

Long wave patterns of absolute and relative government expenditure growth: an historical cross-country perspective

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Abstract

In this study we take an historical perspective on the long-run evolution of absolute and relative growth of government expenditure using data for a sample of developed countries observed over a long time span. We find that the long-term government growth, and the relative share of government, alternate periods of increasing and decreasing government activity, rather than continuing growth. Moreover, while the long-run growth government spending is continuously expanding, the long-term relative share of government expands until WWII only. Our results suggest that the combination of alternative theories, rather than each of them taken in isolation, may provide a comprehensive explanation of long-run government expenditure. Specifically, two different explanations complementary to Wagner's law are suggested for interpreting the evolution of the long-term growth pattern of absolute and relative government spending: the "displacement effect" in the pre-WWII period, and the changing role of the state in the economy in the post-WWII period.

1. Introduction

Over the last decades we have assisted to a proliferation of studies aiming at testing the existence of a long-run relationship between government expenditure and economic activity by means of advanced statistical and econometric techniques. After Henrekson (1993), unit root tests and cointegration analysis, with and without structural breaks, have become the standard tools in this literature because of their ability to take into account the non-stationarity features of the data.

However, the (apparently) simple nature of the "law" estimated using sophisticated techniques¹, due to their rigidity in terms of fixed parameters and functional forms, conflicts with the complexity of the process at the basis of the growth of public sector economic activities (e.g. Peacock and Scott, 2000, Wagner and Weber, 1977, Durevall and Henrekson, 2011). Public expenditures decisions derive from a complex process (interplay) in which supply and demand² economic factors are mediated through political decision-making processes (Jackson, 1993). The plethora of theories used to explain variation in the secular pattern of government expenditure is symptomatic of the complexity of providing an adequate explanation of long-term growth in government spending. Moreover, the observed long-run pattern of public expenditure growth includes periods of increased economic growth, expanded public activities, war or social upheavals, different phase of economic development and several waves of technological changes.

¹ The complexity of the process is simplified to a linear long-run relationship, with or without breaks.

² The demand of public goods during the development process has changed: from the 'traditional' services of defence, law and order, (early stage of development) to the demand for education, infrastructure, social security, health systems, up to new regulatory and protective functions associated with the evolution in the structure of the economy.

Under such circumstances, relatively simple statistical approaches may be the only sensible means of discovering complex patterns. In this study, after estimating and testing the validity of Wagner's law by means of parametric and non-parametric methods, we return to the observation stage and take an historical perspective on the long-run evolution of the absolute and relative growth of government expenditure. For our purpose we use data on government expenditure and GDP for 17 developed countries between 1870 and 2013 from the historical international dataset of Jordà et al. (2017).

Since Wagner's law is based on (refers to) simple regularities detected in the expansion of government along the developmental path, we analyze the cross-country long-term evolution of the absolute and relative growth of the public sector. Specifically, we use wavelet multiresolution decomposition analysis to extract the long-term components of the growth rate of public expenditure and GDP for each country to capture the variation in the trending growth pattern of relative spending (government GDP ratio) from the late XIXth century to present.

The graphical analysis yields several findings with interesting implications for the theories of government size and empirical research. The long-term pattern of the variation of the relative share of government is characterized by long swings (alternates periods of increasing and decreasing government activity), rather than continuing expansion (Crowley, 1970), and by substantial cross-country heterogeneity in the pre-1960s period. Thereafter, the cross-country comparison shows that a substantial reduction as well as increased synchronization in the historical trends of relative government expenditures, with the striking convergence of these long-term growth rates towards the end of the sample to values between 0 and 2% for almost each country of the sample. When the long-term growth patterns of relative government expenditure are averaged across countries three long swings are detected, with the first two expansionary waves associated with each of the pre-WW's armament boom periods, and the third with the economic boom period of the 1960s-mid1970s.

Moreover, when the long-term growth of absolute government expenditure and GDP are analyzed separately we find a close correlation between long swings in absolute and relative government expenditure growth rates, but not with GDP growth whose values are generally stable around 2% (except in the period between the 1950s and the 1970s). Interestingly, in contrast to the long-term relative share of government which after expanding continuously until WWII is characterized by two decades of negative growth in the 1950s and the 1990s, the level of long-run government spending is continuously expanding. This result, although not providing a direct test of Wagner's law, provides evidence consistent with Wagner hypothesis.

These findings suggest that a comprehensive explanation of the long-run evolution of relative government spending requires considering alternative theories of government activity within a unifying framework. Thus, until WWII the "displacement effect" hypothesis may be viewed (considered) as a complementary rather than competitive explanation to Wagner's law for the long-term evolution of government expenditure growth (and the government spending GDP ratio), in the sense that large-scale social upheavals represent periods of acceleration in government spending growth. Otherwise, in the post-WWII period the most likely

complementary explanation to Wagner’s law is the changing view of the economic role of the state. Indeed, after several decades of expansion in the role of government in the 1950s and the 1960s (the golden age of public sector intervention) motivated by the presence of market failures (public goods, externalities, stabilization of the economy), in the last decades there has been a gradual reduction in government intervention and greater reliance on allocative role of the market (Tanzi, 1997).

The paper is structured as follows. Section 2 presents the data and discuss the empirical strategy. Section 3 presents the results of this study using parametric and non-parametric analysis. Section 4 exploratory analysis. Sections 5 discusses the implications of our findings for alternative hypothesis.

