Relationship between government expenditure and output in the problematic regions in the European Union

Szarowska, Irena

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I. Szarowská

RELATIONSHIP BETWEEN GOVERNMENT EXPENDITURE AND OUTPUT IN THE PROBLEMATIC REGIONS IN THE EUROPEAN UNION

Economic and debt crisis has increased the attention paid to the development of government expenditure in problematic regions in the European Union. The goal of the article is to provide direct empirical evidence on cyclicality and the long-term and short-term relationship between government expenditure and output in the Portugal, Ireland, Italy, Greece and Spain in a period 1995–2011. We have applied Johansen cointegration test and the error correction model on adjusted annual data of GDP and government expenditure in compliance with the COFOG international standard. Research confirms procyclical development of government expenditure functions on GDP in the selected countries; this procyclicality is in line with development typical for developing countries. Moreover, output and government expenditure are cointegrated for at least six of the expenditure categories in every country and it implies a long-term relationship between government expenditure and output consistent with Wagner's law. The values of the coefficients for the short-run relationship between expenditure and output confirm the voracity hypothesis, as they suggest that in response to a given shock to real GDP, government expenditure rises by even more in percentage points.

Keywords: government expenditure, cyclicality, voracity effect, Wagner´s law, COFOG classification, long-run elasticity, short-run elasticity

1. Introduction

Economic and debt crisis has increased the attention paid to the development of government expenditure in problematic regions in the European Union. 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. Government expenditure and their growth are seen as an essential problem in these countries.

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.

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. Study of [18] points on fact that procyclical fiscal policy 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." Procyclical fiscal policy is typical for developing countries; contrary developed countries mostly use countercyclical policy.

The goal of the article is to provide direct empirical evidence on cyclicality and the long-term and short-term relationship between government expenditure and output in the Portugal, Ireland, Italy, Greece and Spain in a period 1995–2011. Previously published studies are weakly supported by the data from these problematic regions in which results can vary. We apply cointegration approach on annul data of GDP and government expenditure in compliance with the COFOG international standard. The paper is organized as follows. In the second section, short literature review is summarised. In the third 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. Literature review

As [24] mentioned, the economic theory provides two main categories of arguments that explain the public sector size in time and among countries. The first category has as starting point the Wagner law, according to which the elasticity of government expenditure compared to GDP is greater than one. As countries become more developed, the demand for public goods raises and is consistent with the increasing ability to collect the necessary funds. On top of the "Baumol cost disease", explains that the percentage of government expenditure increases because the raise of public servants' salaries is higher than their productivity, while the price related to public services demand is relatively non-elastic. The second category of arguments is political. For election purposes, the fiscal policy, especially those concerning the government expenditure tends to be inconsistent in time and focuses on greater deficits and greater public sectors.

The relationship between government expenditure and output has often been debated in economic literature. [30] 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. As [17] summed up, the empirical works on Wagner's law can be divided in two groups, based on the different types of used econometric methodology: (1) studies which are performed until the mid-1990s, assume stationary data series and apply simple OLS (ordinary least squares) regressions to test alternative versions of the law; (2) cointegration-based studies, which are performed from the mid-1990s and on, test for cointegration mostly between government expenditure and national income. Early studies of this group use the methodology of [5], whereas more recent works mostly apply the technique of [14]. Many recent studies also perform Granger causality tests to indicate the direction of causality between the variables.

The empirical studies have produced mixed and sometimes contradictory results. Some of these conflicting conclusions have been attributed due to using the different econometric methodology and the different features characterizing different economies during alternative time periods. Above that, [25] pointed out on the fact that there are at least 14 different measures of government expenditure that have been used in the literature (e.g. government expenditure at current prices, government expenditure plus transfers at current prices, government expenditure at constant prices, government expenditure plus transfers at constant prices, government consumption expenditure at current prices, government consumption expenditure at constant prices, central government expenditure only, government capital expenditure at constant prices, etc.), and at least 13 different possible measures of output (e.g. total output Y, output per capita, proportion of Y generated in manufacturing sector, proportion of Y generated in primary sector, permanent income, exports plus imports divided by Y, etc.).

