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# The Nexus between Disaggregated Public Spending and GDP in the Euro Area

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## Abstract

This paper aims to analyze the nexus between disaggregated public spending and GDP in the Euro Area for the period 1990-2010 at a disaggregated level, using a time series approach. We estimated this nexus for ten items of public spending according to the COFOG functional classification. Taking into account cross-section dependence and group-wise heteroskedasticity, cointegration tests reveal a long-run relationship between real per capita GDP and real spending for defence, for housing and community amenities, and for recreation, culture and religion. Moreover, Granger causality tests results show clear evidence against the Keynesian view (G→Y). Finally, decomposing the GDP with Hodrick and Prescott filter, Estonia, Luxembourg, Ireland and Greece exhibit wider fluctuations. Some notes on the policy implications of this analysis conclude the paper.

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## 1. Introduction

In this paper we analyze the relationship between some items of public expenditure and GDP, according to the COFOG[1] international classification for the Euro Area.

A point of debate among the economists is whether the public sector should or should not intervene to stabilize the short-term fluctuations of economic activity. If Classical economists have opposed such a kind of public action, the Keynesians have invoked fiscal policies to support the economy during recessions.

Wagner's Law (Wagner, 1883, 1912) suggests that the public expenditure share of GDP (G/Y) tends to increase in the process of economic development. The reasons are varied: a) public functions substitute for private activities, b) development results in an expansion of expenditure on culture and welfare, therefore public intervention might be necessary to manage natural monopolies. In sum, the expansion of public spending can be seen as a by-product of economic development, and not vice versa (Bird, 1971).

As a result, the two alternative positions call for opposite directions of causality running from public expenditure to income for the Keynesians, and from income to public expenditure for Wagner.

Over the past four decades, several studies on this issue focused on many countries and time periods, using the concepts of cointegration and Granger causality. Since the pioneering research by Gupta (1967), empirical findings are mixed and, for some countries, even controversial (Tarschys, 1975; Peacock and Scott, 2000). The results differ either on the direction of causality or on the short-term and long-term effects.

Government spending is an important component in influencing the growth of the Italian economy. It must be handled systematically and wisely so that the expenditure which has been made is effective.

The rest of the paper is organized as follows. Section 2 provides a survey of the economic literature on this issue. Section 3 overviews the applied empirical methodology and offers a brief discussion of the data used. Section 4 discusses the empirical results. Section 5 presents some policy implications and concludes.

## 2. Wagner's model and the economic literature

We owe to Adolf H. Wagner the first theory on the public expenditure increase dependent upon the structural evolution of society (Wagner, 1883, 1912). He made research on the existence of a desirable limit to the size of the public sector, concluding that such a limit was in fact not possible. In his opinion, the time path of public spending is essentially determined by the increase of national income. An increase of this variable generates a more than proportional expansion of the public sector. Hence, he derived the "law of increasing state activity" (Wagner, 1883, 1912), arguing that its financial pressure would increase in time.

The empirical evidence concerning the relationship between national income and expenditure is based on the assessment of the elasticity of expenditure to income. Only if such elasticity is significant and >1 and the coefficient sign is positive, we may conclude that the link between the two variables exists and it is consistent with Wagner's hypothesis (Hadjimatheou, 1976; Jackson, 1980; Fossati, 1981; Diba, 1982).

Murthy (1994) suggests a broader interpretation of the law allowing for the addition of further explanatory variables related to economic development and government expenditure (e.g. the degree of urbanization, budget deficits, etc.). This alternative would reduce the omit-

[1] The COFOG classification is defined by the major international institutions dealing with national accounts (OECD, IMF, Eurostat), and it is articulated in three levels of analysis: divisions, groups and classes.

ted variable bias in the specification. Magazzino (2012a, 2012b) discussed alternative functional forms of Wagner's Law.

The directions of Granger causality between public spending and aggregate income can be categorized into four types, each of which has important implications for economic policy (Peacock and Scott, 2000):

- *Neutrality hypothesis:* the above economic variables are not correlated as it has been stated by Demirbas (1999), Bağdigen and Cetintaş (2003), Huang (2006), Sinha (2007), Chimobi (2009), and Afzal and Abbas (2010).
- *Wagner's hypothesis:* the unidirectional causality running from GDP to public spending. This hypothesis found empirical support in Ahsan *et al.* (1996), Ansary *et al.* (1997), Chletsos and Kollias (1997), Abizadeh and Yousefi (1998), Asseery *et al.* (1999), Thornton (1999), Islam (2001), Tang (2001), Albatel (2002), Tan (2003), Iyare and Lorde (2004), Sideris (2007), Samudram *et al.* (2008), Kalam and Aziz (2009), Kumar (2009), Kumar *et al.* (2009), and Abdullah and Maamor (2010).
- *Keynesian hypothesis:* the unidirectional causality running from public spending to GDP. This hypothesis is in line with empirical findings in Iyare and Lorde (2004), Dogan and Tang (2006) Babatunde (2007), and Govindaraju *et al.* (2010).
- *Feedback hypothesis:* there exists a bi-directional causality flow between GDP and public spending. The feedback hypothesis has been proposed by Thornton (1999), Chow *et al.* (2002), Abu-Bader and Abu-Qarn (2003), Dritsakis and Adamopoulos (2003), Iyare and Lorde (2004), Halicioğlu (2005), Narayan *et al.* (2008), Ziramba (2008), Ghorbani and Zarea (2009), and Yay and Tastan (2009).

