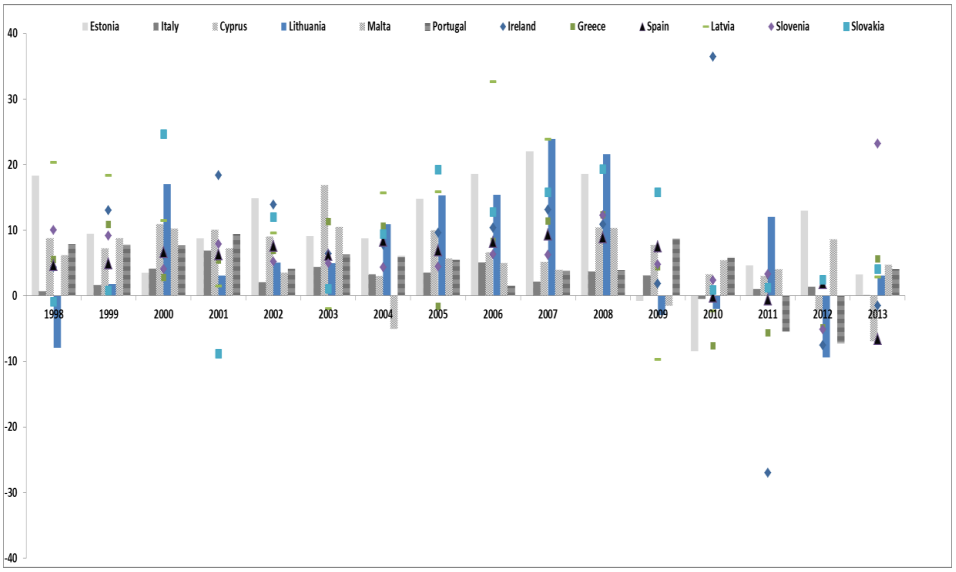


Source: Our elaboration on Eurostat data

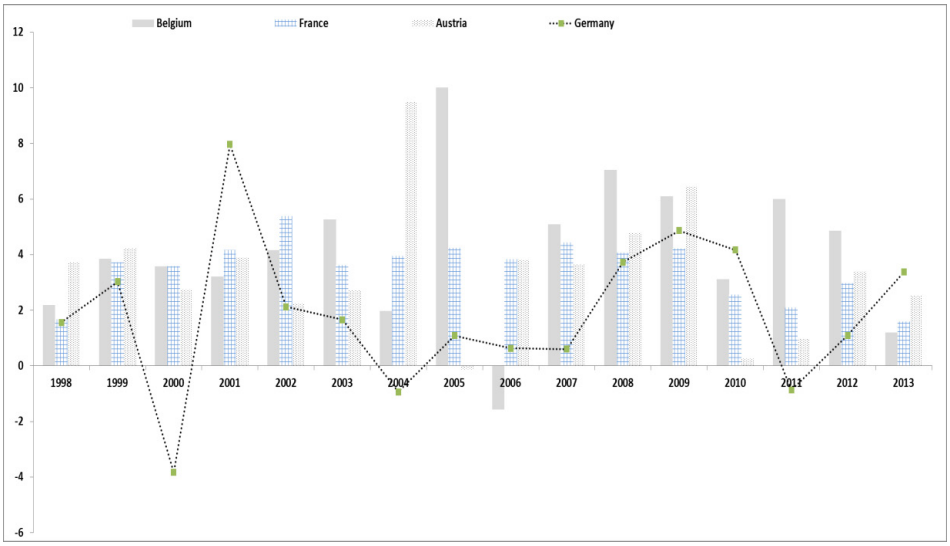
For almost all countries, the year-over-year growth rate of public expenditure records a slight increase from 2006 to 2008 and a subsequent reduction until 2012, stabilizing later (Figure 3). Exceptions are: Belgium, Cyprus, Greece, Slovenia, Spain and, for the particularly high peak in 2010, Ireland. Furthermore, after 2009 we can observe a net increase in negative variations.

Figure 3. Year-over-year growth rate of public expenditure in sixteen European countries (1999-2013)

a) Peripheral and semi-peripheral countries



b) Core countries

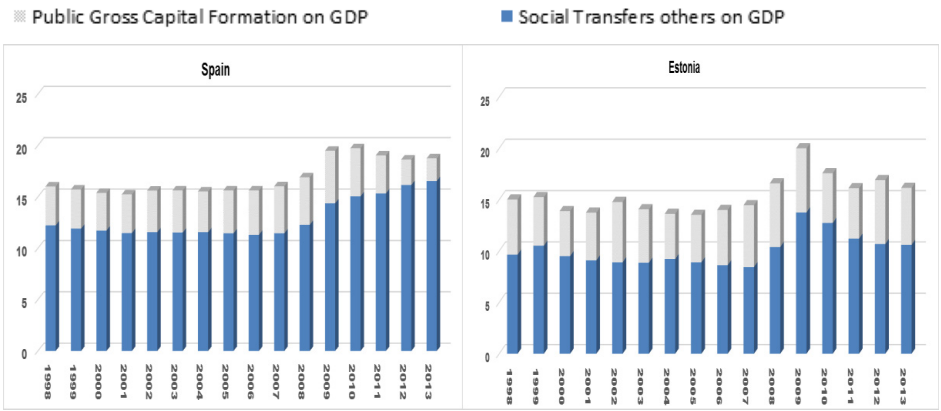


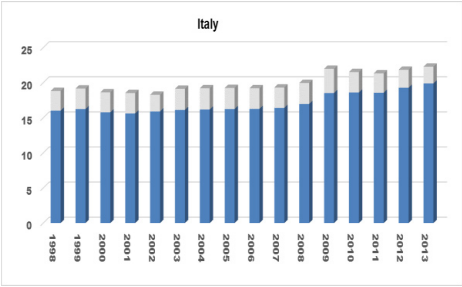
Source: Our elaboration on Eurostat data

On the contrary, in the core countries the growth rate increases in 2008 and 2009 and its variations are much lower (their range is much less wide).

Considering the two specific components of public expenditure, i.e. public gross fixed capital formation and social benefits (other than transfers in-kind), expressed as GDP ratio, the percentage of public spending in social benefits is always much higher than that in public gross fixed capital formation (Figure 4).