[4] investigated empirically the traditional Wagner's hypothesis in the case of Greece using disaggregated data of public expenditures and employing an error correction approach. The empirical findings confirmed Wagner's law only in the case of military expenditure. [29] analysed the experience of six developed economies (Denmark, Germany, Italy, Norway, Sweden and the UK) from the mid-19th century to 1913, and reported results in accordance with the Wagner´s law. [17] applied six alternative functional forms, using data for the EU-15 countries over the time period 1949-1998. The results are ambiguous accordingly to the method applied. The major points that emerge from the Engle and Granger test are that in most of the EU countries, no long term relationship has been observed, except for some subcases in Finland, Italy and the Netherlands. In contrast, the Johansen test supports the existence of Wagner's law in most EU countries, with the exception of France and Italy. As far as the Granger causality test is concerned, patterns of causality between income and government expenditure display dramatic differences across various countries. Moreover, there is limited support for the pattern of causality; Wagner's law was completely verified only in Finland and Italy. [8] analyzed the evidence of the USA, United Kingdom, France, Germany and Italy for the period 1870-1990. They observed that the increase in the public expenditure to national income ratio is faster for the period until

the mid-20th century and develop a model based on Wagner's law.

Next, [2] examined the short- and long-term behaviour of government spending with respect to output in 51 developing countries using an error-correction model. They find evidence that is consistent with the existence of cyclical ratcheting and voracity in government spending in developing countries, resulting in a tendency for government spending to rise over time. They presented three main policy conclusions of the research: (1) the long-term and short-term elasticity of capital spending in relation to GDP is relatively high; (2) there may be scope for fiscal rules or fiscal responsibility laws in some countries that limit the discretion for pro-cyclical fiscal policy; (3) in many countries, there is a long-term relationship between the level of output and government spending. Sideris (2007) investigates the long-run tendency for government expenditure to grow relative to national income using Greek data from 1833 to 1938. Cointegration analysis validates the existence of long-run relationship between the variables, as expressed by the six most popular versions of the Law. Moreover, Granger causality tests indicate causality running from the variables approximating income to the government expenditure variable.

Also [19] analysed the development of public expenditure and aggregate income in 23 OECD countries. Using panel cointegration, the empirical evidence provides findings of a structural positive correlation between public spending and per capita income, consistent with the Wagner's law. The correlation is usually higher in countries with lower per capita income, suggesting that the period of catching-up is characterized by a stronger development of public activities than more mature economies.

[23] studied the linkages between public expenditure and GDP for Italy. Empirical evidence suggests that only for gross public investment expenditure the hypothesis is satisfied. Instead, Granger-causality brings unclear results. Next [22] examined the empirical evidence of Wagner's law and of Augmented Wagner's law, according to which subsists a long-term relationship amongst public expenditure on one side and aggregate income and public deficit on the other side. He has employed six alternative functional forms of Wagner's law, using data for the EU-27 countries over time period 1970-2009. With regard to Keynesian hypothesis, he has found no clear evidence of government expenditure causing national income and he has concluded that the Keynesian proposition of government expenditure as a policy instrument to encourage and lead growth in the economy is not supported by the data used.

As well, [27] provided direct empirical evidence on cyclicality and the long-term and short-term relationship between government spending and output in eight Central and Eastern European countries in a period 1995–2009. The results confirm cyclical development of government spending on GDP, Wagner´s law and voracity effect in the most CEE countries.

The literature testing the cyclicality of government expenditure also provides variety of results. Many of researches as [11] and [12] focused on Latin America. On the one hand, [9] showed in his research that expenditure is countercyclical. However, other papers have shown no discernible pattern. [7] documented for G7 countries, the correlation between government consumption and 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.

