TRENDS OF COFOG GOVERNMENT EXPENDITURE IN THE EU15

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Abstract. The goal of the paper is to examine the trends of government expenditure in the core member states of the European Union (EU15) in a period 1995-2010. Government expenditure and factors of their growth are a serious problem of many countries. Concurrently, government expenditure is an important tool for national governments to mitigate the uneven economic development and economic shocks across individual countries as a potential automatic stabilizer. The paper provides direct empirical evidence on cyclicality and the long-term and short-term relationship between government expenditure in compliance with the COFOG international standard and output. The Johansen cointegration test and the error correction model are used for analysis. The results state significant differences in size and importance of public sector in the selected countries. Research confirms cyclical development of government expenditure on GDP and Wagner´s law in EU15 member states during 1995-2010. The voracity effect is not verified due to a low statistical significant of findings.

Keywords: government expenditure, cyclicality, voracity effect, Wagner´s law, COFOG classification.

JEL classification: C32, H50, E62, E63.

1. Introduction

Nowadays, government expenditure and factors of their growth are a serious problem of many countries. On the other hands, government expenditure is an important tool for national governments to mitigate the uneven economic development and economic shocks across individual countries. From a Keynesian perspective, government expenditure should act as a stabilizing force and move in a countercyclical direction. Serven (1998) points that procyclical fiscal policy[1] is generally regarded as potentially damaging for welfare: it can raise macroeconomic volatility, depress investment in real and human capital, hamper growth, and harm the poor. If expansionary fiscal policies in "good times" are not fully offset in "bad times", they may also produce a large deficit bias and lead to debt unsustainability and eventual default. If a government respect a basic prescription that fiscal tools should function counter-cyclical, the optimal fiscal policy involves a decreasing of government spending in "good times" and a increasing of government spending in "bad times."

Contrary to the theory, many of empirical studies found evidence that government expenditure is procyclical. See Hercowitz and Strawczynski (2004), Kaminsky et al. (2004), Alesina et al. (2008), Rajkumar and Swaroop (2008), Hamerníková (2009), Ganelli (2010) or Szarowská (2010, 2012) for more details. Talvi and Vegh (2005) show that fiscal procyclicality is evident in a much wider sample of countries. Analysis of Lane (1998) finds procyclicality in a single-country time series study of Irish fiscal policy. Lane (2003) also shows that the level of cyclicality varies across expenditure categories and across OECD countries. Abbott and Jones (2011) test differences in the cyclicality of government expenditure across functional categories. Their evidence from 20 OECD countries suggests that procyclicality is more likely in smaller functional budgets, but capital expenditure is more likely to be procyclical for the larger expenditure categories. Many of researches as Gavin et al. (1996), Gavin and Perotti (1997) focused on Latin America. On the one hand, Galí (1994) shows in his research that expenditure is countercyclical. However, other papers show no discernible pattern. Fiorito and Kollintzas (1994) document for G7 countries, the correlation between government consumption and

[1] Procyclical fiscal policy is conversely policy expansionary in booms and contractionary in recessions.

output indeed appears to show no pattern and be clustered around zero. The differences in these results depend on the components of expenditure being measured. Government transfers and subsidies are found to have become substantially more countercyclical.

Actually, development of government expenditure is often associated with Wagner´s law and voracity effect. Wagner's law states that government activity increases as economies grow, with the pace of increase being different for different branches of government. Voracity effect occurs if a positive shock to income leads to a more than proportional increase in public expenditure, even if the shock is expected to be temporary. The voracity is usually attributed to weak institutions and ethnic fractionalization, manifested in the presence of multiple interest groups seeking to secure a greater share of national wealth by demanding larger public expenditure on their behalf.

The aim of the paper is to examine the trends of government expenditure in the core member states of the European Union (EU15) in a period 1995-2010 and provide direct empirical evidence on cyclicality and the short-term and the long-term relationship between government expenditure and output. Although the theory implies that government expenditure is countercyclical, recent evidence suggests that it is procyclical. Previously published studies are weakly supported by the data from EU15 in which results can vary. We follow Akitoby et al. (2006) and apply Johansen cointegration test (1991) and the error correction model on annul data of GDP and government expenditure in compliance with the COFOG international standard during 1995–2010. The paper is organized as follows. In the next section, we describe the dataset and used empirical techniques. Next we present the results of government expenditure cyclicality and long-run and short-run relationship between output and government expenditure. We conclude with a summary of key findings.

2. Methodology and data

The relationship between government expenditure and output has long been debated in economic literature. Wagner (1911) proposed that there is a long-run tendency for government activities to grow relative to total economic aktivity. Wagner stated that during the industrialization process, as the real income per capita of a country increases, the share of its public expenditure in total expenditure increases. Three main reasons are argued to support this hypothesis: the administrative and regulatory functions of the state, the cultural and welfare services and the state participation to finance large-scale projects for technological needs. It means that government grows because there is an increasing demand for public goods and for the control of externalities.

The existing literature testing Wagner's law varies considerably in terms of the dependent and independent variables chosen to “test” the law. Wagner originally proposed that as industrialization or social progress proceeded, public sectors would grow in relative importance. In practice, researchers use different measures of national income as a measure of this social progress. Peacock and Scott (2000) point out on the fact that there are at least 14 different measures of government expenditure that have been used in the literature, and at least 13 different measures of output, including output per capita. In this paper we adopt the simplest formulation of Wagner's law by focusing on the relationship between aggregate economic activity and government expenditure in compliance with the COFOG international standard. Most studies analyzing the cyclicality of government expenditure and output have used a panel data methodology that has not fully exploited the time-series properties of the data. On the other hand, studies testing for a long-run relationship, such as Wagner's law, have ignored the short-term aspects of this relationship. In the literature on cyclicality, many studies use

panel data models that are not well suited to ex-ploring short-term versus long-term relationships. We exploit both the time-series and cross-sectional aspects using an error-correction framework.