Figure 4. Composition of public spending for sixteen European countries (1998-2013)

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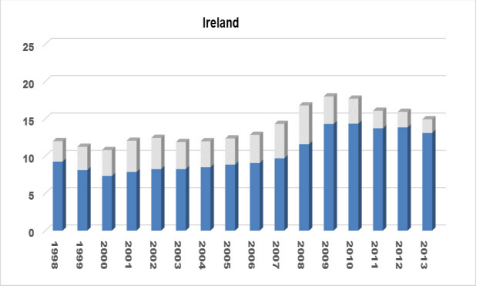
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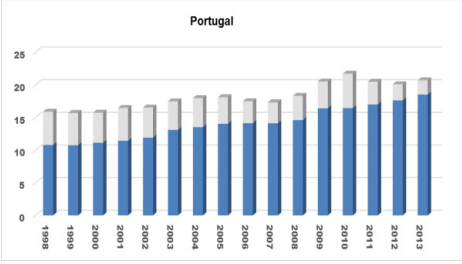
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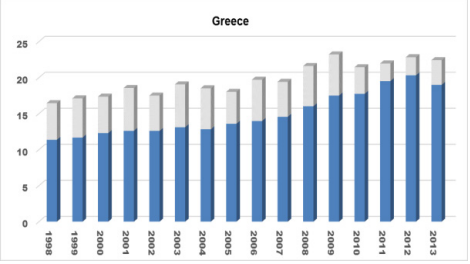
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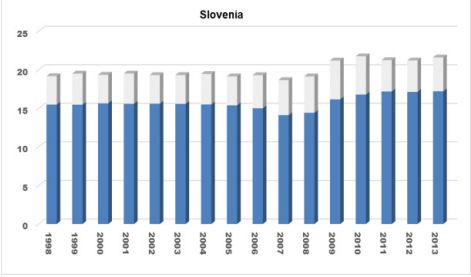
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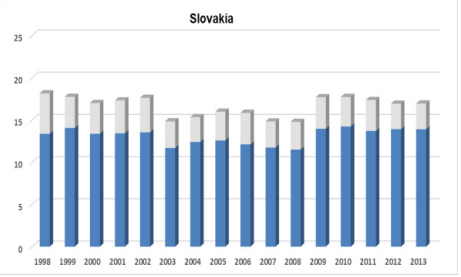
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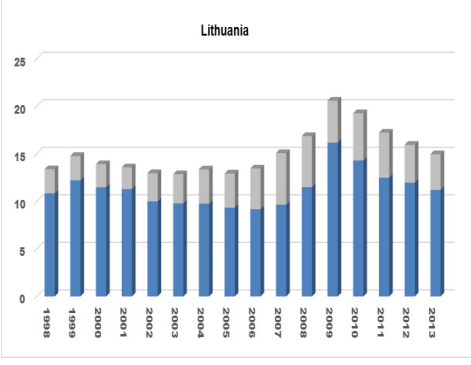
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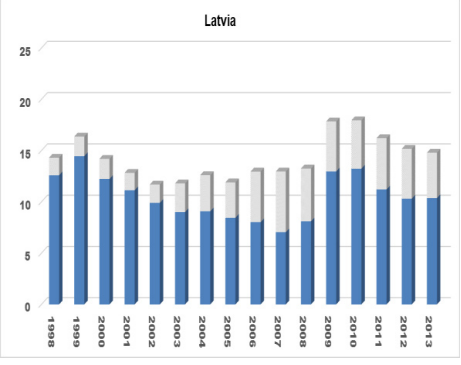
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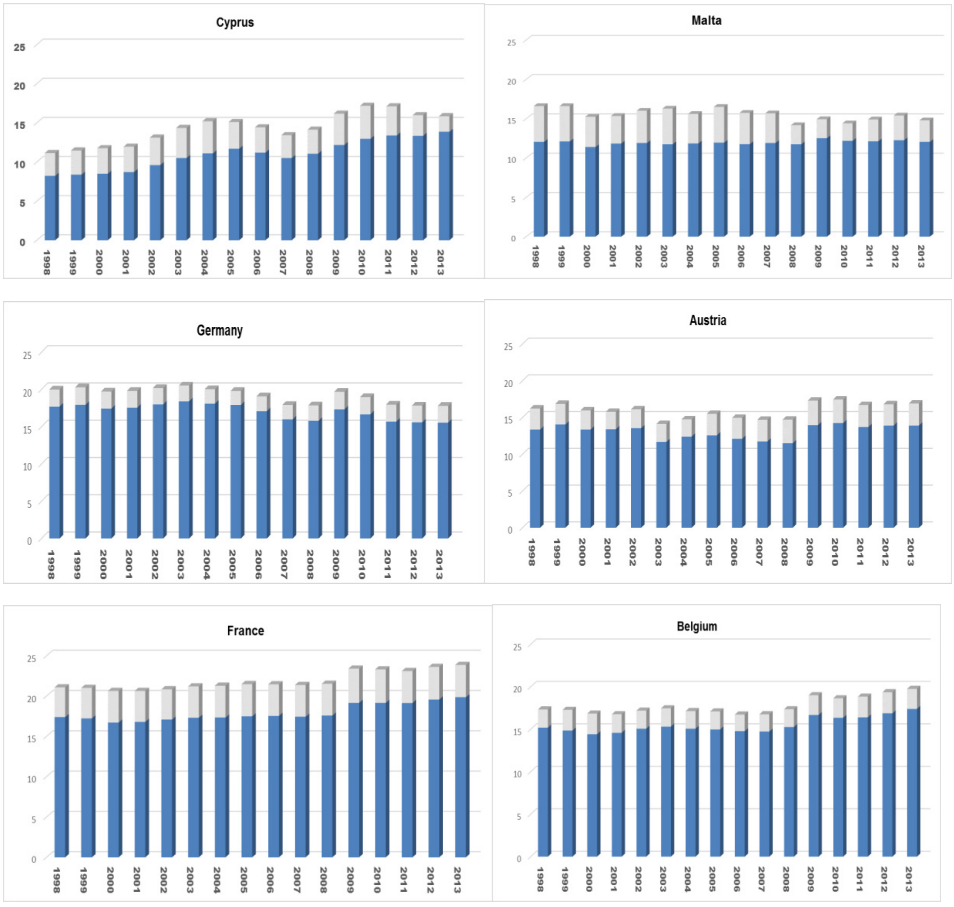
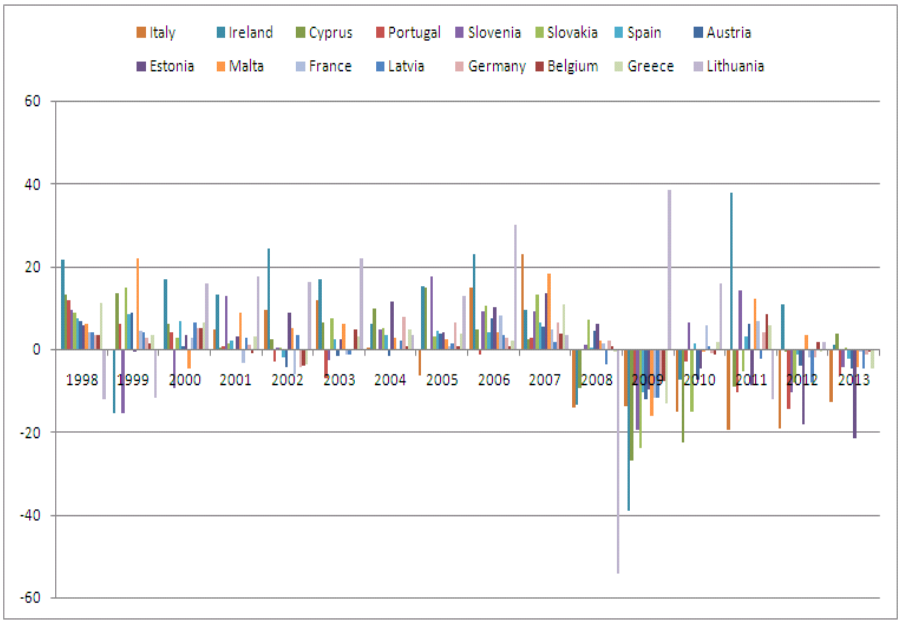


Source: Our elaboration on Eurostat data

The aggregate amount of these two components of the public expenditure is rather stable in almost all countries with a slight increase around 2009. In Belgium, France, Greece, Ireland, Italy, Portugal and Spain, we can also observe a slight increase after 2009. The rate of public gross fixed capital formation is less variable in time and in most of the periphery countries it tends to decrease (especially in Portugal and Greece, while exceptions are Latvia and Lithuania). Among the core countries, France and secondly Austria show the highest rates of this spending component; in Germany and Belgium public investment records increase from 2009 onwards, while in the same period the overall spending decreases only in Germany.