2. Dataset and empirical results

Empirical works studying the relationship between government expenditure and economic activity employ both a time series and cross-section framework. While the country dimension may vary from several units to more than one hundred, the temporal dimension is generally quite low, with the time span being mostly limited to a sub-sample of the post-WWII period (e.g. Ram, 1987, Wahab, 2004, Akitoby et al., 2006, Kolluri and Wahab, 2007, Lamartina and Zaghini, 2011, Bruckner et al., 2012, Afonso and Jalles, 2014). Very few studies use a longer time period, e.g. Henkerson (1993) for Sweden, Durevall and Henkerson (2011) for Sweden and the UK, Paparas et al. (2018) for the UK, Kuckuck (2012) for five western European countries. Even Oakley (1994) and Thornton (1999) use historical data from mid XIXth century for Britain and six European countries, respectively, but limiting their analysis to the pre-WWI period. The only paper that adequately exploits both the country and time dimensions is that by Easterly and Rebelo (1993) with historical data covering 26 countries from the late XIXth century.

The historical database constructed by Jordà et al. (2017), covering data for 17 developed countries from 1970 to 2017 is well behaved to adequately managing both the time and country dimensions. In particular, this sample, by including countries at similar stages of economic development that differ for demographics, trade openness, political organization (i.e. electoral rules, type of government, degree of political participation) to distinguish between alternative theories of government size such as demand-driven and supply-driven.

The two dimensions are both important for testing the validity of Wagner’s law. A time span of several decades may be unfit to allow identification of any significant structural change to be interpreted in terms of economic development, because of the long-run nature of the government expenditure-income relationship. Indeed, studies on economic development generally takes the longest possible time span in order to be able to identify different phases of economic development (Maddison, 1990).

Table 1 – The historical dataset

1870-2013	Dummy	Missing
Australia	WWI-WWII	1870-1901

Belgium	WWI-WWII	1913-1919	1940-1945	
Canada	WWI-WWII			
CHE	WWI-WWII	1870		
Deutschland	WWI-WWII	1870-1871	1914-1924	1939-1949
Denmark	(WWI)	1936		
Espain	Mid-1970s	1936-1939		
Finland	WWI-WWII	1870-1881		
France	WWI-WWII	1914-1919	1939-1949	
Great Britain	WWI-WWII			
Italy	WWI-WWII			
Japan	WWII	1870-1874	1945	
Netherlands	WWI-WWII	1914-1920	1940-1944	
Norway	(WWI)-WWII	1940-1945		
Portugal	WWI			
Sweden	(WWI)-WWII			
USA	WWI-WWII			

2.1 Cointegration analysis

Notwithstanding Wagner did not specifically mention the variable object of his hypothesis (formulation), it is generally assumed that he was referring (thinking) to trends in the ratio of government expenditure to a measure of income (see Musgrave, 1969). Thus, authors have usually explained the long-run evolution of government activity by examining the ratio of public expenditure to gross domestic product (GDP).³ Given the ambiguity in Wagner's (1883) formulation of the 'Law of Increasing State Activity', at least 6 different parametric versions have been proposed in the literature, e.g. Peacock and Wiseman (1961), Gupta (1967), Goffman (1968), Pryor (1969), Musgrave (1969), Goffman and Mahar (1971) and Mann (1980). In what follows we use the probably most common formulation of Wagner's hypothesis as suggested by Musgrave (1969),

$$\text{Government share} = \alpha + \beta (\text{per-capita GDP})$$

where the government share is measured as the log of the ratio between government expenditure and GDP in nominal terms, and the log per-capita GDP is measured in real terms. Since it is generally assumed that Wagner was referring to the trends in the ratio of government expenditure to GDP,⁴ this specification is commonly interpreted as a long-run relationship and therefore estimated using cointegration techniques. Indeed, both the

³ For an international comparison of the major trends of industrial countries, see Tanzi (1986).

⁴ As stated by Musgrave (1969, p.73, fn.1) Wagner never explicitated whether he was thinking to a trend relationship.

existence of a long-run relationship, as well as the sign, size and statistical significance of the coefficient of interest can be easily tested with cointegration analysis (Shelton, 2007, Durevall and Henrekson, 2011).

Using a very long time span may be problematic in that historical time series are likely to exhibit short-lived transient components typical of war or crisis episodes, like abrupt changes, jumps and volatility clustering. The treatment of war years may result in inclusion of war interval dummies or, with missing values, in corrections applied to original data through interpolation (Metz 1992) or a priori elimination of their impact on the assumption that such shocks can be seen as disturbances in the normal structure of data (Korotayev and Tsirel 2010).⁵ As shown in Table A1 of the Appendix 11 countries out of 17 present missing data, generally concentrated at the beginning of the sample, see Australia, Finland and Japan, and in coincidence with WWI and WWII periods, several European countries. For countries with missing data within the sample (that is Belgium, Germany, Spain, France, Netherlands and Norway) we use a wavelet-based approximation of the aggregate series which yields unbiased and consistent estimates for the intercept and slope parameters, e.g. Ramsey et al. (2010), Gencay and Gradejovic (2011) and Gallegati and Ramsey (2012). In particular, wavelet multiresolution decomposition analysis returns at each step a set of averages (along with a set of differences between adjacent averages) that being based on different window widths (or length) allow to obtain a collection of approximations of the original signal, from finer (S_1) to coarser (S_4) resolution levels (see the Appendix for details).