The dataset consists of EU15 annual data on GDP and government expenditure in compliance with the COFOG international standard during the period 1995–2010. It is not possible to use higher frequently time series data as COFOG classification analyzes and reports only annual data. The countries included in the analysis are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom. All the data are collected from the Eurostat database. The series for GDP and total government expenditure and its subcomponent are adjusted at constant 2005 prices. In line with Akitoby et al. (2006), we investigated fiscal and output co-movements by the approach proposed by Lane (2003). We estimated the elasticity of government expenditure with respect to output, based on country-by-country time-series regressions. Next we used an error-correction approach, which allows us to distinguish between the short-term effect of output on government spending and any longer-term effect between these two variables. Most of the results were calculated in econometric program Eviews 7.

Many studies point out that using non-stationary macroeconomic variable in time series analysis causes superiority problems in regression. Thus, a unit root test should precede any empirical study employing such variables. We decided to make the decision on the existence of a unit root through Augmented Dickey–Fuller test (ADF test). The equation (1) is formulated for the stationary testing.

$$\Delta x_t = \delta_0 + \delta_1 t + \delta_2 x_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta x_{t-i} + u_t \tag{1}$$

ADF test is used to determine a unit root x_t at all variables in the time t. Variable Δx_{t-i} expresses the lagged first difference and u_t estimate autocorrelation error. Coefficients δ_0, δ_1, δ_2 and α_i are estimated. Zero and the alternative hypothesis for the existence of a unit root in the x_t variable are specified in (2).

$$H_0: \delta_2 = 0, H_\varepsilon: \delta_2 < 0 \tag{2}$$

The result of ADF test, which confirms the stationary of all time series on the first difference, is available on request. Testing the stationary is the essential assumption for implementation of cointegration approach. It is necessary to confirm that time series are non-stationary at level data but stationary at first difference.

We suppose there is a steady-state relationship between government expenditure and output given by (3).

$$G = AY^{\delta} \tag{3}$$

G represents government expenditure, Y means output and Eq. (3) can also be written in linear form:

$$\log G = a + \delta \log Y, \; a = \log A \tag{4}$$

If the adjustment of government expenditure G to its steady-state $\bar{G}$ is gradual, then the level of government expenditure will respond to transitory changes in output, and G will move gradually toward its steady-state, or equilibrium level. To capture this gradual move, we specify a general autoregressive distributed lag specification for spending category i in period t:

$$\log G_{it} = \mu + \alpha \log G_{it-1} + \beta_0 \log Y_t + \beta_1 \log Y_{t-1} + s_t, \; |\alpha| < 1 \tag{5}$$

We can solve for the static, steady-state equilibrium by assuming that output is at its steady-state level $\bar{Y}$ and ignoring the error term:

$$log\bar{G} = \frac{\mu}{1-\alpha} + \frac{\beta_0+\beta_1}{1-\alpha} log\bar{Y},\ \delta = 1-\alpha \quad (6)$$

More generally, we could allow output to grow at rate g. In this case, the only difference is that the constant term becomes $\frac{\mu+(\beta_0-\delta)g}{1-\alpha}$, which depends on g. To reflect the steady state, (5) can be rearranged as the error correction model (7).

$$logG_{it} = \mu + \beta_0 logY_t + \gamma(logG_{it-1} - \delta logY_{t-1}) + \varepsilon_t \quad (7)$$

In (7), we can interpret β0ΔlogYt as the short-term impact of output on government expenditure and β0 as the short-run elasticity of government expenditure with respect to output. The error correction term γ(logGit-1− δlogYt-1) captures deviations from the steady-state, or long-run equilibrium, where δ is the long-run elasticity of government expenditure with respect to output, and γ is the rate at which government expenditure adjusts to past disequilibrium. μ is constants of the model, εt means residual component of long-term relationship.

Moreover, (7) can be rewritten as (8) and then used to test if there is a long-run relationship between government spending and output. In particular, following Ericsson and McKinnon (2002), if γ is significantly different from zero in (8), then output and government spending are cointegrated.

$$logG_{it} = \mu + \beta_0 logY_t + \gamma logG_{it-1} - \varphi logY_{t-1} + \varepsilon_t \quad (8)$$

where φ = γδ. The above derivation makes clear the underlying assumption that there is a elasticity relationship between output and expenditure, while the transitory deviations are random.

3. Results and discussion

3.1 The structure of government expenditure

The structure and an amount of government expenditure is very important for economic policy of each country as it can help in overcoming the inefficiencies of the market as well as in smoothing out cyclical fluctuations in the economy. We used government expenditure in compliance with the COFOG (Classification of the Functions of Government) international standard in our analysis. The COFOG is one of the four classifications of expenditure according to purpose (functional classifications) used in national accounts. COFOG classifies government expenditure into ten main categories / divisions:

- CF01: General public services
- CF02: Defense
- CF03: Public order and safety
- CF04: Economic affairs
- CF05: Environment protection
- CF06: Housing and community amenities
- CF07: Health
- CF08: Recreation; culture and religion
- CF09: Education

- CF10: Social protection

We analyzed the structure of government expenditure in a period 1995–2010. Results in Table 1 show the average share of government expenditure by functions, the average on total expenditure and the share of total government expenditure on GDP in each EU15 member state during the analyzed period. Table 1 also presents the average of variables in a whole EU15.