Contrary to the theory, many of empirical studies have found evidence that government expenditure is procyclical. Analysis of [20] found procyclicality in a single-country time series study of Irish fiscal policy. Later [21] showed that the level of cyclicality varies across expenditure categories and across OECD countries. [28] concluded that fiscal procyclicality is evident in a much wider sample of countries. [13], [16], [3], [26] or [10] presented similar conclusions. [1] tested 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.

3. Data and methodology

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 exploring 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 annual data on GDP and government expenditure in compliance with the COFOG international standard during the period 1995–2011. It is not possible to use longer and higher frequently time series data as COFOG classification analyzes and reports only annual data. The countries included in the analysis are Portugal, Ireland, Italy, Greece and Spain. All time series are collected from the Eurostat database and adjusted at constant prices (deflators in 2005 prices are taken from the World Bank). In line with [2], we investigated fiscal and output co-movements by the approach proposed by [21]. 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.

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

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 ut 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).

$$H_0: \delta_2 = 0, H_\varepsilon: \delta_2 < 0. \qquad (2)$$

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. The results of ADF test confirmed the stationary of all time series on the first diference.

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

$$G = AY^{\delta}, \qquad (3)$$

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

$$\log G = a + \delta \log Y, a = \log A. \qquad (4)$$

If the adjustment of government expenditure G to its steady-state $\overline{G}$ 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:

$$\log G_{it} = \mu + \alpha \log G_{it-1} + \beta_0 \log Y_t + \beta_1 \log Y_{t-1} + \varepsilon_t, \quad |\alpha|<1 \qquad (5)$$

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

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

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).

$$\log G_{it} = \mu + \beta_0 \log Y_t + \gamma (\log G_{it-1} - \delta \log Y_{t-1}) + \varepsilon_t. \qquad (7)$$

In (7), we can interpret $\beta_0 \Delta \log Y_t$ as the short-term impact of output on government expenditure and β_0 as the short-run elasticity of government expenditure with respect to output. The error correction term $\gamma(\log G_{it-1} - \delta \log Y_{t-1})$ 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, ε_t means residual component of long-term relationship.

Above that, (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 [6], if γ is significantly different from zero in (8), then output and government spending are cointegrated.

$$\log G_{it} = \mu + \beta_0 \log Y_t + \gamma \log G_{it-1} - \varphi \log Y_{t-1} + \varepsilon_t, \qquad (8)$$

where $\phi = \gamma\delta$. The above derivation makes clear the underlying assumption that there is a elastic-