Table 1: A comparison of studies about causality and cointegration analysis between public expenditure and GDP

| Author(s) | Countries | Study period | Causality |
|---|---|---|---|
| **Abdullah, Maamor (2010)** | Malaysia | 1970-2007 | Y → G |
| **Abizaeh, Yousefi (1998)** | Soth Korea | 1961-1992 | Y → G |
| **Abu-Bader, Abu-Qarn (2003)** | Egypt, Israel, Syria | 1963-1998 | Israel, Syria: Y ↔ |
| **Afzal, Abbas (2010)** | Pakistan | 1960-2007 | Neutral |
| **Ahsan *et al.* (1996)** | Canada | 1952-1988 | Y → G |
| **Akitoby *et al.* (2006)** | 51 developing countries | 1970–2002 | - |
| **Albatel (2002)** | Saudi Arabia | 1964-1998 | Y → G |
| **Ansari *et al.* (1997)** | Ghana, Kenya, South Africa | 1957-1990 | Ghana: Y → G |
| **Asseery *et al.* (1999)** | Iraq | 1950-1980 | Y → G |
| **Babatunde (2007)** | Nigeria | 1970-2006 | G → Y |
| **Bağdigen, Cetintaş (2003)** | Turkey | 1965-2000 | Neutral |
| **Burney (2002)** | Kuwait | 1969-1995 | - |
| **Chimobi (2009)** | Nigeria | 1970-2005 | Neutral |
| **Chletsos, Kollias (1997)** | Greece | 1958-1993 | Y → G |
| **Chow *et al.* (2002)** | UK | 1948-1997 | Y ↔ G |
| **Cotsomitis *et al.* (1996)** | China | 1952-1992 | - |
| **Demirbas (1999)** | Turkey | 1950-1990 | Neutral |
| **Dogan, Tang (2006)** | 5 South-East Asian countries | 1960-2002 | Indonesia, Malaysia, Singapore, T<br>Philippines: G → |
| **Dritsakis, Adamopoulos (2003)** | Greece | 1960-2001 | Y ↔ G |
| **Ghorbani, Zarea (2009)** | Iran | 1960-2000 | Y ↔ G |
| **Govindaraju *et al.* (2010)** | Malaysia | 1970-2006 | G → Y |
| **Halicioğlu (2005)** | Turkey | 1960-2000 | Y ↔ G |
| **Huang (2006)** | China and Taiwan | 1979-2002 | Neutral |
| **Islam (2001)** | USA | 1929-1996 | Y → G |
| **Iyare, Lord (2004)** | 9 Caribbean countries | 1950-2000 | Jamaica: Neutral<br>Antigua, Barbados, Belize, Grena<br>Nevis, St. Lucia, Trinidad and T<br>Guyana: G → Y |
| **Kalam, Aziz (2009)** | Bangladesh | 1976-2007 | Y → G |
| **Karagianni *et al.* (2002)** | EU-15 | 1949-1998 | Greece: Neutral |
| **Kumar (2009)** | China, Hong Kong, Japan, Taiwan, South Korea | 1960-2007 | Y → G |
| **Kumar et *al.* (2009)** | New Zealand | 1960-2007 | Y → G |
| **Lamartina, Zaghini (2008)** | 23 OECD countries | 1970-2006 | Y → G |
| **Magazzino (2012a)** | EU-27 | 1970-2009 | Neutral only for 5 out of 11 |
| **Narayan *et al.* (2008)** | Chinese provinces | 1952-1989 | Y ↔ G |
| **Rehman *et al.* (2007)** | Pakistan | 1972-2004 | - |

| | | | |
|---|---|---|---|
| **Samudram *et al.* (2008)** | Malaysia | 1970-2004 | Y → G |
| **Sideris (2007)** | Greece | 1832-1938 | Y → G |
| **Sinha (2007)** | Thailand | 1950-2003 | Neutral |
| **Tan (2003)** | Malaysia | 1991Q1-2002Q3 | Y → G |
| **Tang (2001)** | Malaysia | 1960-1998 | Y → G |
| **Thornton (1999)** | Denmark, Germany, Italy, Norway, Sweden, UK | 1850-1913 | Denmark, Germany, Norwa<br>Y → G<br>Italy, UK: Y ↔ G |
| **Verma, Arora (2010)** | India | 1950-2008 | - |
| **Yay, Tastan (2009)** | Turkey | 1950-2004 | Y ↔ G |
| **Ziramba (2008)** | South Africa | 1960-2006 | Y ↔ G |

Sources: our elaborations.

Table 1 above presents a concise overview on cointegration and causality between public spending and national income discussed in several studies on Wagner's Law.

## 3. Methodology and data

With the growing use of cross-country data over time to study purchasing power parity, growth convergence and international R&D spillovers, the focus of panel data econometrics has shifted towards studying the asymptotic of macro panels with large N (number of countries) and large *T* (length of the time series) rather than the usual asymptotic of micro panels with large *N* and small T. A strand of literature applied time series procedures to panels, worrying about non-stationarity, spurious regression and cointegration. Im, Pesaran and Shin (IPS, 2003) proposed a test based on the average of the ADF statistics computed for each individual in the panel. Formally we assume that under the alternative hypothesis the fraction of the individual processes that are stationary is non-zero Maddala and Wu (1999) proposed a new simple test based on Fisher's suggestion, which consists in combining p-values from individual unit root test. Fisher-type tests approach testing for panel-data unit roots from a meta-analysis perspective. The joint test statistic, under the null and the additional hypothesis of cross-sectional independence of the errors terms $\varepsilon_{it}$ in the ADF equation, has a chi-square distribution with 2*N* degrees of freedom. In essence, we choose these tests be-cause they do not require strongly balanced data, and the individual series can have gaps.

Then we control for the (eventual) cross-section dependence in the data. The parametric testing procedure proposed by Pesaran (2004) tests the hypothesis of cross-sectional independence in panel data models with small *T* and large *N*.