Data confirm significant differences between EU15 member states. Results state sizeable differentiation in size and importance of public sector and a priority of government expenditure functions in the sample of countries. The value of total government expenditure is the smallest in Ireland (38.5% GDP), the highest in Sweden (55.6% GDP), and the average is 48% GDP in the whole EU15. Interesting is that the value of total expenditure is in PIIGS[2], except Italy, below the average value of EU15.

Table 1. Government expenditure - COFOG classification (in % of total G, resp. % GDP for total G).

Country	CF01	CF02	CF03	CF04	CF05	CF06	CF07	CF08	CF09	CF10	Gtotal/ GDP
Austria	14.35%	1.71%	2.91%	10.31%	1.08%	1.50%	15.09%	1.91%	10.65%	40.47%	51.98%
Belgium	21.30%	2.52%	3.07%	9.42%	1.23%	0.64%	12.93%	2.01%	11.56%	35.33%	51.47%
Denmark	15.41%	3.02%	1.83%	6.13%	0.97%	1.19%	12.73%	2.91%	13.09%	42.70%	55.51%
Finland	13.23%	3.02%	2.61%	10.57%	0.59%	0.93%	12.30%	2.29%	11.96%	42.50%	53.27%
France	14.01%	3.75%	2.89%	6.68%	1.62%	3.31%	13.94%	2.26%	10.99%	40.55%	53.58%
Germany	13.35%	2.56%	3.38%	9.12%	1.58%	1.93%	13.81%	1.74%	8.93%	43.60%	47.40%
Greece	23.21%	6.16%	2.73%	11.15%	1.18%	0.80%	11.96%	0.91%	7.34%	34.56%	46.67%
Ireland	9.64%	1.45%	4.33%	15.60%	2.37%	4.34%	17.58%	1.79%	12.82%	30.08%	38.49%
Italy	21.55%	2.67%	3.99%	8.58%	1.65%	1.71%	12.78%	1.72%	9.46%	35.89%	49.96%
Luxembourg	10.98%	0.97%	2.24%	11.23%	2.94%	2.04%	11.87%	4.29%	11.56%	41.87%	40.76%
Netherlands	14.28%	3.34%	3.85%	11.00%	3.45%	1.84%	12.83%	3.54%	11.33%	34.56%	47.36%
Portugal	15.00%	3.25%	4.24%	10.30%	1.42%	1.75%	14.75%	2.66%	14.43%	32.19%	43.92%
Spain	13.65%	2.74%	4.68%	12.07%	2.14%	2.53%	13.75%	3.54%	11.00%	33.91%	40.80%
Sweden	15.09%	3.54%	2.48%	7.78%	0.54%	2.07%	11.93%	2.31%	12.68%	41.58%	55.60%
United Kingdom	10.90%	6.43%	5.42%	6.69%	1.61%	2.46%	14.63%	2.33%	12.65%	36.88%	43.48%
Average	15.06%	3.14%	3.38%	9.78%	1.63%	1.94%	13.53%	2.41%	11.36%	37.78%	48.02%

Source: authors´ compilation based on data from Eurostat.

The three biggest expenditure functions, on average, account for more than 66% of the total expenditure: Social protection, Health and General public services. In the EU15 as a whole as well as in all individual member states, social protection is the most important function of government expenditure. Social protection expenditure (CF10) takes more than the third of all government expenditure in average. Surprisingly, the highest value of CF10 is in Germany, the smallest in Ireland. It contains, for example, expenditure on sickness and disability, old age, survivors, family and children, unemployment, housing, social exclusion and R&D social protection. The next most important functions in terms of government expenditure are general public services and health amounting to 15% and 13.5% respectively of total expenditure in the EU15. Education (11.4%) and economic affairs (9.8%) follow. The remaining functions - composed of defense, public order and

[2] Due to the economic recession which started in 2008, several members of the European Union became historically known as PIIGS. These states include Portugal, Italy, Ireland, Greece and Spain. The reason why these countries were grouped together is the substantial instability of their economies, which was an evident problem in 2009.

safety, environmental protection, housing and culture - represented in average 12.5% of EU15 total expenditure.

However, the EU15 is not a homogenous group of countries and development of government expenditure and its components differs in individual countries. The highest average value of General public services (CF10) is in Italy, although the value decreased by 10 percentage points in selected period (from 26.7% to 16.4%). We can find very similar values and development in Belgium too. On the other hand, the average value is less than a half in Ireland. There are significant differences in value of Health expenditure (CF07). The highest average value (17.6%) is in Ireland - the country with the smallest total government expenditure. The smallest values are in Luxembourg and Sweden (11.9%), even if it is an example of welfare state. Table 1 also presents that the share of other government expenditure functions differs between EU15 member states. Portugal has the highest Education expenditure (14.8%), its share is more than the twice value of Greece (7.3%). Contrary, Greece and United Kingdom have absolutely highest expenditure compare to the rest of EU15 on Defense (CF02) in analyzed period.

Government expenditure relative to GDP progressively decreased in the EU15 between 2003 and 2007, followed by a rise in 2008 and a more emphatic increase in 2009. The development is influenced by the consequences of the economic and financial crisis. The related need for public intervention are the main factors behind the upward trend between 2008 and 2009, and its remaining high level in 2010, as the breakdown of expenditure by functions confirms. The main contributors to the increase in expenditures were social protection and health (for details look at Eurostat database). For example, government expenditure reached 67% of GDP in Ireland in 2010, whereas it was among the countries with the lowest levels until 2008. This jump is largely explained by specific government support to banks during the financial crisis, in the form of capital injections. This type of support is classified as government expenditure in certain conditions (it belongs to CF04).