Given that we only have two variables, and thus there cannot be more than one cointegrating vector, we apply the Engle-Granger (1987) procedure to test for cointegration. Table 1 reports for each country the estimates of the Engle-Granger cointegrating regression and cointegration test statistics (ADF and ADF* tests) over the whole sample, 1870-2013, with time interval dummies for the WWI (1914-1919) and WWII (1940-1945) periods. In addition, we use the Gregory-Hansen (1996) procedure that allows to test for the presence of a structural break at an unknown date.

The cointegrating regression shows that the estimate of the elasticity, β , is always positive, with values ranging from 0.3 (Finland and Italy) to values greater than unity (Switzerland and the USA). The Engle-Granger test shows there is cointegration in all countries, except Finland and Portugal, with three countries (Canada, Italy and Switzerland) being significant at 10% level only. The full sample estimate seems to be supportive of Wagner's law.

Table 1 – Engle-Granger and Gregory-Hansen cointegration tests for the 1870-2013 period

1870-2013	Cointegrating regression	Dummy	ADF
Australia	$gs = -11.4 + 1.034 \text{ ypc}$	WWI-WWII	-2.12
Belgium	$gs = -8.97 + 0.811 \text{ ypc}$		

⁵ This practice, according to Freeman and Louçã (2001), would be equivalent to studying history by erasing part of the history.

Canada	$gs = -6.44 + 0.486 \text{ ypc}$	WWI-WWII	-3.84**
Che	$gs = -13.6 + 1.146 \text{ ypc}$	WWI-WWII	-3.99**
Deutsch	$gs = -8.33 + 0.661 \text{ ypc}$		
Denmark	$gs = -9.56 + 0.864 \text{ ypc}$		-4.24*
Espain	$gs = -5.28 + 0.385 \text{ ypc}$	WWII	
Finland	$gs = -5.09 + 0.398 \text{ ypc}$	WWII	-3.11
France	$gs = -5.17 + 0.384 \text{ ypc}$		
Great Britain	$gs = -9.84 + 0.907 \text{ ypc}$	WWI-WWII	-2.61
Italy	$gs = -4.59 + 0.355 \text{ ypc}$	WWI-WWII	-3.86**
Japan	$gs = -3.50 + 0.172 \text{ ypc}$	WWII	-4.52*
Netherlands	$gs = -6.98 + 0.594 \text{ ypc}$	WWI-WWII	
Norway	$gs = -8.02 + 0.712 \text{ ypc}$	WWII	
Portugal	$gs = -7.20 + 0.632 \text{ ypc}$	WWI	-2.76
Sweden	$gs = -7.53 + 0.646 \text{ ypc}$	WWII	-4.86*
USA	$gs = -12.3 + 1.074 \text{ ypc}$	WWII	-4.11*

Note: S1 approximation is used for Espana, S3 for Belgium, Netherlands and Norway, S4 for Germany and France.

Since most of the missing data are related to WWII years (1940-5), we split the sample into two sub-samples corresponding to, respectively, pre- and post-WW years. In this way we can run the analysis for all countries in the sample. Table 2 shows the estimates of the cointegrating regression and cointegration test statistics for the pre- and post-WWII periods. In the post-WWII period the estimated values of the elasticity, β , albeit always positive, are generally much lower than in the pre-WWII period. Except Denmark and Switzerland, whose values are greater than 0.75, the estimate of β is quite low, with most of the values ranging between 0.2 and 0.4. The two variables are cointegrated only for Germany and Norway, both at 5% significance level. Thus, neither the cointegrating relation nor the cointegration test, is not supportive of Wagner's law the post-WWII period, whereas for the pre-WWII period .

Table 2 – Engle-Granger cointegration tests for the pre-WWII period (1870-1939) and the post-WWII period (1955-2013)

Country	1870-1939	ADF(1)
Australia	$gs = -34.6 + 3.746 \text{ ypc}$	-2.49
Belgium	$gs = -20.4 + 2.208 \text{ ypc}$	-3.05
Canada	$gs = -4.59 + 0.250 \text{ ypc}$	-2.79
CHE	$gs = -18.5 + 1.717 \text{ ypc}$	-3.26
Deutsch	$gs = -18.8 + 1.994 \text{ ypc}$	-

		3.69***
Denmark	$gs = -6.54 + 0.488 \text{ ypc}$	-3.97**
Espain	$gs = -5.04 + 0.363 \text{ ypc}$	-3.27
Finalnd	$gs = -9.26 + 0.943 \text{ ypc}$	-4.09**
France	$gs = -5.90 + 0.490 \text{ ypc}$	-1.42
Great B.	$gs = -24.2 + 2.629 \text{ ypc}$	-3.43
Italy	$gs = -7.74 + 0.779 \text{ ypc}$	-
		3.63***
Japan	$gs = -3.84 + 0.217 \text{ ypc}$	-3.40
Nether	$gs = -7.36 + 0.636 \text{ ypc}$	-2.18
Norway	$gs = -6.56 + 0.513 \text{ ypc}$	-4.08**
Portugal	$gs = -11.6 + 1.251 \text{ ypc}$	-2.41
Sweden	$gs = -4.81 + 0.291 \text{ ypc}$	-5.24*
USA	$gs = -8.94 + 0.655 \text{ ypc}$	-4.39*