Furthermore, we adopted the *t*-test for unit roots in heterogeneous panels with cross-section dependence, proposed by Pesaran (2003). Parallel to IPS test, it is based on the mean of individual DF (or ADF) *t*-statistics of each unit in the panel. Null hypothesis assumes that all series are non-stationary.

The use of panel cointegration techniques to test for the presence of long-run relationships among integrated variables with both a time-series dimension, *T*, and a cross-sectional dimension, *N*, has received much attention recently, especially in the empirical literature. Westerlund (2007) developed four new second-generation panel cointegration tests that are based on structural rather than residual dynamics and, therefore, do not impose any common-factor restriction. The idea is to test the null hypothesis of no cointegration by inferring whether the error-correction term in a conditional panel error-correction model is equal to zero. The new tests are all normally distributed and are general enough to accommodate unit-specific short-run dynamics, unit-specific trend and slope parameters, and cross-sectional dependence.

Granger causality tests (Granger, 1980) are statistical tests of causality in the sense of determining whether lagged observations of another variable have incremental forecasting power when added to a univariate autoregressive representation of a variable. $X_t$ is Granger causal for $y_t$ if $x_t$ helps predict $y_t$ at some stage in the future. It should be noticed, however, that Granger causality is not causality in a deep sense of the word. It just talks about linear prediction, and it only has "teeth" if one thing happens before another. The ten items of spending selected by the COFOG classification involve spending for general public services, for defence, for public order and safety, for economic affairs, for environmental protection, for housing and community amenities, for health, for recreation, culture and religion, for education, and for social protection. In order to convert nominal variables into real variables we

used the GDP deflator and the public consumption deflator for GDP and public expenditures respectively, both derived from the Eurostat[2] database in the period 1990-2010. Our empirical analysis is constrained by the availability of data of disaggregated public spending.

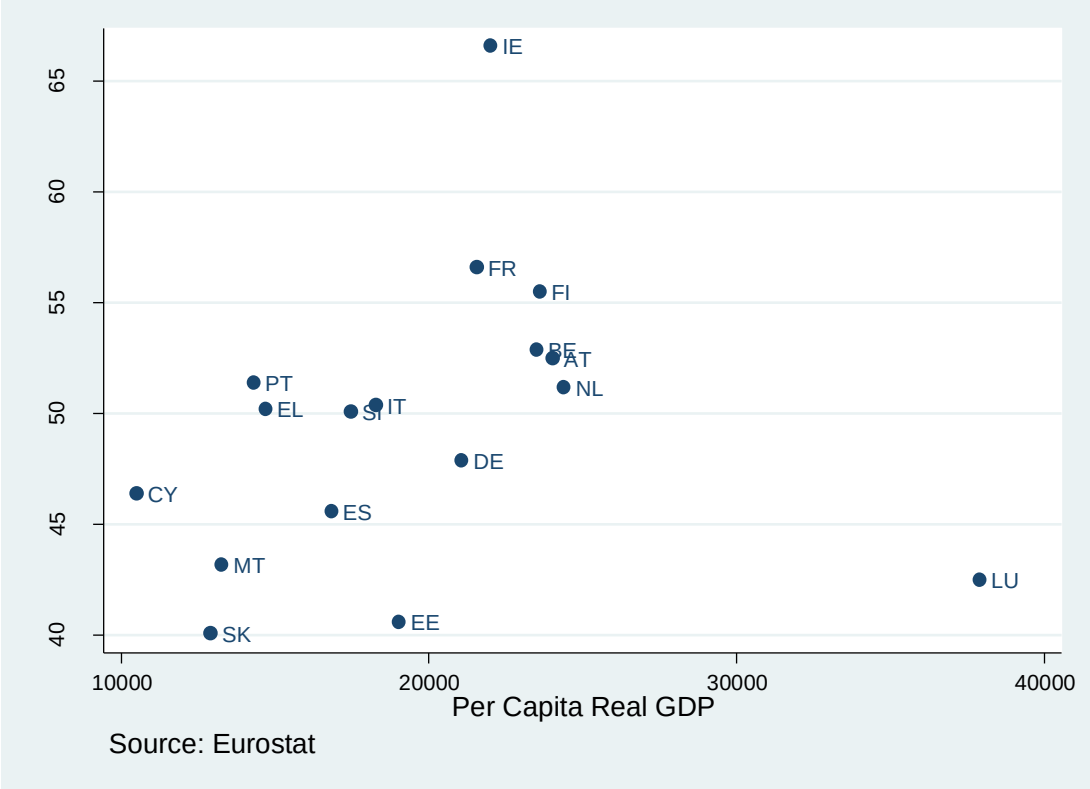
In Table 2 the variables of the model are summed up. All series contain yearly data in real terms.

Table 2: List of the variables (% of GDP)

| Variable | Explanation |
|---|---|
| RPCGDP | Real per capita Gross Domestic Product |
| RTGGE | Real total general government expenditure |
| RGPS | Real spending for general public services |
| RD | Real spending for defence |
| RPOS | Real spending for public order and safety |
| REA | Real spending for economic affairs |
| REP | Real spending for environmental protection |
| RHCA | Real spending for housing and community amenities |
| RH | Real spending for health |
| RRCR | Real spending for recreation, culture and religion |
| RE | Real spending for education |
| RSP | Real spending for social protection |

Source: Eurostat (2012).

Figure 1: Per Capita Real GDP and Real Total General Government Expenditure in the Euro Area countries (2010)




[2] See: http://epp.eurostat.ec.europa.eu/portal/page/portal/government_finance_statistics/data/database.