3.2 The cyclicality of government expenditure

As was already noted, government expenditure can act as an automatic stabilizer. The cyclicality of government expenditure is typically defined in terms of how expenditure moves with the output gap. If government expenditure increases when there is a positive output gap (i.e. output is below its potential), then expenditure is countercyclical. If potential output were observable or easy to estimate, one could define counter-cyclicality as an above average expenditure to output ratio whenever output was below its potential. As Akitoby et al. (2006) mention, measuring potential output is difficult. As a consequence, it is not easy to discuss business cycles or cyclicality per se. Therefore we focus on co-movements of government expenditure and output as a proxy for cyclicality.

Table 2 reports the estimates of the adjustment coefficient γ from equation (7), which is estimated by OLS (ordinary least squares) with a correction for an autoregressive error term. γ is the rate at which government expenditure adjusts to past disequilibrium. In cases where γ is significant, we can conclude there is a cointegrating relationship between government expenditure and output.

Table 2. The value of adjustment coefficient γ.

Country	G total	CF01	CF02	CF03	CF04	CF05	CF06	CF07	CF08	CF09	CF10
Greece	1.02*	-1.50*	1.43*	4.20**	0.88**	0.58	1.19**	0.76**	2.69*	2.07**	0.78**
	(0.06)	(0.27)	(0.55)	(0.32)	(0.14)	(0.01)	(0.23)	(0.01)	(0.30)	(0.15)	(0.09)
Spain	-0.06	-0.65**	0.74**	0.81**	1.23**	1.37**	-0.20	1.94**	0.98**	2.85*	0.91**
	(0.13)	(0.14)	(0.09)	(0.07)	(0.09)	(0.07)	(0.32)	(0.33)	(0.10)	(0.93)	(0.01)
Ireland	0.36*	1.38**	0.55**	0.14	0.56**	0.13	1.11**	1.20**	0.79**	2.46**	0.86**
	(0.15)	(0.21)	(0.01)	(0.14)	(0.08)	(0.59)	(0.09)	(0.05)	(0.09)	(0.61)	(0.01)
Italy	0.94**	-1.97**	1.36*	3.13**	0.77**	1.66**	0.58**	2.37**	1.96**	0.78**	0.88**
	(0.01)	(0.18)	(0.62)	(0.41)	(0.01)	(0.18)	(0.00)	(0.27)	(0.21)	(0.00)	(0.14)
Portugal	2.34**	0.77**	0.64*	0.68**	0.73**	-0.22**	0.58**	2.55**	0.63**	0.77**	0.89**
	(0.40)	(0.01)	(0.0)	(0.02)	(0.00)	(0.72	(0.01	(0.25)	(0.00)	(0.00)	(0.02)
Austria	-1.07*	-0.77*	-1.75**	-0.61	-1.21*	-1.39**	-1.11**	-0.71*	-0.08	-0.04	-0.61**
	(0.37)	(0.39)	(0.33)	(0.38)	(0.42)	(0.06)	(0.14)	(0.30)	(0.22)	(0.04)	(0.20
Belgium	-0.29*	0.02	-0.63**	-0.78**	-1.07*	-0.15*	-0.87*	-0.37	-0.50*	-0.32*	-0.26*
	(0.14)	(0.55)	(0.13)	(0.13)	(0.39)	(0.05)	(0.38)	(0.21)	(0.23)	(0.16)	(0.09)
Germany	-0.95*	-0.40*	-0.37**	-0.27*	-0.02	-0.40	0.00	-0.73**	-0.50*	-0.45*	-0.14*
	(0.32)	(0.21)	(0.09)	(0.13)	(0.06)	(0.40)	(0.00)	(0.26)	(0.18)	(0.23)	(0.05)
Denmark	-0.21*	-0.12	-0.56*	-0.37**	-0.17*	-0.22**	-0.53*	-0.10*	-0.51	-0.57**	-0.18*
	(0.02)	(0.13)	(0.28)	(0.15)	(0.07)	(0.05)	(0.24)	(0.05)	(0.35)	(0.13)	(0.06)
Finland	-0.16**	-0.22	-0.35*	-0.58*	-0.46*	-0.42*	-0.51*	-0.20*	-0.89**	-0.51*	-0.37**
	(0.06)	(0.16)	(0.16)	(0.28)	(0.21)	(0.13)	(0.19)	(0.08)	(0.18)	(0.17)	(0.10)
France	-0.23*	-0.71*	-0.26*	-0.72**	-0.38**	-0.11*	-0.21**	-0.29*	-0.09*	-0.47*	-0.06**
	(0.12)	(0.39)	(0.14)	(0.22)	(0.12)	(0.05)	(0.07)	(0.16)	(0.04)	(0.25)	(0.01)
Luxembourg	-0.53**	-0.31**	-0.12	-0.35*	-0.69*	-0.81*	-0.94	-0.51*	-0.24*	-0.66**	-0.59**
	(0.16)	(0.09)	(0.08)	(0.16)	(0.31)	(0.26)	(0.23)	(0.21)	(0.07)	(0.13)	(0.12)
Netherlands	-0.08*	-0.01	-0.24	-0.48*	-1.97*	-0.23*	-0.46	-0.05*	-0.62*	-0.73**	-0.15*
	(0.03)	(0.06)	(0.14)	(0.19)	(0.53)	(0.11)	(0.52)	(0.02)	(0.24)	(0.14)	(0.07)
Sweden	-0.50*	-0.55*	-0.48*	-0.38*	-0.64*	-0.55	-0.24**	-0.46*	-0.17	-0.76*	-0.53*
	(0.22)	(0.36)	(0.25)	(0.17)	(0.20)	(0.35)	(0.05)	(0.20)	(0.11)	(0.40)	(0.26)
United Kingdom	-0.20*	-0.21*	-0.20*	-0.30**	0.04	-0.79**	-0.12*	-0.36*	-0.40*	-0.28*	-0.21*
	(0.09)	(0.06)	(0.04)	(0.11)	(0.04)	(0.22)	(0.03)	(0.10)	(0.15)	(0.10)	(0.06)
Average	0.45	0.45	0.56	0.45	0.88	0.47	0.57	0.34	0.5	0.49	0.29
Share significant	80%	73%	87%	67%	73%	67%	67%	80%	60%	93%	100%