Considering the annual growth rate of investment, we can note that in the pre-crisis period there was an investment boom, which was not sustained in the post-crisis period (see Figure 5).

Figure 5. Year-over-year variation of investment in sixteen European countries (1998-2013)



Source: Our elaboration on Eurostat data

It may be interesting to see how the relationship between GDP per capita growth and investment growth has changed over time, in the sixteen countries. To give an example, we only considered three years: the first and the last of the observing period and one just before the crisis (that is, 1998, 2006 and 2013). We can observe a strong and positive relation in 1998, a much less clear relation in 2006 and again a positive weaker relation in 2013 (especially if we do not consider Latvia; see Figure 6).

If the pre-crisis investment levels were stimulated by optimistic growth expectations and supported by external funding availability, in the post-crisis period growth prospects were reassessed and private funding tightened.[5] As Forgò and Jevčák (2015, p. 8) noted: "The average share of gross fixed capital formation (GFCF) in the CEE10 increased from below 25% of GDP in 2004 to above 29% of GDP in 2007 and 2008 while it remained below 24% of GDP in the EA12 […]. The average share of GFCF in the CEE10 declined to about 22% of GDP in 2010 and then remained broadly stable up to 2014 (while it declined below 19% of GDP in 2013-14 in the EA12)".

[5] The capitals started flowing in opposite directions, amid a general reappraisal of risk: nominal divergence in interest rates linked to growing spreads between the centre and the periphery took place together with real divergence in growth and unemployment rates.

Figure 6. Relation between investment and GDP per capita in 1998, 2006 and 2013

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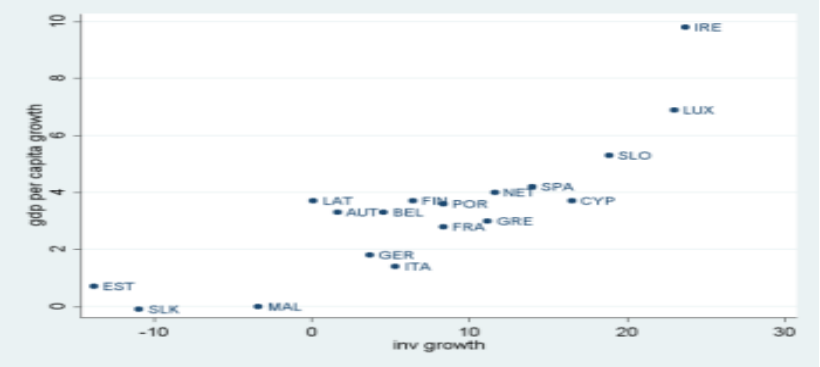


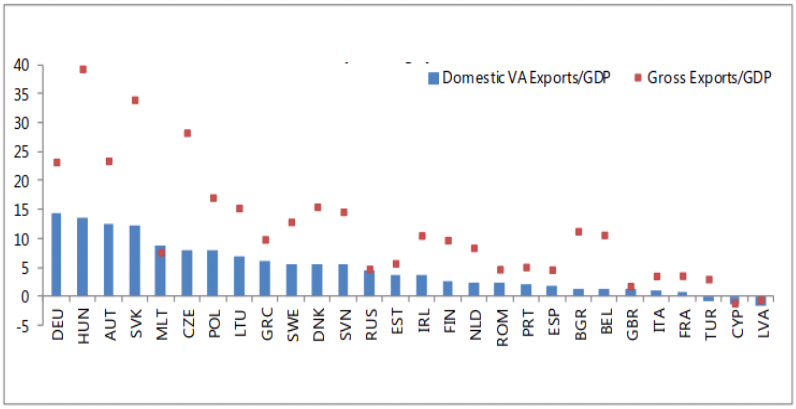
2006

2013

Source: Our elaboration on Eurostat data

The openness of Central Eastern European economies to trade improved considerably between 2004 and 2008; however, the relevance of exports of goods among the European countries shows extremely different values (Figure 7).

Figure 7. Relative percent change in gross and domestic VA exports of goods and services in European countries (1995-2008)



Source: IMF (2013)

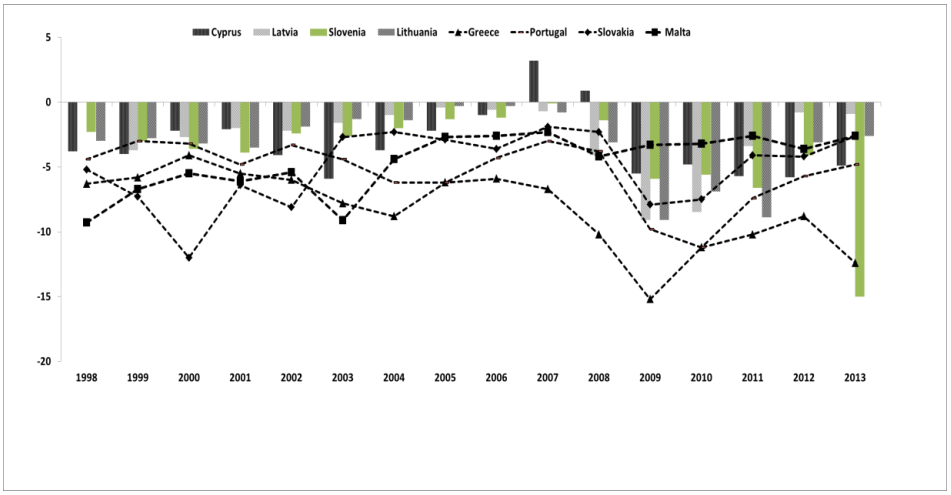
The parallel deterioration in financial conditions, which inter alia forced Latvia to seek official international balance of payments assistance from the EU and the IMF, revealed that some CEE countries encountered problems to (re-) finance their public sector borrowing needs during periods of heightened financial market tensions; this happened despite in most cases general government debt levels were relatively lower compared to the euro area core countries average (see Figure 8). An aspect to consider is the relevant difference between public debt and GDP level in Cyprus, Estonia, Latvia, Lithuania, Malta, Slovenia and Slovakia.