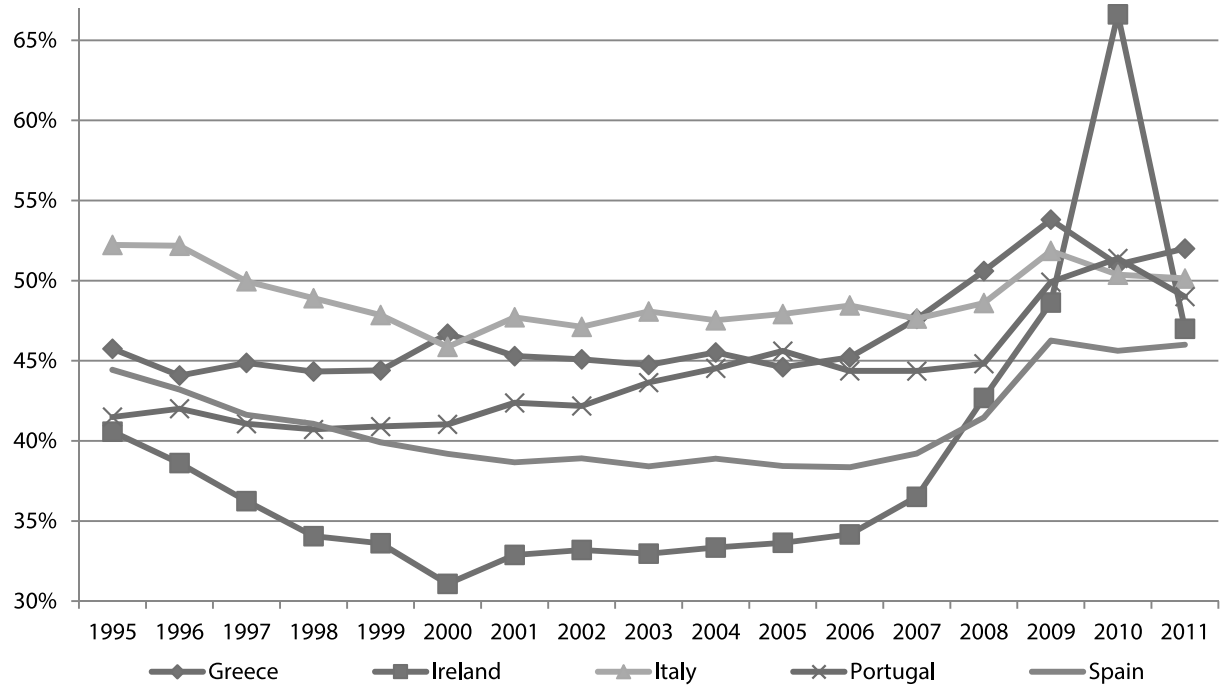

Fig. 1. *Development of government expenditure (in % GDP). Source: authors´ compilation based on data from Eurostat*

ity relationship between output and expenditure, while the transitory deviations are random.

4. Results and discussion

4.1 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 the 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

Figure 1 shows development of government expenditure in the selected countries in a period 1995–2011. Government expenditure relative to GDP progressively decreased in the PIIGS, except Greece, between 1995 and 2000, next stagnated till 2006, followed by a rise in 2007 and 2008 and a more emphatic increase in 2009, the end of the analyzed period is characterized by a slight decrease or stagnation. 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 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).

The average value of total government expenditure is the smallest in Ireland (38% GDP), the highest in Italy (50% GDP), while the average is 48% GDP in the whole EU15. It means that the average value of total expenditure in PIIGS, except Italy, is lower than the average value in the EU15, although these countries are often criticized for the excessive government expenditure.

Table 1 shows the average share of government expenditure by functions on total expenditure in each analyzed country during the selected period. Data states sizeable differences in importance of public sector and a priority of government ex-

Table 1

Government expenditure — COFOG classification (in % of total *G*)

Country	CF01	CF02	CF03	CF04	CF05	CF06	CF07	CF08	CF09	CF10
Greece	23.86%	6.11%	2.58%	11.19%	1.17%	0.81%	11.50%	0.85%	7.19%	34.73%
Spain	13.95%	2.77%	4.67%	12.03%	2.13%	2.53%	13.63%	3.51%	10.99%	33.80%
Ireland	10.72%	1.61%	4.51%	13.70%	2.34%	4.33%	17.64%	1.81%	13.17%	30.18%
Italy	21.66%	2.67%	3.99%	8.58%	1.65%	1.72%	12.73%	1.71%	9.47%	35.81%
Portugal	15.18%	3.29%	4.21%	10.42%	1.43%	1.78%	14.72%	2.68%	14.50%	31.81%
Average	17.08%	3.29%	3.99%	11.18%	1.74%	2.24%	14.04%	2.11%	11.06%	33.27%

Source: authors´ compilation based on data from Eurostat.

penditure functions and confirms that these problematic countries are not a homogenous group.

The three biggest expenditure functions, on average, account nearly 65% of the total expenditure: Social protection, Health and General public services. In the PIIGS 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 the third of all government expenditure in average. 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 highest value of CF10 is in Italy, although the value decreased by 10 percentage points in selected period (from 26.7% to 16.4%). On the other hand, the average value is less than a half in Ireland. The value of General public services (CF01) is the second highest category (17%). We can find the highest value of CF01 in Greece (23.86%), followed by Italy (21.66%); it is due to a high expenditure on public debt services. On the other hand, Ireland has the smallest CF01 expenditure (less than 11%). Economics affairs (CF04) and (CF09) Education expenditure are in average very similar (11.18% resp. 11.06%), but the share differs in each country. Education expenditure is twice as high in Portugal as in Greece. Contrary, Greece has the absolutely highest expenditure on Defense (CF02) compare to the rest of the PIIGS in analyzed period.