Note: Symbols *and ** and denote significance at the 1% and 5% level, standard deviation are in parenthesis. Average means average absolute values of significant coefficients only. Share significant means share of significant cases.

Source: authors´ calculations.

Table 3 summarizes the results about the long- run elasticity of expenditure with respect to output. Results show that the long-run elasticity coefficient δ is significant in 91% cases. A positive value of δ is consistent with a wider interpretation of Wagner's law, as it implies that government expenditure rises with national income. If δ is higher than one then this would be consistent with a narrow interpretation of Wagner's law, where government expenditure rises faster than national income. The long-term elasticity of government expenditure and output δ is mostly positive (in 87% of cases), and it is the highest for Public order and safety (CF03) due to the extremely high δ in Italy (it greatly increased the average). Moreover, δ is for total expenditure larger than one (1.17), average value is 1.30 for all expenditure functions. It is consistent with the narrow interpretation of Wagner's law and indicating that in the long-term, the public sector is increasing in relative importance. The coefficient

for long-run elasticity was significant in all EU15 member states only for Health (CF07) and Education (CF09). In Table 4, we can also find the long-run δ lower than one. It means that the expenditure functions as Defense (CF02), Economic affairs (CF04) and Housing and community amenities (CF06) rise slower than national income in the long term.

Table 3. The long-run elasticity coefficient δ.

Country	G total	CF01	CF02	CF03	CF04	CF05	CF06	CF07	CF08	CF09	CF10
Greece	1.02*	-1.50*	1.43*	4.20**	0.88**	0.58	1.19**	0.76**	2.69*	2.07**	0.78**
	(0.06)	(0.27)	(0.55)	(0.32)	(0.14)	(0.01)	(0.23)	(0.01)	(0.30)	(0.15)	(0.09)
Spain	-0.06	-0.65**	0.74**	0.81**	1.23**	1.37**	-0.20	1.94**	0.98**	2.85*	0.91**
	(0.13)	(0.14)	(0.09)	(0.07)	(0.09)	(0.07)	(0.32)	(0.33)	(0.10)	(0.93)	(0.01)
Ireland	0.36*	1.38**	0.55**	0.14	0.56**	0.13	1.11**	1.20**	0.79**	2.46**	0.86**
	(0.15)	(0.21)	(0.01)	(0.14)	(0.08)	(0.59)	(0.09)	(0.05)	(0.09)	(0.61)	(0.01)
Italy	0.94**	-1.97**	1.36*	3.13**	0.77**	1.66**	0.58**	2.37**	1.96**	0.78**	0.88**
	(0.01)	(0.18)	(0.62)	(0.41)	(0.01)	(0.18)	(0.00)	(0.27)	(0.21)	(0.00)	(0.14)
Portugal	2.34**	0.77**	0.64*	0.68**	0.73**	-0.22**	0.58**	2.55**	0.63**	0.77**	0.89**
	(0.40)	(0.01)	(0.0)	(0.02)	(0.00)	(0.72	(0.01	(0.25)	(0.00)	(0.00)	(0.02)
Austria	0.67**	-0.01	-0.31**	0.76**	1.29**	0.88**	-0.72**	0.73**	0.47	0.79**	0.88**
	(0.05)	(0.08)	(0.08)	(0.06)	(0.33)	(0.13)	(0.18)	(0.23)	(0.31)	(0.01)	(0.00)
Belgium	0.93**	-0.58**	-0.58**	1.64**	1.70**	-0.98	1.77**	1.66**	2.45**	0.99**	0.95**
	(0.13)	(0.03)	(0.03)	(0.05)	(0.19)	(0.68)	(0.27)	(0.12)	(0.21)	(0.07)	(0.10)
Germany	0.61**	0.40**	-0.30	0.74**	0.90**	-1.56**	0.46**	1.57**	0.99**	0.59**	-1.07*
	(0.12)	(0.12)	(0.26)	(0.12)	(0.05)	(0.36)	(0.08)	(0.09)	(0.18)	(0.11)	(0.40)
Denmark	0.25	-0.91*	0.70**	1.27**	-0.78*	-1.81*	-1.15*	2.27**	1.22**	0.98*	0.06
	(0.15)	(0.31)	(0.00)	(0.16)	(0.35)	(0.89)	(0.40)	(0.41)	(0.09)	(0.09)	(0.28)
Finland	0.79**	0.75**	0.48*	0.85**	-0.07	0.52**	- 0.53	1.60**	0.59**	0.77**	0.60**
	(0.15)	(0.16)	(0.20)	(0.05)	(0.23)	(0.00)	(0.29)	(0.18)	(0.06)	(0.06)	(0.09)
France	1.08**	0.33**	0.72**	1.40**	0.77**	0.69**	0.73**	1.50**	0.71**	0.84**	0.94**
	(0.05)	(0.07)	(0.00)	(0.08)	(0.00)	(0.01)	(0.00)	(0.07)	(0.01)	(0.07)	(0.01)
Luxembourg	0.85**	0.72**	1.50	1.27**	0.63**	0.56**	0.18*	0.90**	0.64**	0.89**	0.89**
	(0.04)	(0.01)	(1.22)	(0.11)	(0.21)	(0.04)	(0.09)	(0.07)	(0.01)	(0.03)	(0.03)
Netherlands	2.71*	-2.10*	0.68**	1.93**	0.78**	1.72**	-1.19**	0.89**	1.31**	1.29**	0.85*
	(0.81)	(0.63)	(0.00)	(0.07)	(0.00)	(0.23)	(0.35)	(0.04)	(0.16)	(0.04)	(0.00)
Sweden	-0.55**	-0.34*	-0.59*	0.71**	1.04**	3.46**	0.67**	1.33**	0.18**	0.90**	0.69**
	(0.19)	(0.15)	(0.19)	(0.00)	(0.16)	(0.39)	(0.01)	(0.06)	(0.32)	(0.05)	(0.07)
United Kingdom	1.35**	0.05	1.36**	1.47**	0.86**	2.53**	4.80**	1.84**	1.47**	1.96**	0.99**
	(0.25)	(0.43)	(0.37)	(0.12)	(0.04)	(0.17)	(1.24)	(0.11)	(0.14)	(0.12)	(0.13)
Average	1.17	1.26	0.95	2.20	0.84	1.08	0.86	1.77	1.41	1.79	0.87
Share significant	87%	87%	93%	93%	93%	80%	87%	100%	93%	100%	93%