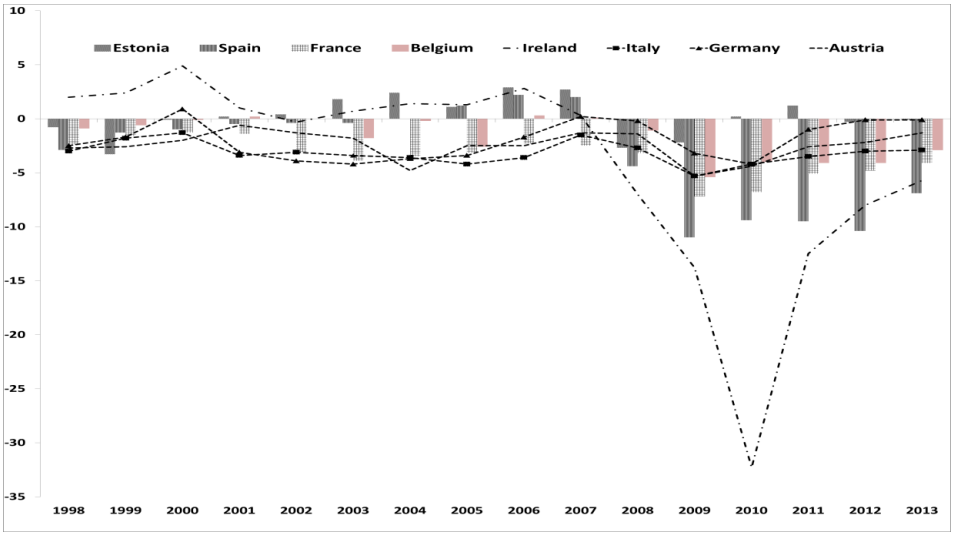
The 2008-2009 global financial crisis had a significant negative impact on fiscal positions of most CEE countries. From 2008 onwards, the average debt ratio in the euro zone rose dramatically, in response to huge budget deficits and to the fall of GDP. This led to a gradual loss of confidence in the working of the euro zone, and in particular to severe problems for high debt nations (as in Greece, Ireland, Portugal and Italy) in financing their deficits.

In summary, in the light of the previous considerations and of graphical evidences, it emerges that during the economic crisis total public expenditure played a small role as an automatic stabilizer, while public gross fixed capital formation seems to be little cyclically dependent (coherently with Gemmell et al., 2016).

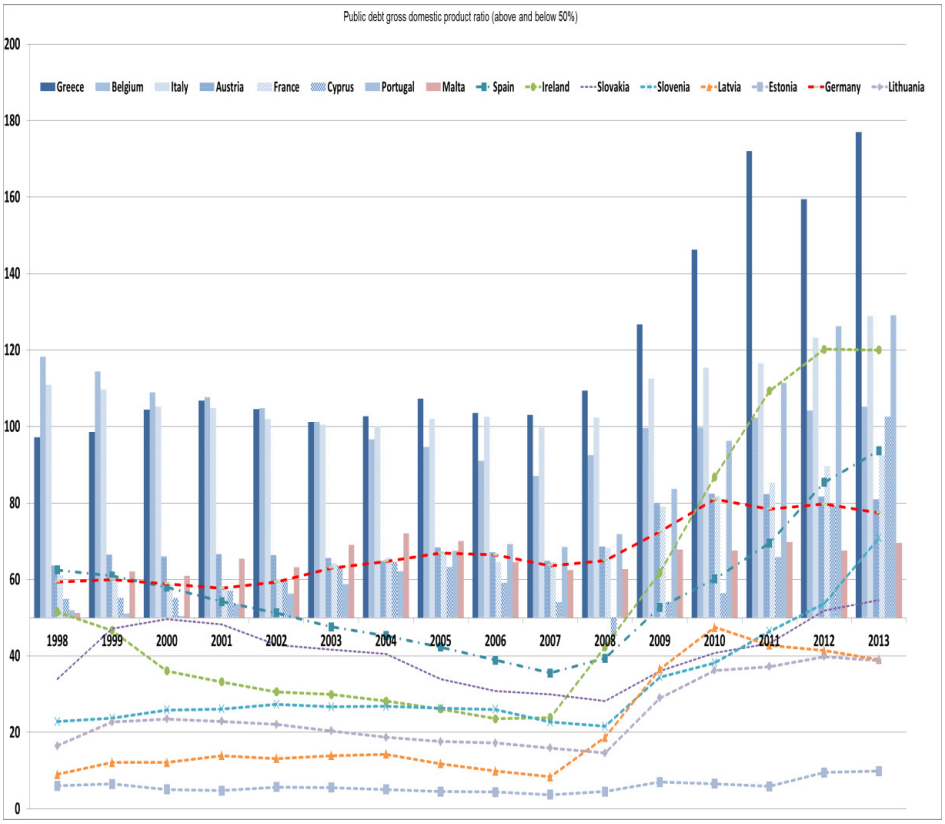
Figure 8. Net borrowing and debt as GDP ratio in European countries (1998-2013)

a) Net Borrowing





b) Public debt as GDP ratio (above and below 60%)



Source: Our elaboration on Eurostat data

To complete the description of the main variables so far considered, we can analyse their variability. In particular, some of them (i.e. openness, investment, GDP per capita, social benefits, total expenditure and revenue, and public gross capital formation) show great variability (see the first column of Table 1). Since our data have a panel structure, that is, each variable is observed for each of sixteen countries over fourteen years, the whole variability could depend on the variability existing in each country along the time, the *Within variability*, or on the one existing among countries for each year, the so called *Between variability*.

As shown in Table 1, the major source of variability is the *Within* for GDP per capita, social transfers, public gross fixed capital formation and inflation differential. On the contrary, the two sources of variability are almost equivalent for public expenditure and GDP ratio, while the *Between variability* is the biggest one for all the other variables.

Table 1. Variability decomposition, in terms of standard deviations

	Overall	Between	Within
GDP per head	4.57	2.02	4.13
Investment as GDP ratio	9.70	8.46	5.45
Mean years of schooling	1.49	1.44	0.55
Public expenditure as GDP ratio	5.90	4.05	4.03
Public revenue as GDP ratio	5.58	5.43	1.73
Inflation differential	2.02	1.04	1.94
Debt	1.06	1.08	0.21
Social transfer in-kind	6.93	1.18	6.84
Openess	18.24	18.00	3.09
Public gross capital formation	16.22	3.91	15.81
Exports as GDP ratio	0.30	0.31	0.10
Population growth	0.94	0.82	0.52

Source: Our elaborations on Eurostat data

In conclusion, the graphical analysis highlights four main aspects:

1) relevant differences in the living standard among the European countries (Figure 1) that remained almost unchanged during the whole period;
2) reduced economic growth of periphery and semi-periphery countries after the financial crisis due to the fall in investments (Figures 5-6);
3) generalized fall in the size of public budget and particularly in public spending components after the crisis in CEE and Southern European countries; however, differences in the composition of public spending among countries remain (Figures 3, 4, 8);
4) reduced economic growth of core countries, as their economies have been propelled by exports to the rest of EU and periphery and semi-periphery countries being sizeable consumers of core country exports (Figure 7).

4. Model specification

Let us first recall Barro's (2003) model, in which public expenditure, as a variable of the productivity function, improves capital productivity. Consequently, the aggregate production function is Y=f(L,K,G), being G the relevant fiscal variable.

Here we start considering a linear function f(·) and specify the following model, based on a simple panel regression:

$$y_{it}=\beta x'_{it}+\alpha_i+\varepsilon_{it} \quad (1)$$

where t=1,2,…,T is the time indicator and i =1,2,…, N refers to the country.