## 4. Econometric results

In this section we present and discuss an analysis of the relationship between disaggregated public spending and real GDP, applied to the Euro Area.

As a preliminary analysis, some descriptive statistics are shown in the following Table 3.

Table 3: Exploratory data analysis

| Variable | Mean | Median | Std. Dev. | Skewness | Kurtosis | Range |
|---|---|---|---|---|---|---|
| RPCGDP | 16879.97 | 17144.84 | 6074.995 | .9036 | 4.5841 | 33922.871 |
| RTGGE | 45.9572 | 45.95 | 6.4215 | .0963 | 2.9608 | 35.50 |
| RGPS | 7.2507 | 6.80 | 2.6921 | .9219 | 3.9061 | 13.30 |
| RD | 1.3918 | 1.30 | .6173 | .8939 | 4.8664 | 3.80 |
| RPOS | 1.7117 | 1.70 | .4484 | .3320 | 4.1820 | 2.60 |
| REA | 4.9843 | 4.70 | 1.7575 | 5.8325 | 60.3153 | 23.20 |
| REP | .8007 | .70 | .3755 | .7353 | 3.6979 | 2.50 |
| RHCA | .9521 | .80 | .6381 | 2.3648 | 14.1366 | 5.80 |
| RH | 5.9540 | 6.10 | 1.2958 | -.4014 | 2.9322 | 6.40 |
| RRCR | 1.1452 | 1.10 | .4449 | .5139 | 3.0130 | 2.10 |
| RE | 5.3161 | 5.45 | 1.0226 | -.2430 | 2.7141 | 5.50 |
| RSP | 16.4523 | 16.90 | 4.1406 | -.0169 | 2.7085 | 21.50 |

Correlation coefficients, summarized in Table 4, indicate a negative correlation ($r \geq 0.5$) between real per capita GDP and real spending for defence, and for public order and safety. These findings underline that higher values of real GDP are associated with lower values of various items of public spending. Moreover, we find a strong correlation between *RRCR* and *RSP*.

Table 4: Correlation matrix

| | RGPCDP | RTGGE | RGPS | RD | RPOS | REA | REP | RHCA | RH | RRCR | RE | RSP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RPCGDP | 1 | | | | | | | | | | | |
| RTGGE | .073 | 1 | | | | | | | | | | |
| RGPS | -.296 | .511 | 1 | | | | | | | | | |
| RD | -.517 | .305 | .469 | 1 | | | | | | | | |
| RPOS | -.546 | -.109 | -.071 | .220 | 1 | | | | | | | |
| REA | -.150 | .343 | -.032 | .055 | .119 | 1 | | | | | | |
| REP | .298 | -.092 | -.297 | -.298 | -.053 | .158 | 1 | | | | | |
| RHCA | -.185 | -.087 | -.000 | .008 | .149 | .026 | .026 | 1 | | | | |
| RH | .310 | .569 | -.066 | -.114 | -.066 | .079 | .057 | -.242 | 1 | | | |
| RRCR | .337 | -.148 | -.474 | -.184 | .224 | -.102 | .225 | -.089 | -.134 | 1 | | |
| RE | -.041 | .225 | -.073 | -.080 | .214 | -.012 | -.183 | .070 | .098 | .439 | 1 | |
| RSP | .383 | .840 | .210 | .072 | -.391 | .076 | -.058 | -.251 | .624 | -.055 | .071 | 1 |

Notes: Bonferroni adjustment applied.

Table 5 contains the results of panel cross-section dependence and group-wise heteroskedasticity tests, for our variables.

Table 5: Panel cross-section dependence and group-wise heteroskedasticity tests

| Variable | Pesaran test | Modified Wald test | Verdict |
|---|---|---|---|
| RPCGDP | 35.470 | 576.43 | Panel c-s dependence |
| | (0.0000) | (0.0000) | and g-w heteroskedasticity |
| RTGGE | 18.245 | 611.82 | Panel c-s dependence |
| | (0.0000) | (0.0000) | and g-w heteroskedasticity |
| RGPS | 6.448 | 446.79 | Panel c-s dependence |
| | (0.0000) | (0.0000) | and g-w heteroskedasticity |
| RD | 3.854 | 78.19 | Panel c-s dependence |
| | (0.0001) | (0.0000) | and g-w heteroskedasticity |
| RPOS | 10.946 | 172.42 | Panel c-s dependence |
| | (0.0000) | (0.0000) | and g-w heteroskedasticity |
| REA | 1.824 | 3730.93 | G-w heteroskedasticity |
| | (0.0681) | (0.0000) | |
| REP | 5.990 | 1470.65 | Panel c-s dependence |
| | (0.0000) | (0.0000) | and g-w heteroskedasticity |
| RHCA | 0.654 | 260.41 | G-w heteroskedasticity |
| | (0.5128) | (0.0000) | |
| RH | 15.486 | 242.46 | Panel c-s dependence |
| | (0.0000) | (0.0000) | and g-w heteroskedasticity |
| RRCR | 3.601 | 79.04 | Panel c-s dependence |
| | (0.0003) | (0.0000) | and g-w heteroskedasticity |
| RE | 14.921 | 575.31 | Panel c-s dependence |
| | (0.0000) | (0.0000) | and g-w heteroskedasticity |
| RSP | 26.758 | 580.33 | Panel c-s dependence |
| | (0.0000) | (0.0000) | and g-w heteroskedasticity |

Notes: Critical values at the 5% significance level in parentheses. For the Pesaran's test, Pesaran's statistic and, in parentheses, the P-Values are reported. For the Modified Wald's test, the $\chi^2$ and the P-Values are reported. Tests include the intercept.