Note: Symbols *and ** and denote significance at the 1% and 5% level, standard deviation are in parenthesis. Average means average absolute values of significant coefficients only. Share significant means share of significant cases.
Source: authors´ calculations.

We also analyzed the short-term elasticity and Table 4 summarizes findings about the short-run elasticity of government expenditure with respect to output. In this case, the results and conclusions for the short-run elasticity are not so unequivocal. The short-run elasticity is positive for 48% of statistically significant cases in the sample, with a mean coefficient above unity. It´s needed to points out on 35% statistical significant of results only. The statistical significance is the highest for social protection (60%) what it is important because of its share on total government expenditure.

Table 4. The short-run elasticity coefficient β

Country	G total	CF01	CF02	CF03	CF04	CF05	CF06	CF07	CF08	CF09	CF10
Greece	-0.54	2.34*	5.97*	4.23*	0.96	1.92*	0.96	3.45*	-4.02	0.12	0.47
	(1.14)	(0.83)	(2.07)	(2.36)	(1.73)	(0.80)	(1.38)	(1.33)	(2.56)	(1.62)	(0.62)
Spain	1.21**	1.01*	0.19	2.11*	-0.29	-0.65	0.38	0.79*	-0.29	0.89**	1.21*
	(0.21)	(0.54)	(0.34)	(1.10)	(0.76)	(0.88)	(2.28)	(0.33)	(1.24)	(0.22)	(0.51
Ireland	-0.20	-0.63	0.83*	1.39*	1.11	1.43*	-1.65	-1.25*	2.92*	0.55*	-1.44*
	(0.70)	(0.39)	(0.31)	(0.48)	(4.68)	(0.60)	(1.52)	(0.49)	(1.50)	(0.15)	(0.58)
Italy	0.44*	1.05*	-0.43	0.18	0.52	0.64	-0.35	-0.55	1.14*	0.60*	-0.67**
	(0.23)	(0.50)	(0.77)	(0.89)	(1.53	(0.38)	(5.01)	(0.36)	(0.55)	(0.27)	(0.22)
Portugal	0.07	-0.69*	1.00	-2.63*	0.49	0.19	4.38*	1.13*	0.49	0.42	-1.34*
	(0.35)	(0.14)	(0.76)	(1.24)	(1.14)	(0.91)	(1.30)	(0.57)	(0.84)	(0.88)	(0.69)
Austria	-0.91*	0.02	1.45*	-0.11	-2.85	-1.92*	-2.16*	-0.37	0.76	0.32	-0.26
	(0.41)	(0.44)	(0.54)	(0.35)	(2.35)	(0.83)	(1.01)	(0.81)	(0.80)	(0.37)	(0.24)
Belgium	-0.14	0.79	-0.15	-0.79*	-1.54	-0.49	0.89	0.21	-1.01	-0.05	-0.23
	(0.34)	(0.47)	(0.39)	(0.33)	(1.62)	(0.68)	(1.87)	(0.51)	(0.95)	(0.26)	(0.22)
Germany	-0.55	-0.12	0.01	-0.17	-0.33	0.28	-0.63	-0.77	-0.28	-0.34	-0.34
	(0.51)	(0.23)	(0.33)	(0.14)	(4.72)	(1.44)	(0.67)	(0.45)	(0.37	(0.26	(0.30
Denmark	-0.40	0.09	1.04	-0.26	-0.67	0.64	2.33	-0.05	0.13	-0.81*	-0.66*
	(0.21)	(0.40)	(0.70)	(0.35)	(0.40)	(0.86)	(1.46)	(0.27)	(0.50)	(0.28)	(0.26)
Finland	-0.17	-0.15	-0.16	-0.24	-0.53	0.82*	-0.04	0.12	-0.56*	-0.14	-0.80**
	(0.17)	(0.34)	(0.35)	(0.31)	(0.49)	(0.31)	(0.69)	(0.19)	(0.32)	(0.22)	(0.24)
France	-0.21	0.88*	-0.14	-0.90	-0.06	0.30	1.65*	-0.02	-0.08	0.04	-0.46**
	(0.17)	(0.41)	(0.58)	(0.57)	(0.35)	(0.65)	(0.66)	(0.28)	(0.03)	(0.25)	(0.18)
Luxembourg	-0.34*	-0.66	-0.85*	-2.17	-0.35	-0.17	-0.52	-0.08	-0.47	-0.47*	-0.50*
	(0.19)	(0.44)	(0.43)	(1.27)	(0.35)	(1.02)	(0.42)	(0.33)	(0.50)	(0.17)	(0.14)
Netherlands	0.35	-0.58	0.75	0.07	-6.05*	-0.07	1.63	0.09	-0.41	-0.65*	0.55*
	(0.25)	(0.52)	(0.48)	(0.39)	(2.08)	(0.34)	(5.91)	(0.85)	(0.67)	(0.26)	(0.19)
Sweden	-0.19	0.28	-0.08	-0.10	-1.10*	0.86	-0.11	-0.18	-1.18	-0.20	-0.00
	(0.17)	(0.69)	(0.60)	(0.41)	(0.52)	(1.70)	(0.77)	(0.32)	(1.47)	(0.36)	(0.26)
United Kingdom	-0.21	-1.64*	-0.46	0.06	3.70	-3.07**	-0.33	-0.72*	0.06	-0.27	-0.18
	(0.41)	(0.70)	(0.46)	(0.34)	(2.30)	(1.35)	(1.07)	(0.39)	(0.49)	(0.33)	(0.25)
Share significant	27%	40%	33%	40%	20%	40%	20%	40%	27%	40%	60%