Equation (1) includes an intercept that varies across countries, but is constant in time, and allows us to face country specific effects. The advantages of panel regression lay on controlling the individual heterogeneity by modelling the dynamic behaviour of units. The result is a major efficiency in estimation. As a matter of fact, the panel approach takes into account both the cross-sectional and the time series components of the dataset. The variation of explanatory variables over time and among units provides additional explanatory power and degrees of freedom for the regression analysis.

According to the methodology defined by Gray et al. (2007), Borys et al. (2008), Afonso and Jalles (2014), and Acosta-Ormaechea and Morozumi (2013), we specify the following panel regression equation:

$$y_{it}=\beta'\boldsymbol{x}_{it-1}+\varsigma'\boldsymbol{\theta}_{it}+\varphi_t+\nu_i+\varepsilon_{it} \quad (2)$$

The model relates the annual growth of per-capita real income to two groups of variables: the state variables, $\boldsymbol{x}$, and the control/environmental ones, $\boldsymbol{\theta}$. The state variables determine the initial position of economy, while the others represent the steady state. An equi-proportional increase in the state variables reduces growth, thus implying the presence of 'conditional' convergence; on the contrary, an increase in the steady state output level leads to higher growth rates during the (seemingly) long adjustment period towards the steady state growth rate (Acosta-Ormaechea and Morozumi, 2013). The term φ_t stands for common time effects, while ν_i is the country-specific fixed effect; finally, $\varepsilon_{i,t}$ is the error term. Among the state variables, we have the initial level (in natural logarithm) of per capita GDP. Here, however, in order to prevent the temporary fluctuation of GDP per capita from affecting the results, on track of Borys et al. (2008), we employ predicted values of GDP per capita levels (OECD estimates) instead of the observed ones. The other state variable included in $\boldsymbol{x}$ is the mean years of schooling. This variable is a proxy for human capital accumulation while the initial real GDP per capita is a proxy of physical capital. Among the steady state variables, we have: social benefits (other than social transfers in-kind) paid by general government and public gross fixed capital formation. In a second step we will also consider another public spending component, that is social transfers in-kind, to give more robustness to the results. All the spending components are expressed as ratio of total public expenditure.

To check the robustness of the results, some prudent specifications have been tried and other regressors have been added. They include: investment stock (Borys et al., 2008); population growth (Acosta-Ormaechea and Morozumi, 2013); a dummy to take into account if a Member State respects the 3% threshold for the deficit GDP ratio (proxy of the respect of public spending limit); the inflation differential (Borys et al., 2008; Mongelli, 2008); trade openness, expressed by GDP ratio of exports plus imports and total exports. As regards this last regressor, we can note that trade openness is closely related to country size, i.e. bigger countries tend to be less open and rely more heavily on domestic trade (Borys et al., 2008). The openness of Central Eastern European economies to trade improved considerably between 2004 and 2013; however, the relevance of goods exports among the European countries shows extremely different values. For this reason, in our regression we consider both the covariates.

Unlike the study of Gemmell et al. (2016), we do not consider the methods of financing the spending categories explicitly, because in our study public spending has a predefined cap[6] that has to be respected to match the requirements of fiscal discipline present in the euro area: the total national public spending shall not increase and the possibility to increase one category of spending could be accompanied only by the reduction of another existent category. For the same reason, unlike Barro (2003) and Barro and Sala-i-Martin (2004) we do not include total public expenditure, neither total general revenue as suggested in Gemmell et al. (2016).

The model is estimated on two different datasets. The first one is based on four-year interval averages of annual data,[7] over the following non-overlapping periods: 1998-2001, 2002-2005, 2006-2009, and 2010-2013; the second one is based on annual data. Given the greater temporal detail of this data set, we decided to add a dummy variable among the regressors, to explicitly consider the years of the crisis. The main advantage in using interval averages is that the results are not influenced by idiosyncratic economic

[6] Under the expenditure benchmark, spending increases, which go beyond a country's medium-term potential economic growth rate, must be matched by additional discretionary revenue measures. The expenditure benchmark complements the medium-term budgetary objectives (MTO) by putting growth in net expenditure on a sustainable path and therefore helping to move towards or maintain the MTO itself.

[7] The same choice has been made in Borys et al. (2008).

dynamics according to business cycle frequency. However, one notable disadvantage is the reduction of the number of observations, i.e. with 12 countries and 4 intervals we have 48 observations.

In contrast, with annual data the sample size rises to 188 observations. One disadvantage, however, is its vulnerability to cyclical demand related factors, which introduces extra "noise" into the regression. Another disadvantage is that lagging by one year GDP per capita level, it could be a value too recent to explain the real convergence process.

For parameters estimation we consider several procedures: Pooled OLS, Fixed Effects (FE), OLS with Instrumental Variables (2SLS) and Arellano-Bond/Generalized Method of Moments (GMM).

Pooled OLS estimation represents the benchmark method, being the simplest one; in fact, it does not take into account the differences existing among countries (the intercept α in equation (1) is the same for all the countries). Actually, ignoring the panel structure of data can lead to biased estimates, due to the omission of country-specific effects (i.e. those generated by idiosyncrasies such as geographic location). We avoid this problem by using fixed effects to control for the unobserved heterogeneity in OLS regression. The fixed effects estimator assumes the orthogonality condition that the regressors are uncorrelated with the idiosyncratic error $\varepsilon_{i,t}$, i.e. $E(X_{i,t} \cdot \varepsilon_{i,t})=0$. However, problems of endogeneity for one or more regressors could break the condition expressed above (for example, using the dataset with four-year interval averages, in our model we proved the endogeneity of the variable investment). Then the IV approach (also called Two Stages Least Squares, or 2SLS) and the GMM approach (according to the proposal of Arellano and Bond (1991) and Arellano and Bover (1995) are applied to reduce these effects (in particular, the GMM is the best procedure to address the problem of omitted variables). Actually, both these methods employ instrumental variables (i.e. new variables uncorrelated with ε, but correlated with the endogenous regressors), which allow us to isolate and capture the part of the endogenous variable that is uncorrelated with the error term. The peculiarity of the Arellano et al. approach is that the regression equation is firstly differenced to eliminate the country-specific effect ν_i. In particular, following their notation, let $\boldsymbol{x}_{i,t}$ be the vector of strictly exogenous covariates (dependent on neither the current nor the past error $\varepsilon_{i,t}$) and let $W_{i,t}$ be a vector of potentially endogenous variables that may be correlated with current or past errors $\varepsilon_{i,t}$. In our analysis, $\boldsymbol{x}_{it}$ includes the forecasted annual growth rate of GDP per capita at time t-2, while W_{it} includes investment, inflation, and, in general, the steady state variables plus other control variables. The regression equation becomes:

$$y_{it} - y_{it-1} = \beta' (\boldsymbol{x}_{it} - \boldsymbol{x}_{it-1}) + \gamma' (W_{it} - W_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1}) \quad (3)$$

For the potentially endogenous term $(W_{it} - W_{it-1})$, Arellano and Bover (1995) suggest using the lagged regressors W_{it-s}, $s \geq 2$ (i.e. W_{it} is lagged by at least two periods) as instruments. Actually, conditionally on $(\boldsymbol{x}_{it} - \boldsymbol{x}_{it-1})$, the explanatory variables W_{it-s} can be considered exogenous, at least weakly, and hence they can be used as instruments. In particular, starting from the moment condition $E[W_{it-s} (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0$, for $s \geq 2$ and $t=3,...,T$, we can apply the Arellano and Bond estimator (two-step "GMM difference"): it adds the original equation in levels to the equation in differences, generating more efficient estimates due to the use of additional instruments (i.e. variables in levels W_{it} are instrumented by their own first differences $W_{it-1} - W_{it-2}$, under the assumption that these differences are uncorrelated with the unobserved country effects).