A standard assumption in panel data models is that the error terms are independent across cross-sections. As we can see, it emerges that the CD test strongly rejects the null hypothesis of no cross-sectional dependence for 10 out of 12 variables, because only *REA* and *RHCA* seem not to be affected. Moreover, the null hypothesis of the modified Wald test statistic (Greene, 2000) is decisively rejected for all variables. Thus, the errors exhibit group-wise heteroskedasticity.

Based on the mean of the individual Dickey and Fuller *t*-statistics of each unit in the panel, the IPS test assumes that all series are non-stationary under the null hypothesis. The *W-t*-bar statistic is distributed standard normal under the null hypothesis of non-stationarity. The Pesaran's CADF test runs the *t*-test for unit roots in heterogeneous panels with cross-section dependence. The findings suggest that four variables are stationary (total general government expenditure, spending for general public services, for economic affairs, and for environmental protection), while the remaining are non-stationary.

Table 6: Panel cross-section dependence and panel unit root tests

| Variable | Im, Pesaran and Shin (IPS) test | Pesaran's CADF test | Verdict |
|---|---|---|---|
| RPCGDP | | -1.805<br>(0.407) | Non-stationary |
| RTGGE | | -1.663<br>(0.048) | Stationary |
| RGPS | | -1.787<br>(0.037) | Stationary |
| RD | | -1.546<br>(0.061) | Non-stationary |
| RPOS | | 0.012<br>(0.505) | Non-stationary |
| REA | -1.1155<br>(0.1323) | | Stationary |
| REP | | -1.791<br>(0.037) | Stationary |
| RHCA | -3.6293<br>(0.0001) | | Non-stationary |
| RH | | 0.314<br>(0.623) | Non-stationary |
| RRCR | | 0.175<br>(0.569) | Non-stationary |
| RE | | -0.726<br>(0.234) | Non-stationary |
| RSP | | 1.397<br>(0.919) | Non-stationary |

Notes: Critical values at the 5% significance level in parentheses. For the IPS test the *W*-t-bar statistic and the P-Values are reported. For the Pesaran's CADF test, the *Z*-t-bar or t-bar statistics and, in parentheses, the P-Values are reported. Panel unit root tests include the intercept.

The cointegration approach is consistent with Wagner's view that there is a long-run relationship between government spending and output, without necessarily implying causality (Akitoby *et al.*, 2006).

Westerlund's cointegration tests have been subsequently applied, in order to find the long-run relationship between each item of public spending and real per capita GDP. As is shown in Table 7, cointegration method suggests that there is a clear cointegrating relationship in three cases (for *RD*, *RHCA*, and *RRCR*).

Table 7: Panel cointegration tests (Westerlund)

| Variables | Group statistics and Panel statistics | Value | P-Value |
|---|---|---|---|
| RPCGDP, RD | Gt | -1.787 | 0.001*** |
| | Ga | -2.166 | 0.931 |
| | Pt | -5.675 | 0.001*** |
| | Pa | -1.565 | 0.222 |
| RPCGDP, RPOS | Gt | -0.426 | 0.985 |
| | Ga | -0.629 | 0.998 |
| | Pt | -3.626 | 0.096* |
| | Pa | -0.693 | 0.682 |
| RPCGDP, RHCA | Gt | -1.716 | 0.002*** |
| | Ga | -3.987 | 0.433 |
| | Pt | -5.240 | 0.004*** |
| | Pa | -2.017 | 0.079* |
| RPCGDP, RH | Gt | -1.326 | 0.083* |
| | Ga | -2.810 | 0.816 |
| | Pt | -4.025 | 0.050* |
| | Pa | -1.642 | 0.190 |
| RPCGDP, RRCR | Gt | -1.735 | 0.001*** |
| | Ga | -2.865 | 0.802 |
| | Pt | -3.870 | 0.065* |
| | Pa | -1.384 | 0.305 |
| RPCGDP, RE | Gt | -1.108 | 0.301 |
| | Ga | -1.830 | 0.963 |
| | Pt | -3.892 | 0.063* |
| | Pa | -0.681 | 0.689 |
| RPCGDP, RSP | Gt | -0.746 | 0.820 |
| | Ga | -0.453 | 0.999 |
| | Pt | -2.999 | 0.222 |
| | Pa | -0.402 | 0.813 |

Notes: Critical value at the 5% significance level in parentheses. Panel cointegration tests include intercept.

Granger causality tests support the Wagner's Law for five countries (Austria, Germany, the Netherlands, Portugal, and Spain); the Keynesian hypothesis did not receive any support by causality results; the feedback mechanism is confirmed in five cases (Cyprus, France, Greece, Ireland, and Slovenia). Finally, for the remaining seven countries (Belgium, Estonia, Finland, Italy, Luxembourg, Malta, and Slovakia) neutrality hypothesis is valid (see Table 8). Therefore, our Granger causality analyses strong reject the Keynesian view according to which public spending might promote economic growth. Interestingly, these conclusions slightly diverge to those in Magazzino (2011), based on time series analyses for Italy.