4.2 Cyclicality of government expenditure

As was already noted, government expenditure is a possible 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, then expenditure is countercyclical. If potential output were observable or easy to estimate, one could define counter-cyclicality as above-average expenditure to output ratio whenever output was below its potential.

As [2] 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 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. The results indicate significant difference across expenditure functions. There is a long-term relationship between total government expenditure and output consistent with Wagner‘s law, the share of significant results is 68% for all categories in all countries. Although the error correction term is not significant for all expenditure functions in any country of the sample, all countries have a significant error correction term for at least six of the expenditure functions (six in Greece and Spain, seven in Ireland and Portugal and eight in Italy). Moreover, the error correction term for General public services (CF01), Defense (CF02) Education (CF09) and Social protection (CF10) are significant in all countries. As expected, the adjustment coefficients are mostly negative (in 86% of cases), indicating dynamic stability. These findings are in line with [2], as they have found that all adjustment coefficients are negative and although the error correction term is significant in about 30% of countries in the sample for all expenditure aggregates, 70% of the sample countries have a significant error correction term for at least one of spending aggregates. Similarly, the error correction term not significant for all expenditure functions in any CEE country of the sample, all countries have a significant error correction term for at least four of the spending functions and the adjustment coefficients are mostly negative ([27]).

The implication of a significant error correction term is that there is in fact a long-term relationship between government expenditure and output. But it is suitable to point out that the existence of cointegration does not imply causality, which

Table 2

The value of adjustment coefficient γ

country	G total	CF01	CF02	CF03	CF04	CF05	CF06	CF07	CF08	CF09	CF10
Greece	–0.91*	0.32*	–0.60*	–0.25	–1.28*	–0.01	–0.49	0.03	–0.80*	–1.10*	–0.39*
	(0.45)	(0.09)	(0.22)	(0.34)	(0.30)	(0.12)	(0.31)	(0.11)	(0.28)	(0.45)	(0.20)
Spain	0.23*	0.37*	–0.37*	0.41	–1.18*	–0.29	–0.17	–0.17*	–0.35	–0.04*	0.05*
	(0.06)	(0.15)	(0.19)	(0.41)	(0.34	(0.21)	(0.32)	(0.07)	(0.25)	(0.02)	(0.03
Ireland	0.29	–0.01*	–0.32*	0.23*	1.41	–0.04	–0.91*	–0.18**	0.28	–0.06*	–0.28*
	(0.18)	(0.00)	(0.14)	(0.12)	(1.03)	(0.05)	(0.39)	(0.11)	(0.36)	(0.02)	(0.07)
Italy	–0.00	–0.56**	–0.27*	–0.07*	–0.62*	–0.39*	–0.66*	–0.31**	–0.13	–0.31*	–0.34**
	(0.03)	(0.18)	(0.11)	(0.34)	(0.24)	(0.16)	(0.30)	(0.08)	(0.24)	(0.11)	(0.09)
Portugal	–0.01	–0.69**	–1.11*	–0.06	–0.40	–0.23*	–0.52*	–0.02	–0.48*	–0.56*	–0.16**
	(0.11)	(0.14)	(0.37)	(0.19)	(0.43)	(0.13)	(0.14)	(0.23)	(0.24)	(0.23)	(0.05)
Average	0.57	0.39	0.53	0.23	1.2	0.31	0.69	0.22	0.64	0.41	0.24
Share significant	40%	100%	100%	20%	60%	40%	60%	60%	40%	100%	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

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)
Average	1.17	1.26	0.95	2.20	0.83	1.08	0.86	1.76	1.41	1.79	0.86
Share significant	80%	100%	100%	80%	100%	60%	80%	100%	100%	100%	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.

is consistent with Wagner's view that there is not necessarily a cause and effect relationship between economic development and government activity.