We used the GMM estimator with annual data; it proved to be more efficient than the simple IV estimator, in the presence of heteroscedasticity. Nevertheless, the use of GMM entails a price; in particular, as Hayashi (2000) points out, it requires reasonable estimates of fourth moments and hence we may need very large sample sizes. As a consequence, the efficient GMM estimator could have poor small sample properties.

In order to verify the exogeneity of all the regressors included in the model, we implement a set of post-estimation tests (in fact, the validity of instruments cannot be tested ex ante, since in general a test is based on GMM residuals). In particular, in the case of interval averages data, following Borys et al. (2008), we choose investment relative to GDP at time *t*–1 as instrument. Since the errors are

heteroscedastic, we test the null hypothesis of exogenous regressors using the heteroscedasticity-robust version of Hausman test. The null hypothesis can be accepted for all the regressors employed (being p-value=0.19).

5. Results

As described in the previous section, on both datasets we estimated the model parameters by means of several procedures, depending on whether we were taking into account the panel structure of data only (FE procedure), the problem of endogeneity only (2SLS), or both (2SLS-FE and, in the case of annual data, GMM).[8]

Coherently with the aim of the research, country units are the twelve periphery and semi-periphery European countries: Cyprus, Estonia, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Portugal, Slovakia, Slovenia and Spain. For the sake of completeness, for evaluating the robustness of our estimation, and for verifying if the growth rates of core and periphery countries are significantly different, we also estimated the same model including the four core countries too (the results are in the Appendices).

Referring to the dataset based on four-year interval averages, the best choices among FE, 2SLS and 2SLS-FE are FE and 2SLS-FE; actually, the Hausman test used for comparing 2SLS vs FE and vs 2SLS-FE allows refusing the null that implies 2SLS to be valid. Parameters estimates obtained by the two procedures with fixed effects are shown in Table 2, while those obtained by 2SLS are in Table A1 of the Appendices. The two estimation methods produce quite similar estimates; moreover, the two spending components are the most significant ones and show opposite signs: positive for public gross fixed capital formation and negative for social benefits (other than social transfers in-kind). Among the remaining covariates, exports have a significant positive effect, while a significant negative effect is shown by an excessive deficit procedure dummy, population growth and inflation differential.

These results are in great part confirmed in the analysis with sixteen countries (see Table A2 in the Appendices); again the two spending components are the most significant ones and show opposite signs, exports have a significant positive effect and an excessive deficit procedure dummy shows a significant negative effect. Whereas, now inflation differential is no more significant, while initial GDP per capita shows significant negative effects.

[8] In the other case, we avoided deriving GMM estimates, due to the small number of observations and the excessive reduction of degrees of freedom.

Table 2. Parameters estimates based on four-year interval average dataset

Covariates	**FE**	**2SLS-FE**
Public gross fixed capital formation/total public expenditure	0.012***	0.011***
	(0.0035)	(0.0024)
Social benefits/total public expenditure	-0.0032***	-0.0032***
	$(81/10^5)$	$(64/10^5)$
Mean years of schooling	-0.71	-0.74
	(0.54)	(0.76)
Openness	-0.11	-0.11
	(0.053)	(0.12)
Excessive Deficit Procedure dummy.	-1.72**	-1.77***
	(0.87)	(0.82)
Population growth	-1.87	-2.00
	(0.68)	(1.18)
Exports on GDP	4.53***	4.50***
	(1.02)	(1.80)
Inflation differential	-4.84	-4.81**
	(3.20)	(2.38)
Investment	$18/10^6$	$26/10^6$
	$(21/10^6)$	$(67/10^6)$
Initial GDP per capita	-3.75	-3.84
	(2.70)	(2.38)
R^2	0.40	0.75
Number of observations	48	48
Hausman test	18***	19.26***

Symbols denote: * significant at 10%; ** significant at 5%; *** significant at 1%.
Values in parentheses are standard errors.

Source: Our elaborations on Eurostat data

Referring to the model based on annual data, we also added a dummy for the crisis period, recalling that social transfers and public capital spending show some changes in their pattern (see Figures 3-5).

Even in this case the Hausman test allows refusing 2SLS procedure, in both the comparisons with FE and with 2SLS-FE. On the other hand, the Arellano Bond test (which test the uncorrelation of error terms) and the Hansen test (which checks the overall validity of the various instruments) confirm the validity of the GMM procedure. More precisely, the GMM estimator lacks consistency when the idiosyncratic error term of the first difference equation is affected by second-order serial correlation; actually, the presence of serial correlation would render the lagged variables invalid as instruments. Arellano and Bond (1991) developed a z test for serial correlation, that allows the exclusion of serial correlation even when a significant negative first-order autocorrelation is detected, but there is no evidence of second order autocorrelation in differenced residuals. In our case the Arellano Bond test does not allow us to reject the hypothesis of uncorrelated error terms.

In Table 3 we show the results obtained by 2SLS-FE and GMM procedures, while those obtained by FE and 2SLS are reported in Table A3 of the Appendix.

The new results are quite coherent with the previous ones: again public gross fixed capital formation and exports positively act on GDP growth, while social benefits, an excessive deficit procedure dummy, population growth and inflation differential negatively do; now, however, with the GMM procedure the effect of social benefits is not significant while mean years of schooling become significant. Furthermore, both procedures suggest a significant negative effect by crisis dummy.

Extending the analysis to the core countries, the main results are again confirmed and, more interestingly, the dummy about belonging to periphery or semi-periphery countries shows a significant negative effect. In other words, belonging to these countries reduces the growth rate.

A further confirmation of the previous results is obtained introducing, among the covariates, another spending component, that is social transfers in-kind.[9] In particular, for the four-year interval average dataset, the new variable does not show a significant effect; moreover, its introduction makes the effects of social benefits not significant (except for 2SLS-FE) but maintaining the same signs. With annual data, instead, the negative effect of social benefits is significant again (except for GMM). The results are shown in tables A5 and A6 in the Appendices, respectively.

To summarize, the most interesting findings are the following: a significant and positive effect of public gross fixed capital formation and exports; a significant and negative effect of social benefits (other than social transfers in-kind), excessive deficit procedure, crisis dummy, inflation differential and belonging to periphery and semi-periphery countries. These findings support the theory that to boost economic growth it is more useful to act on public investments.

Finally, the panel approach allows us to report cluster standard errors that are robust to both arbitrary heteroscedasticity and arbitrary intra-group correlation within countries.

[9] ESA 95-code: D.63 Social transfers in-kind consist of individual goods and services provided as transfers in-kind to individual households by government units.