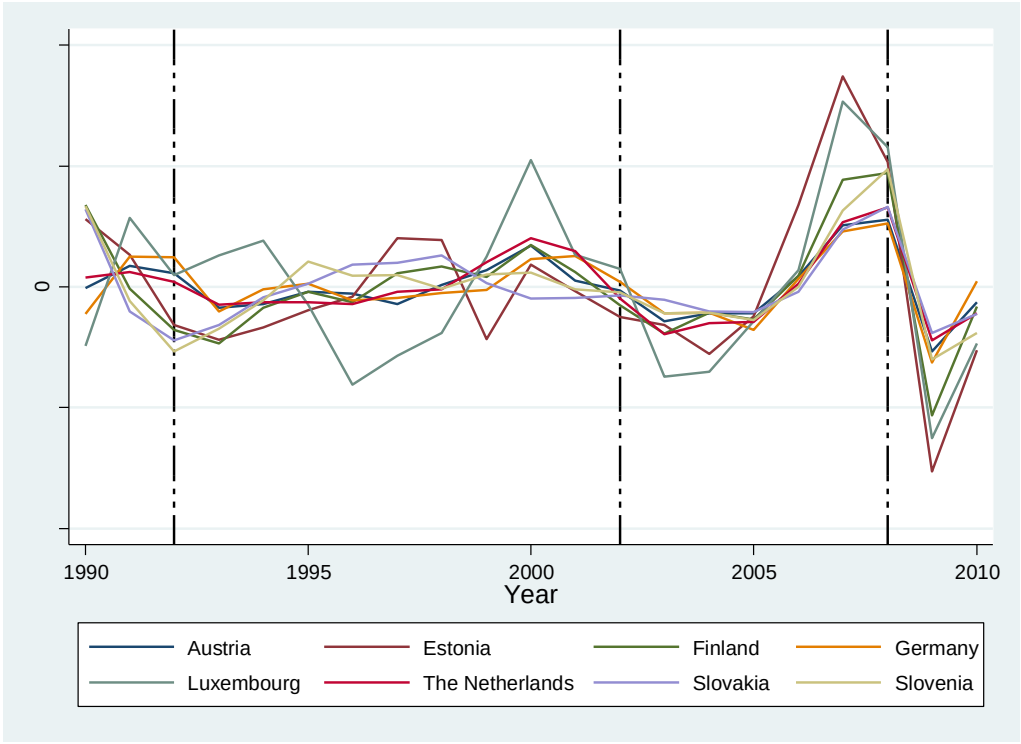
Table 8: Results for short-run causality tests

| Country | Granger causality | $\chi^2$ | P-Value | Verdict | Country | Granger causality | $\chi^2$ | P-Value | Verdict |
|---|---|---|---|---|---|---|---|---|---|
| Austria | RPCGDP⇏RTGGE | 6.26 | 0.0436** | W | Italy | RPCGDP⇏RTGGE | 0.68 | 0.7102 | N |
| | RTGGE⇏RPCGDP | 0.59 | 0.7445 | | | RTGGE⇏RPCGDP | 2.79 | 0.2479 | |
| Belgium | RPCGDP⇏RTGGE | 0.24 | 0.8891 | N | Luxembourg | RPCGDP⇏RTGGE | 3.32 | 0.1897 | N |
| | RTGGE⇏RPCGDP | 0.56 | 0.7566 | | | RTGGE⇏RPCGDP | 0.77 | 0.6810 | |
| Cyprus | RPCGDP⇏RTGGE | 17.92 | 0.0001*** | F | Malta | RPCGDP⇏RTGGE | 0.03 | 0.9843 | N |
| | RTGGE⇏RPCGDP | 10.34 | 0.0057*** | | | RTGGE⇏RPCGDP | 1.61 | 0.4463 | |
| Estonia | RPCGDP⇏RTGGE | 2.69 | 0.2607 | N | The Netherlands | RPCGDP⇏RTGGE | 7.09 | 0.0289** | W |
| | RTGGE⇏RPCGDP | 3.94 | 0.1395 | | | RTGGE⇏RPCGDP | 1.05 | 0.5911 | |
| Finland | RPCGDP⇏RTGGE | 3.13 | 0.2087 | N | Portugal | RPCGDP⇏RTGGE | 4.68 | 0.0963* | W |
| | RTGGE⇏RPCGDP | 3.94 | 0.1394 | | | RTGGE⇏RPCGDP | 1.88 | 0.3906 | |
| France | RPCGDP⇏RTGGE | 32.54 | 0.0000*** | F | Slovakia | RPCGDP⇏RTGGE | 0.51 | 0.7749 | N |
| | RTGGE⇏RPCGDP | 14.80 | 0.0006*** | | | RTGGE⇏RPCGDP | 2.17 | 0.3375 | |
| Germany | RPCGDP⇏RTGGE | 5.56 | 0.0621* | W | Slovenia | RPCGDP⇏RTGGE | 7.41 | 0.0245** | F |
| | RTGGE⇏RPCGDP | 1.57 | 0.4569 | | | RTGGE⇏RPCGDP | 12.72 | 0.0017*** | |
| Greece | RPCGDP⇏RTGGE | 5.12 | 0.0775* | F | Spain | RPCGDP⇏RTGGE | 6.99 | 0.0304** | W |
| | RTGGE⇏RPCGDP | 9.66 | 0.0080*** | | | RTGGE⇏RPCGDP | 1.28 | 0.5285 | |
| Ireland | RPCGDP⇏RTGGE | 7.37 | 0.0251** | F | | | | | |
| | RTGGE⇏RPCGDP | 6.30 | 0.0429** | | | | | | |

Notes: $\chi^2$ values; numbers in parentheses are P-values. ***, ** and * denote significance at 1%, 5% and 10% level, respectively. W: Wagner's hypothesis; F: Feedback hypothesis; N: Neutrality hypothesis.