Country	1955-2013	ADF(1)
Australia	$gs = -2.82 + 0.146 \text{ ypc}$	-2.12
Belgium	$gs = -3.44 + 0.234 \text{ ypc}$	-2.06
Canada	$gs = -3.11 + 0.144 \text{ ypc}$	-2.60
CHE	$gs = -9.90 + 0.759 \text{ ypc}$	-2.84
Deutsch	$gs = -1.84 - 0.019 \text{ ypc}$	-3.98**
Denmar	$gs = -8.68 + 0.777 \text{ ypc}$	-2.28
Espain	$gs = -6.20 + 0.484 \text{ ypc}$	
Finalnd	$gs = -2.15 + 0.084 \text{ ypc}$	-2.10
France	$gs = -2.48 + 0.107 \text{ ypc}$	-2.24
Great B.	$gs = -4.01 + 0.298 \text{ ypc}$	-2.69
Italy	$gs = -5.93 + 0.495 \text{ ypc}$	-1.68
Japan	$gs = -4.56 + 0.282 \text{ ypc}$	-1.85
Nether	$gs = -1.58 + 0.035 \text{ ypc}$	-1.72
Norway	$gs = -3.52 + 0.250 \text{ ypc}$	-3.61 ***
Portugal	$gs = -6.79 + 0.584 \text{ ypc}$	-2.43
Sweden	$gs = -5.31 + 0.421 \text{ ypc}$	-1.80

USA $gs = -3.35 + 0.172 \text{ ypc}$ -2.52

Table 3 shows the estimates of the cointegrating regression and cointegration test statistics for two periods, 1946-1974 (the after-WWII period) and 1975-2013, based on the findings of previous literature (e.g. Durevall and Henrekson, 2011). In the post-WWII period the estimated values of the elasticity, β , albeit always positive, are generally much lower than in the pre-WWII period. Except Denmark and Switzerland, whose values are greater than 0.75, the estimate of β is quite low, with most of the values ranging between 0.2 and 0.4. The two variables are cointegrated only for Germany and Norway, both at 5% significance level. Thus, neither the cointegrating relation nor the cointegration test, is not supportive of Wagner's law the post-WWII period.

The results are also less supportive of Wagner's law after the 1970s, the period most widely examined in the recent empirical literature, The estimate of β is mostly negative, in striking contrast with what expected on the basis of Wagner's hypothesis., and the cointegration test indicate the presence of cointegration for one country only, the Netherlands. Interestingly, and differently from previous findings there is less dispersion between the estimated values of the elasticity across countries.

Table 3 – Engle-Granger cointegration test for the post-WWII period:1946-1974 and 1974-2013

Country	1970-2013	1974-2013	1980-2013
Australia	$gs = 0.06 - 0.146 \text{ ypc}$	$gs = 1.64 - 0.305 \text{ ypc}$	$gs = 2.26 - 0.367 \text{ ypc}$
Belgium	$gs = 0.43 - 0.160 \text{ ypc}$	$gs = 2.92 - 0.412 \text{ ypc}$	$gs = 5.70 - 0.691 \text{ ypc}$
Canada	$gs = 2.84 - 0.456 \text{ ypc}$	$gs = 5.30 - 0.703 \text{ ypc}$	$gs = 8.00 - 0.972 \text{ ypc}$
CHE	$gs = -10.2 + 0.772 \text{ ypc}$	$gs = -8.21 + 0.592 \text{ ypc}$	$gs = -9.94 + 0.763 \text{ ypc}$
Denmark	$gs = -2.98 + 0.202 \text{ ypc}$	$gs = -1.21 + 0.024 \text{ ypc}$	$gs = 1.99 - 0.297 \text{ ypc}$
Deutschland	$gs = -0.98 - 0.107 \text{ ypc}$	$gs = 0.02 - 0.209 \text{ ypc}$	$gs = 0.02 - 0.210 \text{ ypc}$
Espain	$gs = -5.69 + 0.430 \text{ ypc}$	$gs = -4.48 + 0.304 \text{ ypc}$	$gs = -0.42 - 0.118 \text{ ypc}$
Finland	$gs = -2.98 + 0.168 \text{ ypc}$	$gs = -2.81 + 0.152 \text{ ypc}$	$gs = -0.93 - 0.038 \text{ ypc}$
France	$gs = -3.16 + 0.176 \text{ ypc}$	$gs = -1.60 + 0.019 \text{ ypc}$	$gs = 1.52 - 0.297 \text{ ypc}$
Great Britain	$gs = -2.90 + 0.185 \text{ ypc}$	$gs = -1.98 + 0.092 \text{ ypc}$	$gs = -1.81 + 0.075 \text{ ypc}$
Italy	$gs = -2.80 + 0.172 \text{ ypc}$	$gs = 0.67 - 0.184 \text{ ypc}$	$gs = 8.70 - 1.006 \text{ ypc}$
Japan	$gs = -5.21 + 0.349 \text{ ypc}$	$gs = -3.87 + 0.213 \text{ ypc}$	$gs = -3.49 + 0.175 \text{ ypc}$
Netherlands	$gs = 1.20 - 0.246 \text{ ypc}$	$gs = 3.21 - 0.449 \text{ ypc}$	$gs = 4.99 - 0.628 \text{ ypc}$
Norway	$gs = -1.65 + 0.062 \text{ ypc}$	$gs = -1.46 + 0.043 \text{ ypc}$	$gs = -1.46 + 0.043 \text{ ypc}$
Portugal	$gs = -6.06 + 0.506 \text{ ypc}$	$gs = -3.79 + 0.265 \text{ ypc}$	$gs = -1.09 + 0.007 \text{ ypc}$