Table 3. Parameters estimates based on annual data

Covariates	**2SLS-FE**	**GMM**
Public gross fixed capital formation/total public expenditure	0.013***	0.0064***
	(0.0042)	(0.003)
Social benefits/total public expenditure	$-18/10^{6}$***	$-24/10^{6}$
	$(8.75/10^{6})$	$(19/10^{6})$
Mean years of schooling	1.06	0.64***
	(0.66)	(0.20)
Openness	0.008	-0.0034
	(0.11)	(0.013)
Excessive Deficit Procedure dummy	-1.22**	-1.75**
	(0. 64)	(0.55)
Population growth	-0.59	-1.25**
	(0.66)	(0.33)
Exports on GDP	15.33***	1.09**
	(3.13)	(0.58)
Inflation differential	-8.26**	-1.91*
	(1.63)	(1.05)
Investment	$-21/10^{6}$	$8.51/10^{6}$
	$(19/10^{6})$	$(2.01/10^{6})$
Crisis dummy	-5.47***	-5.07***
	(0.87)	(1.02)
Initial GDP per capita	3.37	1.68
	(2.21)	(1.66)
R^2	0.56	
Number of observations	188	188
Hausman test	46.14***	
Arellano-Bond test for AR(1): z = -2.72; p= 0.007		
Arellano-Bond test for AR(2): z = -1.46; p= 0.144		

Symbols denote: * significant at 10%; ** significant at 5%; *** significant at 1%.
Values in parentheses are standard errors.

Source: Our elaborations on Eurostat data

5. Conclusions

The liberalization of capital firstly, and the Monetary Union secondly, have greatly assisted the Central Eastern European economies and Southern European countries until the burst of economic crisis in 2008. This crisis brought a shortage of financial resources and many European countries, currently in financial difficulty, still need infrastructural investment to be competitive (that are very risky in the long run and may not be immediately and surely profitable). Furthermore, since 2009 the public spending of these countries recorded a consistent reduction in absolute value compared to the previous period. Our study contributes to economic literature demonstrating the existence of a nexus between public spending composition and growth in the Eastern, Central and Southern European countries. The methodology used here follows the recent studies of Gray et al. (2007), Borys et al. (2008), Acosta-Ormaechea and Morozumi (2013), Afonso and Jalles (2014), and Morozumi and Veiga (2016). In particular, we estimated several econometric models on two different datasets: one with four-year averaged data and another with annual data. Averaged data have the advantage that results are not influenced by idiosyncratic economic dynamics at business cycle frequency. However, one notable disadvantage is the reduction of the number of observations. On the other hand, the largest number of observations is the

strength of the annual dataset, even if the analysis is more influenced by the short time dynamics. Notwithstanding, we obtained quite coherent results, addressing all the sources of endogeneity.

Briefly, our main results are:

1) Public gross fixed asset capital formation recorded a positive effect in all the estimation procedures, in line with Nelson and Singh (1994), Von Hagen (2003), Gumpta et al. (2005, 2015), Morozumi and Veiga (2016) and IMF (2015). On the contrary, social benefits (other than transfers in-kind) show a negative effect, but not always significant. Overall, our results also suggest that social transfers spending may have moderate GDP-reducing effects in line with Gemmel et al. (2016).
2) The respect of Stability and Growth Pact rule with regard to the provision of deficit/GDP ratio at 3% level, as proxy of the public spending limit, has a negative effect on growth. This result is in line with Dosi et al. (2014),[10] Goujard (2017), Carnot and De Castro (2015).[11] In other words, Maastricht fiscal criteria have fundamentally failed in identifying the most appropriate instruments to fulfil anti-cyclical fiscal policy stances and to prevent divergences among European countries.
3) The reduced growth of periphery and semi-periphery countries impeded them to reach the per capita income levels of core countries, maintaining the divide between the two groups.

Future work could concern the analysis of European countries in regional terms, employing spatial econometric models.

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[10] "When the SGP rule is in place, the economy is more volatile, unemployment is higher and deep downturns are more frequent and longer than in the benchmark scenario, where Keynesian fiscal policies are free to dampen business cycle fluctuations" (Dosi et al., 2014, p.92).

[11] Fiscal consolidation in one country could have sizeable negative growth impact on others (Goujard, 2017; Carnot and De Castro, 2015).

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Appendices

Table A1. 2SLS estimates based on four-year interval average

Covariates	
Public gross fixed capital formation/total public expenditure	0.0062***
	(0.0020)
Social benefits/total public expenditure	-0.0012**
	$(54/10^5)$
Mean years of schooling	-0.033
	(0.21)
Openness	-0.002
	(0.015)
Excessive Deficit Procedure dummy	-1.42***
	(0.60)
Population growth	-0.78
	(0.45)
Exports on GDP	3.47
	(1.14)
Inflation differential	-1.42**
	(0.60)
Investment	$1.73/10^6$
	$(3.35/10^6)$
Initial GDP per capita	-4.38***
	(1.38)
R^2	0.73
Number of observations	48

Symbols denote: * significant at 10%; ** significant at 5%; *** significant at 1%.
Values in parentheses are standard errors.

Source: Our elaborations on Eurostat data

Table A2. Parameters estimates based on four-year interval average dataset and sixteen countries

Covariates	**FE**	**2SLS**	**2SLS-FE**
Public gross fixed capital formation/total public expenditure	0.011***	0.0064***	0.010***
	(0.002)	(0.0016)	(0.002)
Social benefits/total public expenditure	-0.0024***	0.0013***	-0.0026***
	$(58/10^5)$	$(40/10^5)$	$(51/10^5)$
Mean years of schooling	-1.74**	0.34***	-1.34**
	(0.70)	(0.14)	(0.6)
Periphery country dummy	0	-0.19	0
	0	(0.68)	0
Openness	-0.09	0.010	-0.09
	(0.12)	(0.012)	(0.11)
Excessive Deficit Procedure dummy	-1.42***	-1.26***	-1.45***
	(0.65)	(0.40)	(0.58)
Population growth	-1.64	-1.14***	-1.74***
	(4.18)	(0.35)	(0.75)
Exports on GDP	4.18***	2.35***	4.19***
	(1.19)	(0.90)	(1.66)
Inflation differential	-2.61	-0.23	-2.54
	(2.22)	(0.42)	(1.94)
Investment	$9.8/10^6$	$1.33/10^6$	$1.6/10^6$
	$(14/10^6)$	$(1.67/10^6)$	$(31/10^6)$
Initial GDP per capita	-4.31**	-0.36**	-4.19***
	(2.36)	(0.18)	(1,66)
R^2	0.38	0.74	0.72
Number of observations	64	64	64
Hausman test	22.25***		52.31**

Symbols denote: * significant at 10%; ** significant at 5%; *** significant at 1%.
Values in parentheses are standard errors.

Source: Our elaborations on Eurostat data

Table A3. FE and 2SLS parameters estimates based on annual data

Covariates	**FE**	**2SLS**
Public gross fixed capital formation/total public expenditure	0.013***	0.0068***
	(0.0044)	(0.0027)
Social benefits/total public expenditure	-19/10^6**	-23/10^6***
	(9.07/10^6)	(9.29/10^6)
Mean years of schooling	0.97	0.53***
	(0.68)	(0.20)
Openness	-0.010	0.0029
	(0.11)	(0.015)
Excessive Deficit Procedure dummy	-1.38**	-1.74***
	(0.65)	(0.55)
Population growth	-0.80	-1.23**
	(0.66)	(0.40)
Exports on GDP	15.41***	1.23
	(3.24)	(1.13)
Inflation differential	-8.09***	-1.46**
	(1.68)	(0.84)
Investment	-6.88/10^6	-1.77/10^8
	(16/10^6)	(3.19/$10^{6)}$
Crisis dummy	-5.27***	-5.03***
	(0.89)	(0.67)
Initial GDP per capita	2.89	0.99
	(2.26)	1.33
R^2	0.27	0.53
Number of observations	188	188
Hausman test	18***	

Symbols denote: * significant at 10%; ** significant at 5%; *** significant at 1%.
Values in parentheses are standard errors.