Table 3 summarizes the results about the long-run elasticity of expenditure with respect to output. The long-run elasticity coefficient δ is significant in 84% 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 92% of cases) and it is in line with a wider interpretation of Wagner's law; the highest elasticity coefficient is 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 in accordance with the narrow interpretation of Wagner's law and indicates that in the long-term, the public sector is increasing in relative importance. The coefficient for long-run elasticity was significant in all countries for all expenditure functions with the exception of Public order and safety (CF03), Environment protection (CF05) and Housing and community amenities (CF06). In Table 3, we can also find the long-

Table 4

The short–run elasticity coefficient β

	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)
Average	0.83	1.27	3.40	2.59	–	1.68	4.38	1.65	2.3	0.68	1.16
Share significant	40%	80%	40%	80%	0%	40%	20%	80%	40%	60%	80%

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.

run δ lower than one, it means that the expenditure function rises slower than national income.

Table 4 summarizes results about the short-run elasticity of expenditure with respect to output. The results and conclusions for the short-run elasticity are not so unequivocal. For all expenditure categories, the average coefficient is 2.09. Although the short-run elasticity is positive for 79% of the cases in the sample, it´s needed to points out on 51% statistical significant of results. However, 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.

The Public order and safety expenditure (CF03) indicates the highest short-run elasticity, with a mean coefficient of 2.59 for the 80% of cases where the coefficient is significant. This implies that governments cut and expand CF03 expenditure proportionally more during recessions and expansions, respectively, than other types of expenditure.

Elasticity results confirm conclusions of earlier studies ([29], [21], [2], [1], [27]). But the size of the elasticity with respect to output varies greatly across countries. Following [21], we try to explain the cross-country variation in the short-term elasticity, using a wide range of variables, including output volatility, index for power dispersion, per capita GDP, the standard deviation of terms of trade volatility or financial risk. However, the results were not statistically significant. On the other hand, [22] did not find clear evidence between government expenditure and GDP, but he used panel data instead of separate time series.

5. Conclusion

The aim of this article was to provide direct empirical evidence on cyclicality and the long-term and short-term relationship between government expenditure and output in the Portugal, Ireland, Italy, Greece and Spain in a period 1995–2011. We analysed cyclically adjusted annual data in compliance with the COFOG international standard.

We used Johansen cointegration test and the error correction model [15]. Output and government expenditure are cointegrated for at least six of the expenditure functions in every country and it implies a long-term relationship between government expenditure and output. The government expenditure functions are procyclical in most countries (68% cases in the sample). Average value of long-run elasticity coefficient is 1.30 for all expenditure functions, 1.17 for total government expenditure. It is consistent with the wider interpretation of Wagner‘s law and indicates that the public sector is increasing in relative importance in the long-term. The δ coefficient was significant in each country for all expenditure functions with the exception of Public order and safety (CF03), Environment protection (CF05) and Housing and community amenities (CF06).

The research focused also on short-run relationship between expenditure and output. Results are not unambiguous due to a relatively low statistical significance (51%). However, the coefficient values (average is 2.09) confirm the voracity hypothesis, as they suggest that in response to a given shock to real GDP, government expenditure rises by even more in percentage points.

When comparing the short-run and the long-run coefficients for countries where there is a long-

term relationship between government spending and output, we find that in most cases, the short-run elasticity is larger than that for the short term. This is similar with development in Central and Eastern European countries ([27]), but opposite findings are in most developing countries, where the long-run elasticity is larger than that for the short term in 65% of cases ([2]).

We can conclude that although the theory implies government expenditure is countercyclical; our research does not prove that and this procyclicality is in line with development typical for developing countries. The results confirm procyclical development of government expenditure on GDP, Wagner´s law and voracity effect in PIIGS countries during 1995–2011. Our result is in consistent with the empirical literature using the identical methodology.

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Information about the author

Irena Szarowská (Karvina, Czech Republic) — Ph.D., Assistant Professor, Department of Finance, Silesian University, School of Business Administration (Univerzitni nam. 1934/3, 733 40 Karvina, Czech Republic, e-mail: szarowska@opf.slu.cz).