Sweden	$gs = -1.94 + 0.080 \text{ ypc}$	$gs = -0.49 - 0.066 \text{ ypc}$	$gs = 1.05 - 0.221 \text{ ypc}$
USA	$gs = -2.14 + 0.052 \text{ ypc}$	$gs = -1.35 - 0.024 \text{ ypc}$	$gs = -0.18 - 0.140 \text{ ypc}$

4. Exploratory analysis of the long-term growth rate pattern of absolute and relative government expenditure

The sophistication of statistical and econometric analysis, both parametric and non-parametric, allows to take into account the statistical features of the data,⁶ such as non-stationary and non-linearity, but at the cost of assuming a simple explanation for the long-term evolution of the government spending ratio. However, several scholars (e.g. Wagner and Weber, 1977, and Durevall and Henrekson, 2011), casts serious doubts on simple explanations for the long-run evolution of relative government spending, although estimated using the most sophisticated econometric and statistical methods (e.g. Wagner and Weber, 1977, Durevall and Henrekson, 2011). Any rigorous quantitative formulation in this field is likely to encounter (strong) limitations as budgetary decisions, representing the most visible quantified (economic) measure of government activity, are the result of the complex interaction between economic and non-economic factors, i.e. political decision-making processes.

Not to mention the problems related to the ambiguity in Wagner's (1883) formulation of the 'Law of Increasing State Activity'.⁷ As Wagner did not specifically mention the variable object of his hypothesis (formulation), authors have usually explained the growth of public expenditure over time by examining the evolution in the ratio of public expenditure to gross domestic product (GDP).⁸ Government spending as a share (percent) of GDP is the measure that researchers usually look at when studying Wagner's law. This ratio can change due opposite patterns: government can grow in relative terms either because the government growth has accelerated relative to GDP growth or due to a decline in the rate of growth of GDP relative to government expenditure. Therefore, in what follows we analyze the growth rate of absolute and relative government expenditure GDP. Since Jordà et al. (2017) dataset includes data for government expenditure (nominal, local currency) and real GDP per capita (PPP), we calculate the growth rate of government expenditure deflated the consumer price index and the growth rate of real GDP per capita (PPP) multiplied by total population in real terms.⁹

⁶ See Henkerson's (1993) insights on the spurious nature of the results supporting Wagner's law, due to the non-stationary features (properties) of variables.

⁷ This ambiguity is also reflected in the proliferation of empirical studies aiming at testing the validity of Wagner's law which differ (among them) for a number of features such as the specification of the "government" variable, the time span and the set of countries.

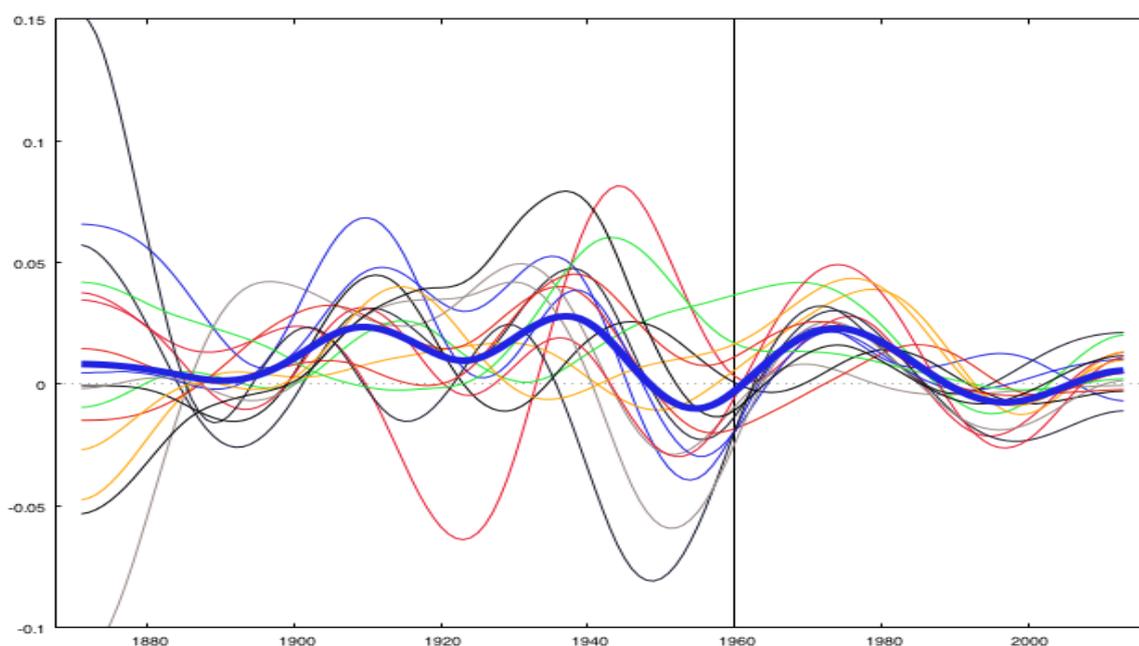
⁸ For an international comparison of the major trends of industrial countries, see Tanzi (1986).

⁹ The real growth rate of government expenditure provides a measure that reflect better than that in nominal terms the allocation of resources to government (Libeck and Henrekson, ...).