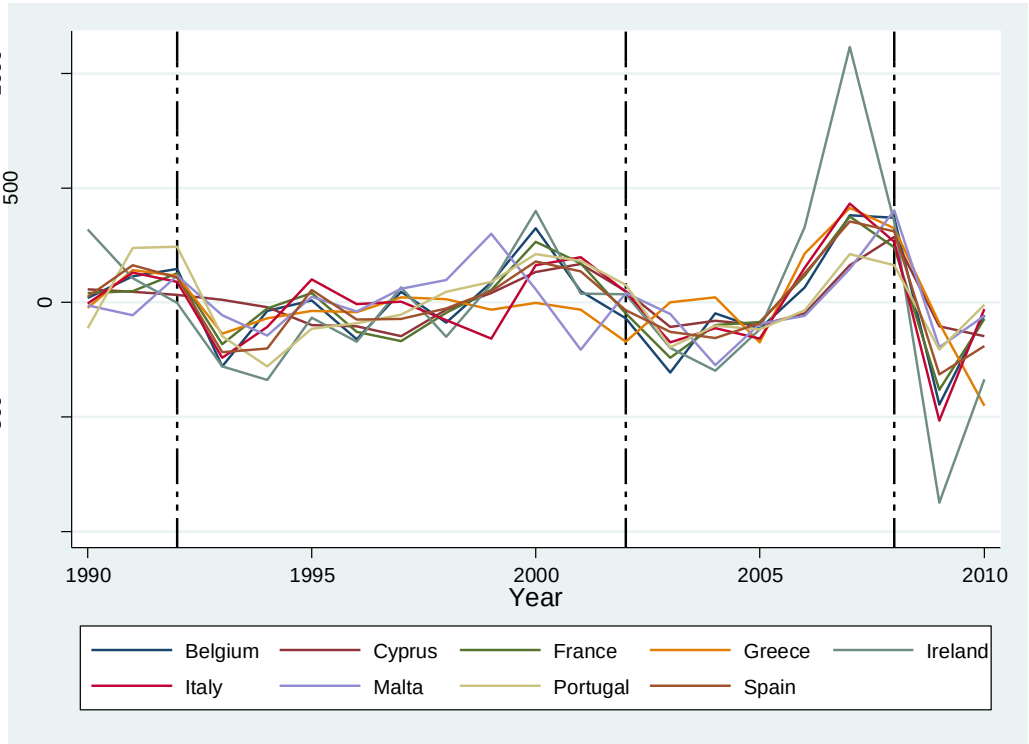
Afterwards, we have decomposed the real per capita GDP in its cyclical and trend components, in order to highlight a common dynamic amongst analyzed countries. Figure 2 shows the evolution of the cyclical component of economic growth in the eight Euro Area countries between 1980 and 2011 with public finance' scenarios less under market's pressure. First, it could be noted as the cyclical fluctuations before the starting of the actual economic-financial crisis have been everywhere much more contained. In general, Estonia and Luxembourg exhibits oscillations wide enough in the whole period, given the structure of their little financialized economies.

Figure 2: Hodrick and Prescott filter, cyclical components (1990-2010)




In the next Figure 3, we indicate the cyclical component of the remaining nine Euro Area countries. It emerges clearly the wide fluctuations for Ireland, as well as the strong decline in the Greek cyclical component.

Figure 3: Hodrick and Prescott filter, cyclical components (1990-2010)



Nevertheless, the oscillations experienced by this second group of countries appear to be more restrained if compared to the previous one.

## 5. Conclusions

The purpose of this paper is to contribute to the literature on the relationship between GDP and public spending at a disaggregated level, using recent econometric techniques. Wagner's Law is empirically tested employing panel data methods for Euro Area countries. To this extent, we have studied the relationship between real per capita GDP and ten different items of real public spending (according to the COFOG functional classification), using annual data for the period 1990-2010. The properties of the data have been assessed using group-wise heteroscedasticity, panel cross-dependence, and unit root tests. Empirical results indicate that eight out of twelve series are clearly an *I(1)* process (real total general government expenditure, real spending for general public services, for economic affairs, and for environmental protection). Furthermore, cointegration analysis has revealed that only three out of ten spending series (for defence, for housing and community amenities, and for recreation, culture and religion) share a clear common trend – and a long-run relationship – with real aggregate income. Granger causality tests results show evidence in favour of Wagner's Law (Y→G) in five countries: Austria, Germany, the Netherlands, Portugal, and Spain. A bi-directional causality flow has been found for seven countries (Cyprus, France, Greece, Ireland, and Slovenia). Finally, for the remaining seven countries the neutrality hypothesis holds. In other words, the Keynesian proposition of government expenditure as a policy instrument to encourage and lead growth in the economy is not supported by the data for these seventeen Euro Area countries. Certainly, this result is subject to the time period examined and statistical methods used but, given the high deficits and the high public spending/GDP share maintained by countries in the last years of the period in question, not observing causality from government spending to national income is strong rejection of the Keynesian proposition (Ansari *et al.*, 1997). This is particularly discouraging for those who see government as a major actor to encourage growth in developing countries.

Moreover, since a long-term relationship between the level of output and government spending has been found for several items, short-run cuts in spending, or surges in government outlays, will eventually be erased as the government spending/GDP ratio returns to its long-term average. Special care will need to be taken to ensure that spending cuts achieved over the short-run are accompanied by longer-term structural reforms to ensure these savings are durable (Akitoby *et al.*, 2006). As suggested by Shelton (2007), the increasing share of the population over 65 is strongly supporting the growth of government spending (and thus the positive correlation with per capita GDP) in many advanced economies since greying population calls for increased social security expenditures.

The implications of our analysis are straightforward: since no item of public spending Granger-causes GDP, expenditure cuts shouldn't negatively impact on economic growth. Therefore, reallocating resources among different items of public spending might result in increased economic growth, if R&D sector is promoted (Musu, 2007). Though, if the structural knots of the European economy are not removed, even the public promotion of the R&D sector may come out ineffective (Daveri, 2006; Romagnoli, 2011). Moreover, expenditure cuts would contribute to reduce public debt, consolidating Italian public finances (Forte and Magazzino, 2011).