Note: Symbols *and ** and denote significance at the 1% and 5% level, standard deviation are in parenthesis. Share significant means share of significant cases.
Source: authors´ calculations.

The coefficient value above one is consistent with the voracity hypothesis, as it suggests that in response to a given shock to real GDP, government expenditure rises by even more in percentage points. Although findings include the short-run elasticity coefficient β complying with the above condition, voracity effect cannot be verified by reason of a very low statistical significance.

4. Conclusion

The aim of this paper was to to examine the trends of government expenditure in the core member states of the European Union in a period 1995-2010 and provide direct empirical evidence on cyclicality and the short-term and the long-term relationship between government expenditure and output. We analyzed annual data on government expenditure in compliance with the COFOG international standard. Total government expenditure amounted to 48% GDP of EU15 in average during analyzed period. Two thirds are devoted to social protection, health and general public services. The other functions of government expenditure mainly concern education and economic

affairs. The remaining functions, namely defense, public order and safety, environmental protection, housing and culture, represented in average 12.5% of EU15 total expenditure only. But results express significant differences in size and importance of public sector in the EU15 member states.

Although the theory suggests that government expenditure is countercyclical, our research does not prove that. We used Johansen cointegration test and the error correction model. The results confirm cyclical development of government expenditure on GDP and Wagner´s law. Output and government expenditure are cointegrated for at least six of the expenditure functions in EU15 member states and it implies a relationship between government expenditure and output. This contrasts with the existing empirical literature, which generally provides weak support for Wagner's law and cyclical development in developed countries. As expected, the adjustment coefficient γ is mostly negative (in 96% of significant cases) and it indicates dynamic stability. The government expenditure functions are procyclical in most countries (77% cases in the sample). Average value of a long-run elasticity coefficient is 1.30 for all expenditure functions, 1.17 for total government expenditure. It is consistent with the narrow interpretation of Wagner's law and it indicates that the public sector is increasing in relative importance in the long-term. Results varied across member states and categories but the long-run elasticity coefficient δ was significant for Health (CF07) and Education (CF09) in a whole EU15. That means that the long-run relation between health and education government expenditure and output exists in all EU15 member states.

The short-run relationship between expenditure and output was also analyzed. Results are not unambiguous due to a relatively low statistical significance (35%). Findings also include the short-run elasticity coefficient β above one what is consistent with the voracity hypothesis, but voracity effect cannot be verified because of a very low statistical significance.

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Central and Eastern European Countries