Figure 2 shows the difference between the long-term trend of the growth rate of the government expenditure and GDP in real terms for each country from 1871 to 2013, with the components extracted using the MODWT applying the LA(8) Daubechies filter with reflecting boundary conditions. This difference provides us with evidence on the evolution (variation) of the long-term growth rate pattern of the relative government spending for each country.¹⁰ Two main findings emerge from the visual inspection of Figure 2: the wave-like pattern of the long-term growth rate of the government expenditure GDP ratio (Crowley, 1970), and the clear break in the cross-country long-term pattern (marked by a black vertical line). In particular, the substantial cross-country heterogeneity typical of the pre-1960s period is followed by a period of high synchronization among countries in the long-term growth pattern of relative government spending.

Given the high degree of cross-country heterogeneity of the long-term patterns in the first part of the sample, Figure 2 shows a thick blue line representing the cross-country average historical trend of the relative growth of the government share. Three long swings are now clearly detected with peaks occurring in 1910s, late 1930s, and early 1970s. The first two expansionary waves precede each of the two WWs and correspond to periods of preparations for war (pre-war armament booms). The 3rd, covering a period of 30-35 years after WWII, coincides with the stimulus given to the economy by governments involved in the reconstruction effort after WWII and culminated in the boom of the 1960s. Finally, following the peak of the early 1970s we assist to a reduction in the public expenditure growth relative to GDP that culminates in the trough of the early 1990s, then followed by a small increase in the first decade of the XXIst century.

Figure 2 – Long-term growth rate in government expenditure GDP ratio for each country (thin colored lines) and cross-country average (thick blue line) from 1871 to 2013



¹⁰ Recall that the growth rate of a ratio is approximately equal to the difference of the growth rates of the numerator and denominator.

Figures 3 and 4 show the long-term pattern of the growth rate of real government expenditures and real GDP, respectively, for each country, with the red line representing the cross-country average historical trend of the two variables. When analyzing the long-term growth rate pattern of government expenditure and GDP separately we find similarities and differences. The long-term trend pattern of both variables shows a striking reduction in its cross-country heterogeneity after the 1960s, more evident for absolute government expenditure than for GDP, and increased synchronization, starting after the 1960s for government expenditure and after the 1950s for GDP. Moreover, since the 1970s the long-term trends of the two variables show a strikingly similar declining pattern,¹¹ with real government expenditure stabilizing its growth rate within the 0-2% range (except and the US) and real GDP values mostly concentrated within the 0-1% range.

The most interesting difference stems from the comparison between the patterns of red lines in Figures 3 and 4 with the blue solid line in Figure 2 that reveals how the long swings in the growth rate of public expenditure resemble very closely the long wave growth rate pattern of relative public spending.¹² By contrast, the long-term pattern of GDP growth rate displays a quite uniform pattern over the whole sample with a unique large peak in the early 1960s. Thus, the growth rate of government expenditure may be considered the key variable for capturing long-term variations in the public sector share of GDP. Other minor differences refer to the greater variability of the long-term growth rate pattern of government spending with respect to its GDP counterpart,¹³ and the increasing divergence among GDP growth trends across countries in the new century. This last finding, excluding boundary problems, represents an inversion of the tendency to higher synchronization that characterized GDP patterns in the 2nd half of the XXth century, a timing that is consistent with different effects of globalization on individual countries' economic growth.

Figure 3 – Long-term trends of the growth rate of real government expenditure from 1871 to 2013

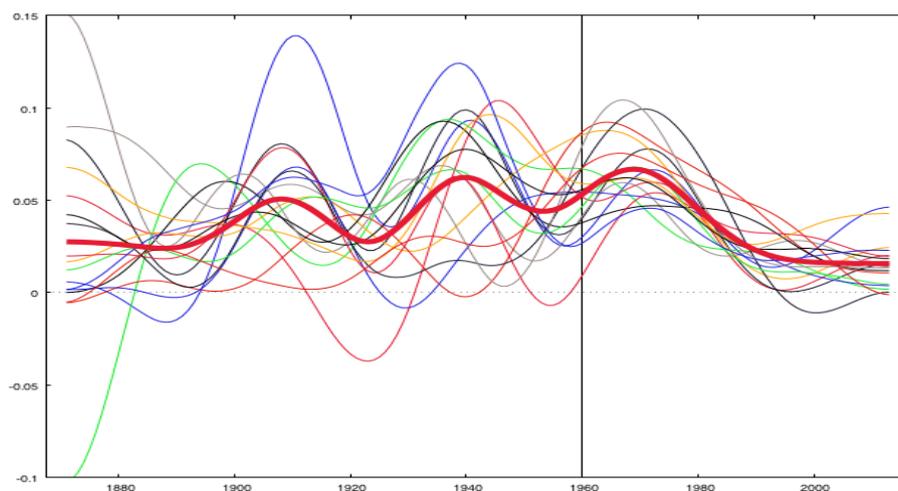
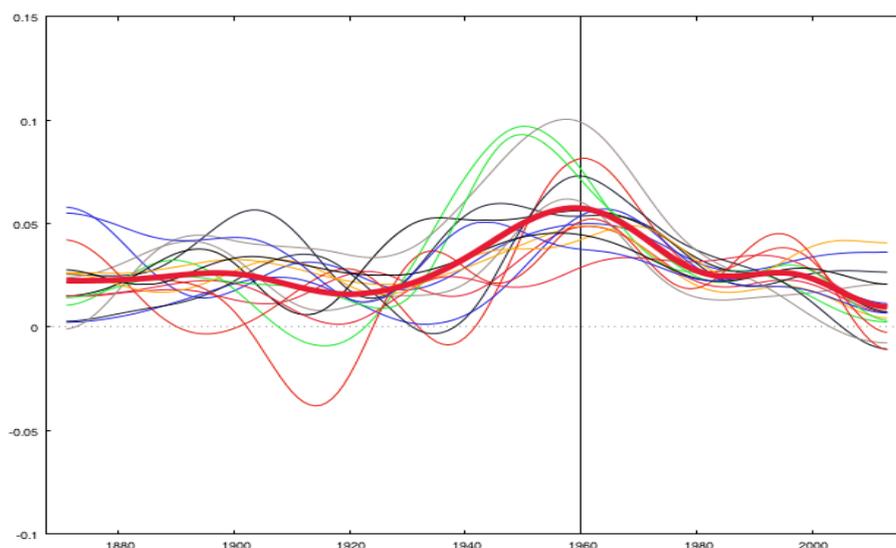