However, while traditional channels for the expanding role of government may be less effective, other factors may have contributed to the upholding of Wagner's law in the most recent period of relatively subdued growth in per capita GDP: from the supply-side, the increased ability of governments in collecting taxes and thus the relatively ease in financing growing expenditures; from the demand-side, the most advanced economies have witnessed an increasing demand of social security services due to fast-ageing population (Lamartina and Zaghini, 2008).

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# Appendix

Figure 4: Per Capita Real GDP and Real Total General Government Expenditure in the Euro Area countries (1990-2010)

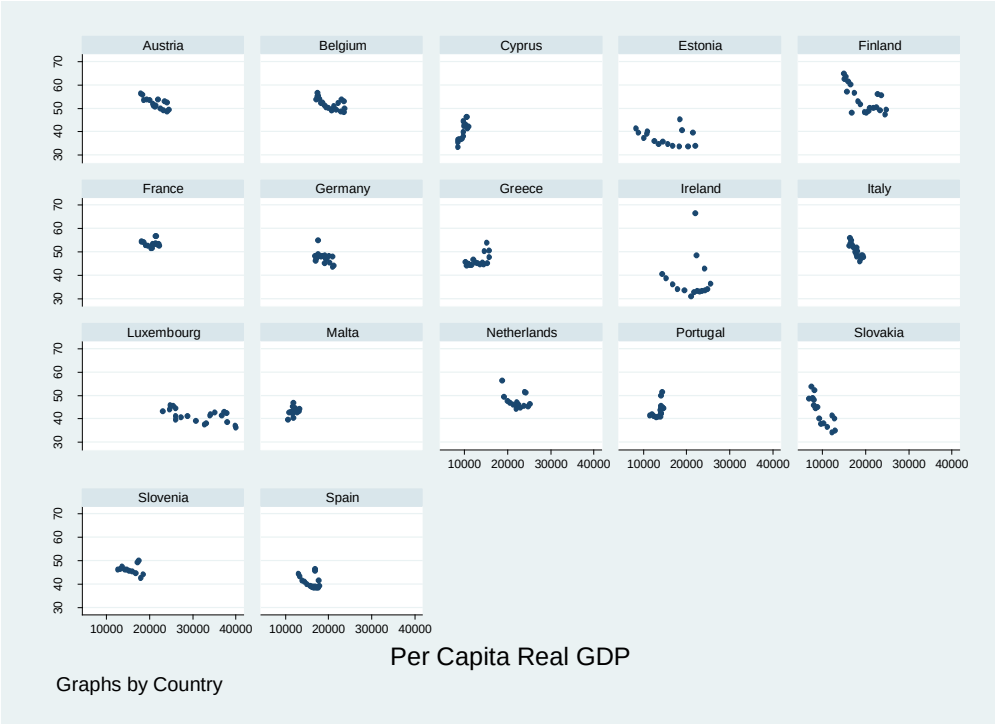


Figure 5: Spending for Defense, for Public Order and Safety, for Environment Protection, for Housing and Community Amenities, and for Recreation, Culture and Religion in the Euro Area countries (1990-2010)

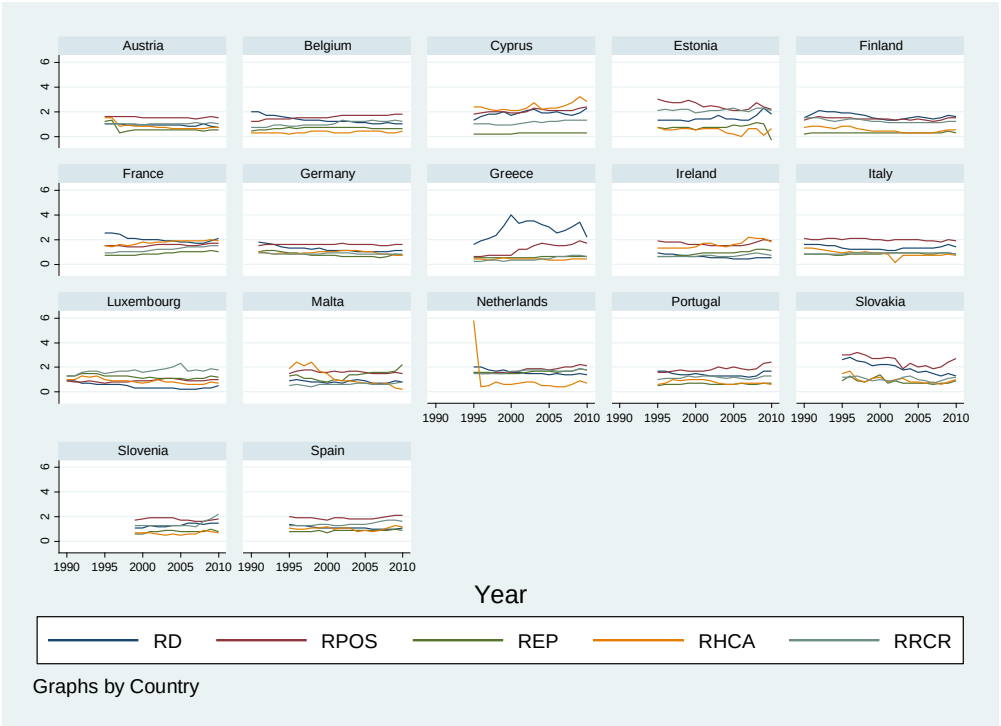

Figure 6: Spending for General Public Services, for Economic Affairs, for Health, for Education, and for Social Protection in the Euro Area countries (1990-2010)