Source: Our elaborations on Eurostat data

Table A4. Parameters estimates based on annual data and sixteen countries

Covariates	**FE**	**2SLS**	**2SLS-FE**	**GMM**
Public gross fixed capital formation/total public expenditure	0.014***	0.0064***	0.015***	0.006***
	(0.0037)	(0.0021)	(0.0036)	(0.002)
Social benefits/total public expenditure	-13/10^8***	-15/10^8***	-14/10^8**	-15/10^8
	(6.23/10^8)	(6.26/10^8)	(6.15/10^8)	(11/10^8)
Mean years of schooling	0.11	0.81***	0.20	1.01***
	(0.51)	(0.18)	(0.50)	(0.23)
Periphery country dummy	-4.66	-2.88***	-5.14*	-3.50***
	(3.01)	(0.95)	(2.96)	(1.10)
Openness	-0.032	0.014	0.0034	0.013
	(0.10)	(0.014)	(0.104)	(0.014)
Excessive Deficit Procedure dummy	-2.01****	-1.58***	-1.82***	-1.75***
	(0.57))	(0.45)	(0.56)	(0.47)
Population growth	-1.04**	-0.80**	-0.74	-0.91***
	(0.50)	(0.35)	(0.51)	(0.32)
Exports on GDP	13.86***	2.70***	13..33***	2.19**
	(2.92)	(0.92)	(2.88)	(1.03)
Inflation differential	-6.54***	-1.42***	-6.94***	-3.06***
	(1.38)	(0.45)	(1.37)	(1.14)
Investment	11/10^8	-5.89/10^8	-0.000013	--4.61/10^7
	(10/10^8)	(1.62/10^8)	(15/10^8)	(1.86/10^8)
Crisis dummy	-3.65***	-4.16***	-3.73***	-4.41***
	(0.66)	(0.45)	(0.75)	(0.79)
Initial GDP per capita	1.18	-0.56***	2.03	1.99
	(2.00)	(0.20)	(2.00)	(1.64)
R^2	0.32	0.52	0.51	
Number of observations	250	250	250	250
Hausman test	43.79***		54.04***	
Arellano-Bond test for AR(1): z = -2.99; p= 0.003				
Arellano-Bond test for AR(2): z = -1.83; p= 0.067				
Symbols denote: * significant at 10%; ** significant at 5%; *** significant at 1%.				
Values in parentheses are standard errors				

Source: Our elaborations on Eurostat data

Table A5. Parameters estimates based on four-year interval average dataset and twelve countries, with another covariate

Covariates	**FE**	**2SLS**	**2SLS-FE**
Public gross fixed capital formation/total public expenditure	0.012***	0.0063***	0.0113***
	(0.0041)	(0.022)	(0.0026)
Social benefits cash/total public expenditure	-0.0044	-0.0011	-0.0044**
	(0.0026)	(0.0013)	(0.0022)
Social benefits in-kind/total public expenditure	1.20	-0.13	1.47
	(3.28)	(1.42)	(2.69)
Mean years of schooling	-0.86	-0.034	-0.53
	(1.61)	(0.21)	(0.87)
Openness	-0.12	-0.0022	-0.094
	(0.18)	(0.015)	(0.13)
Excessive Deficit Procedure dummy	-1.74*	-1. 44**	-1.73**
	(0.91)	(0.63)	(0.83)
Population growth	-2.04**	-0. 78*	-1.97*
	(0.94)	(0.45)	(1.18)
Exports on GDP	4.29*	3.51***	4.14***
	(2.49)	(1.2)	(1.89)
Inflation differential	-5. 30*	-1.68*	-5.16**
	(3.11)	(0.88)	(2.46)
Investment	$18/10^6$	$1.69/10^6$	$17.4/10^6$
	$(25/10^6)$	$(3.39/10^6)$	$(72/10^6)$
Initial GDP per capita	-3.858	-4.42***	-2.99
	(3.24)	(1.42)	(2.91)
R^2	0.43	0.73	0.75
Number of observations	48	48	48
Hausman test	18.12***		31.61***

Symbols denote: * significant at 10%; ** significant at 5%; *** significant at 1%.
Values in parentheses are standard errors.

Source: Our elaborations on Eurostat data

Table A6. Parameters estimates based on annual data and twelve countries, with another covariate

Covariates	**FE**	**2SLS**	**2SLS-FE**	**GMM**
Public gross fixed capital formation/total public expenditure	0.013***	0.0072***	0.013***	0.0066***
	(0.0044)	0.0028	(0.0042)	(0.0031)
Social benefits cash/total public expenditure	-15/10^6***	-23/10^6***	-15/10^6***	-24/10^6
	(9.10/10^6)	(9.33/10^6)	(8.83/10^6)	(18/10^6)
Social benefits in-kind/total public expenditure	13/10^6**	2.91	16/10^6***	1.25/10^6
	(6.35/10^6)	(4.04/10^6)	(6.26/10^6)	(3.44/10^6)
Mean years of schooling	0. 40	0.43***	0.45	0.64***
	(0.73)	(0.18)	(0.71)	(0.21)
Openness	-0.02	-0.00045	-0.011	-0.0032
	(0.11)	(0.0152)	(0.011)	(0.0136)
Excessive Deficit Procedure dummy	-1.59****	-1.88****	-1.30***	-1. 78***
	(0.66)	(0.56)	(0.64)	(0.55)
Population growth	-1.05	-1.13***	-0.67	-1.26***
	(0.67)	(0.42)	(0.66)	(0.32)
Exports on GDP	16.8***	1.66*	18.00***	1.00
	(3.29)	(1.00)	(3.19)	(0.62)
Inflation differential	-8..25***	-0.91**	-8.65***	-2.10
	(1.67)	(0.48)	(1.62)	(1.20)
Investment	-16/10^6	-5.48/10^6	-50/10^6***	-1.64/10^6
	(18/10^6)	(8.34/10^6)	(19/10^6)	(6.99/10^6)
Crisis dummy	-5.60***	-4.82***	-6.13***	-5.06***
	(0.90)	(0.64)	(0.89)	(1.00)
Initial GDP per capita	3.31	-0.21	4.46*	1.99
	(2.25)	(0.26)	(2.21)	(1.69)
R^2	0.28	0.53	0.56	
Number of observations	188	188	188	187
Hausman test	20.16***		58.18***	
Arellano-Bond test for AR(1): z = -2.73; p= 0.006				
Arellano-Bond test for AR(2): z = -1.73; p= 0.083				
Symbols denote: * significant at 10%; ** significant at 5%; *** significant at 1%.				
Values in parentheses are standard errors.				

Source: Our elaborations on Eurostat data