Figure 4 – Long-term trends of the growth rate of real GDP from 1871 to 2013

¹¹ The declining pattern starts in the 1960s for the long-term growth rate of real GDP.

¹² The value of the contemporaneous correlation is 0.61.

¹³ Real GDP growth rate values are mostly concentrated in the 0-5% range.



To summarize, the visual inspection of the (long-term pattern) historical trend of the growth rate of government expenditures, both individually and in relation to GDP, provides several interesting findings: i) notwithstanding substantial cross-country heterogeneity until late 1950s, several expansionary waves are clearly detectable in coincidence with pre-WWs armament booms and; ii) the cross-country variation tends to decrease dramatically after the 1960s along with increased synchronization.

5. Robustness analysis

Government expenditure and the size of government display a great diversity among countries according to the definition adopted: central vs local. The ratio between government expenditure and GDP can vary significantly among countries, from 20% to 50% in function of the definition used. In Figure 5 we present the long-term growth rate in government expenditure GDP ratio and government expenditure using a different definition and a different source of data for public spending.

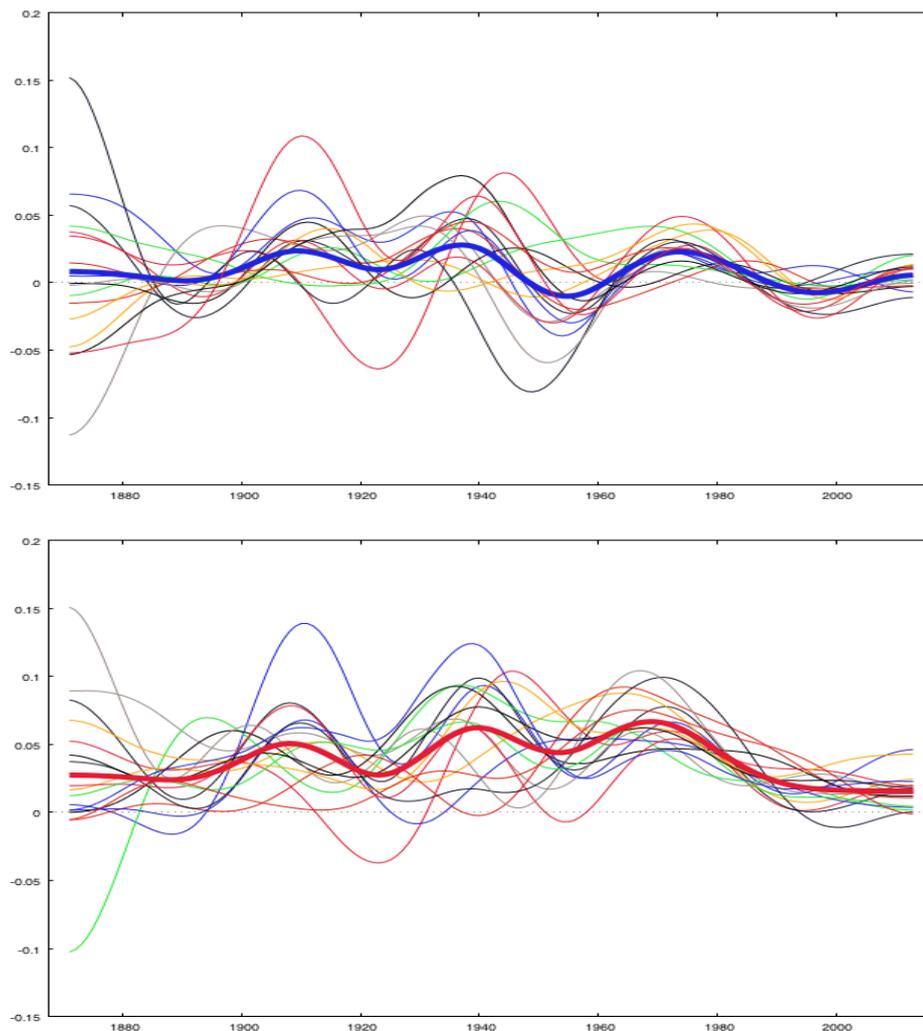
The results confirm the main findings previously reported: the wave-like long-term growth pattern of relative government expenditure is determined by absolute government expenditure, with the three expansionary waves corresponding to pre-WW armament booms and to the golden age of public-sector intervention. These findings may be considered a robustness test of the exploratory results provided in the previous section.