The adjustment coefficient γ

	G total	G10	G20	G30	G40	G50	G60	G70	G80	G90	G100
CR	0.03	-0.14	-0.37	-1.14*	-0.41	-0.45*	-0.85*	-0.35	-0.80*	-0.22	-0.19
	(0.03)	(0.32)	(0.62)	(0.36)	(0.25)	(0.16)	(0.49)	(0.33)	(0.27)	(0.27)	(0.21)
HU	-0.63	-0.15	0.27	0.45	-1.70*	-1.21**	-0.16*	-0.12	-0.33	0.30*	-0.36
	(0.45)	(0.09)	(0.70)	(0.28)	(0.46)	(0.26)	(0.08)	(0.36)	(0.195)	(0.32)	(0.25)
SK	-0.90*	-2.04**	-1.21*	-0.29	-0.03	-1.29*	-1.67**	-1.09**	-1.05*	0.03	-1.33**
	(0.40)	(0.44)	(0.57)	(0.53)	(0.37)	(0.45)	(0.24)	(0.42)	(0.31)	(0.17)	(0.27)
BG	-2.72**	-1.00	0.04	0.31	-2.00*	-1.15*	-1.20*	-0.06	-2.22*	-0.52	-0.52*
	(0.48)	(0.56)	(0.04)	(0.36)	(0.76)	(0.58)	(0.37)	(0.34)	(0.64)	(0.42)	(0.27)
EE	-0.45	-1.51*	-0.57	-1.52*	-0.20	-1.25*	-1.25*	-0.38	-0.84*	-1.91*	-0.81*
	(0.33)	(0.47)	(0.35)	(0.49)	(0.23)	(0.46)	(0.54)	(0.21)	(0.40)	(0.49)	(0.29)
LV	-1.00**	-0.09	-0.12	-0.64*	-0.91*	-0.14	0.12*	-0.85*	-0.76*	-1.51*	-0.68*
	(0.23)	(0.08)	(0.55)	(0.20)	(0.29)	(0.23)	(0.05)	(0.27)	(0.29)	(0.39)	(0.26)
RO	-0.16	-0.56*	-0.85**	-1.27*	-1.27*	-1.38**	-0.46*	-0.12	-1.73**	-1.35	-0.05*
	(0.20)	(0.20	(0.17)	(0.61)	(0.35)	(0.15)	(0.23)	(0.13)	(0.27)	(0.84)	(0.02)
SI	-1.12*	-1.75**	0.09*	-0.69*	-1.53*	-0.64**	0.97*	-0.97**	1.55*	-0.24	0.02
	(0.30)	(0.15)	(0.02)	(0.22)	(0.50)	(0.15)	(0.50)	(0.19)	(0.68)	(0.38)	(0.05)
Average	1.15	1.47	0.71	0.93	1.48	1.5	0.84	0.97	1.28	1.24	0.68
Share significant	62.5%	50.0%	37.5%	75.0%	62.5%	87.5%	100.0%	37.5%	87.5%	37.5%	62.5%

Symbols *and ** and denote significance at the 1% and 5% level, standard deviation are in parenthesis.
Average means the average absolute values of significant coefficients only

The long-run elasticity coefficient δ

	G total	G10	G20	G30	G40	G50	G60	G70	G80	G90	G100
CR	1.62**	1.54**		0.50**	–0.46*		2.01*	1.94**	1.80**	1.62**	1.36**
	(0.10)	(0.26)		(0.07)	(0.16)		(0.53)	(0.15)	(0.21)	(0.24)	(0.19)
HU	1.06**	1.33*	1.79**	1.92**	0.91**	1.05**	3.06*	1.31**	1.85**	1.65**	1.60**
	(0.05)	(0.42)	(0.08)	(0.14)	(0.13)	(0.22)	(1.19)	(0.11)	(0.21)	(0.10)	(0.18)
SK	0.46**	0.32*	–0.21*		–1.27*		0.09*	1.20**	0.52*		0.54**
	(0.10)	(0.11)	(0.08)		(0.39)		(0.12)	(0.07)	(0.23)		(0.06)
BG	0.86**		7.27**	2.07**	1.49**		4.37**	2.95**	0.99**	1.33**	0.61**
	(0.02)		(1.19)	(0.31)	(0.14)		(0.29)	(0.62)	(0.08)	(0.08)	(0.04)
EE	0.79**	0.41**	1.34**	0.59**	0.65*	1.34**	–1.14*	0.80**	1.01**	0.72**	0.91**
	(0.04)	(0.05)	(0.10)	(0.04)	(0.22)	(0.07)	(0.46)	(0.06)	(0.04)	(0.01)	(0.05)
LV	0.82**		1.95**	0.48*	1.11**	3.48**	4.74**	0.96**	1.12**	0.97**	0.37**
	(0.05)		(0.06)	(0.13)	(0.07)	(0.27)	(1.03)	(0.13)	(0.08)	(0.04)	(0.06)
RO	1.84**		–1.49*	1.23**	2.14**	1.88*		3.02*	2.84**	1.45**	11.99**
	(0.31)		(0.70)	(0.28)	(0.26)	(0.49)		(1.28)	(0.24)	(0.12)	(2.36)
SI	0.69**	0.53**	9.07**		0.70**			0.64**	0.63**	1.05**	1.10**
	(0.02)	(0.04)	(1.68		(0.08)			(0.04)	(0.13)	(0.08)	(0.03)
Average	1.02	0.83	3.30	1.13	1.09	1.94	2.57	1.60	1.34	1.26	2.31
Share significant	100.0%	62.5%	87.5%	75.0%	100.0%	50.0%	75.0%	100.0%	100.0%	87.5%	100.0%

Symbols *and ** and denote significance at the 1% and 5% level, standard deviation are in parenthesis.
Average means the average absolute values of significant coefficients only

The short-run elasticity coefficient β

	G total	G10	G20	G30	G40	G50	G60	G70	G80	G90	G100
CR				1.41* (0.66)	2.34* (1.28)	5.45** (2.16)	0.81* (3.57)				
HU		0.31* (1.03)				0.09* (2.68)	0.48* (2.35)				
SK		7.33** (1.18)						2.58* (1.38)			1.65* (0.56)
BG	-2.39* (-0.75)										
EE								0.96* (-0.32)	1.06* (-0.41)		
LV			2.80* (-1.22)								
RO		-2.39* (-1.12)	7.65** (-1.56)		-1.923* (-1.05)	12.68** (-1.53)		-1.51* (-0.81)	-7.63** (-1.60)		
SI		-0.90* (-0.45)	-5.72* (-1.94)						7.22* (-3.37)	1.89* (-0.81)	
Average	2.39	2.73	5.39	1.41	2.13	6.07	0.64	1.69	5.31	1.89	1.65
Share significant	12.5%	50.0%	37.5%	12.5%	25.0%	37.5%	25.0%	37.5%	37.5%	12.5%	12.5%

Symbols *and ** and denote significance at the 1% and 5% level, standard deviation are in parenthesis.
Average means the average absolute values of significant coefficients only