Their definitions and coverage differ somewhat from each other but both dataset give essentially the same qualitative picture of trends in public expenditure. The rapid expansion in the absolute and relative size of the public sectors took place between 1960 and 1980 as a result of the positive attitude towards an interventionist role for government and the introduction (expansion) of welfare state (and Keynesian) policies.

Following the identification of the shortcomings associated to governmental intervention by public choice theorists the view on the economic role of the state has changed since the

1980s, with both the absolute and relative growth in public spending and GDP slowing down. Regulatory activities are replacing direct production of services and price controls within the objectives of public policy. This has more to do with the growth in GDP than the reduction in the absolute size of public spending.

Figure 5 – Long-term growth rate in government expenditure GDP ratio (top panel) and government expenditure (bottom panel) for each country (thin colored lines) and cross-country average (thick blue and red lines) from 1871 to 2013



5. Discussion and conclusion

The long-term growth rate pattern of absolute and relative government spending has interesting implications for theories and empirical studies aiming at explaining the long-run evolution of government activity, especially in the view of the (apparent) contrast between the variety and plurality of theoretical approaches and the consensus emerging on the empirical side.

In the recent literature, cointegration analysis has become the standard approach to investigate the existence of a long-run relationship between economic development and government activity because of its ability to manage the non-stationarity properties of the data. However, the simplicity of the theoretical relationship assumed by cointegration

analysis contrasts (seems to be at odds) with the complexity of the relationship to be estimated. The substantial variation occurred in the long-term growth rate pattern of absolute and relative government spending casts serious doubts on any attempt to estimate over very long time spans econometric models expressed in terms of fixed parameters and fixed structural equations, unless one takes as estimation period the years from 1960s onwards when a striking convergence in the pattern is observed across countries. Since this is the period mostly used in the literature to detect the existence of a long-run relationship between economic development and government activity, it is not difficult to believe that researchers performing panel cointegration tests could easily find evidence of the presence of a long-term relationship between government expenditure and economic growth using data for the last 30-40 years.¹⁴

A wide range of hypotheses, and associated variables, has been proposed for explaining the historical evolution of the role of the public sector, and especially its absolute and relative expansion along the development process. Wagner's (1883, 1892, 1911) formulation of the 'Law of Increasing State Activity',¹⁵ was followed by Peacock and Wiseman's (1961) displacement effect and Bird's ratchet effect (1971, 1972), Musgrave's (1969) stages of development approach, and, later, Rodrik's (1998) theory of trade openness, Alesina and Wacziarg (1998) theory of country size, and the theories on the role of political organization in terms of electoral rules, type of government, and degree of political participation (Persson and Tabellini, 1999, and Milesi-Ferretti, Perotti and Rostagno, 2002).

The variety and plurality of the theoretical approaches reflect the view that theories are alternative each other. However, the graphical evidence presented in the previous section shows that each theory, taken in isolation, cannot explain the observed long-run evolution of relative government spending, although a combination of them can. In particular, the different long-term growth rate pattern between the pre- and post-WWII period suggests that to combine Wagner's law with two different theories: the displacement (Peacock and Wiseman, 1961) and the ratched effect hypotheses (Bird, 1971, 1972), and the shift of the vision on the benefits of government intervention (Tanzi and Shuknecht, 2000, Tanzi, 2005), respectively. The pre-WWII evidence, characterized by expansionary long waves corresponding to pre-armament boom periods, is consistent with the view that government expenditure tends to evolve in a steplike pattern represented by an acceleration of the growth rate occurring around periods of social upheaval such as the two WWs period.

For the interpretation of the post-WWII evidence, with the expansionary wave in the growth rate of government activity between early-1950s and late-1960s, the golden age of public-sector intervention, and the associated governmental services (Tanzi and Shuknecht, 2000), followed by a slowing that is still lasting, as the growth rate of public spending is now stabilized in the 0-2% range, we can refer to the characteristic of our sample. Given that our study includes countries at comparable stages of economic development differing to

¹⁴ However, the existence of cointegration cannot be used to confirm the validity of Wagner's law given the decreasing pattern of both variables.

¹⁵ Wagner's law is based on the simple regularities detected in the growth of government along the developmental path, represented by an absolute and relative expansion of the public sector within the national economy.

(country-specific) features related to population, size, trade openness, inequality, political organization (i.e. electoral rules, type of government, political participation, federalism), etc., we conclude that neither demand-driven nor supply-driven theories of government size allow to explain the common pattern displayed by the absolute and relative government expenditure long-term growth rate in the last 50 years. A plausible explanation for the fall in public spending growth is the shift away from public-sector interventionism due to the influence of neo-liberal ideas occurring in the 1980s.¹⁶

Our findings show the limitations encountered by any quantitative analysis that aims at verifying the outcome of an evolutionary process such as government activity, but also the ability of simple exploratory analysis to detect the complexity of its long-term growth rate pattern.

These findings, beyond confirming the complexity of the long-term growth pattern of government expenditure, suggest that researchers should concentrate more on (groups of) theories of the dynamics of the public sector with the ability to explain both increasing and decreasing periods of public expenditure growth rather than on the search for increasingly sophisticated estimation and testing procedures to test simple explanations.

5. References

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¹⁶ The Public School Choice (Buchanan, 1975) questions the need for public sector intervention by emphasizing how market failures are simply replaced by government failures in its attempt to correct market shortcomings.

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