Testing threshold cointegration in Wagner's Law: The role of military spending

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ABSTRACT

This paper analyses historical data since the mid-19th century to find support for Wagner's Law in the Italian economy. Unlike previous studies, we accommodate possible nonlinear asymmetric effects of government spending and GDP towards their long-run equilibrium. The results reveal a threshold cointegrating relationship between the two variables with significantly different error correction adjustments in normal and extreme regimes. A long-run tendency for the public sector to grow relative to GDP from 1862 to 2009 is observed only when nonlinearities generated by temporary higher military spending during wars are take into account.

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1. Introduction

The provision of public goods and services to citizens using the central state's fiscal capacity implies that government expenditure underwent constant growth during the 20th century, despite institutional and cultural differences (Tanzi and Schuknecht, 2000). A simple explanation for the long-run determination of public spending was proposed by Wagner (1883) and is known as Wagner's Law (henceforth WL). WL states that a positive relation exists between level of economic development and scope of government. State expansion is driven by a growing demand for defence, public investment in infrastructures, education and wealth, but also for the regulation and enforceability of contracts which arises as a society becomes more complex.

These processes are not rigorously derived from a context of individual utility maximization. Some exceptions exist in WL literature. In a public choice framework, Meltzer and Richard (1981), Persson and Tabellini (1990) and Lindert (1994, 2004a,b) propose an economic foundation for WL, in which WL emerges as a game between government and electorate. Governments tailor expenditure policies towards satisfying the median voter and this behaviour induces a relationship between public spending and national income. An alternative theoretical foundation of WL emerges as a Principal-Agent problem. As pointed out by Oxley (1994), bureaucrats are rational utility maximizers that derive utility from power and prestige and expand the size of their bureaus at the expense of efficiency. While the microeconomic foundations of WL are rarely discussed, a large number of studies focus on an empirical assessment of WL from different perspectives and applying different techniques. For recent overviews see Durevall and Henrekson (2011), Kuckuck (2014) and Narayan et al. (2008, 2012).

Generally speaking, an empirical strategy to investigate the relationship between public spending and economic growth involves the detection of causal links in a long-run perspective. Most examples

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in the literature start from an analysis of a bivariate error-correction regression model when a long-run relationship is observed between the variables of interest. Causality is then discussed applying a Granger bivariate causal structure. Such linear long-run relationships have been called into questioned in various ways. Only a few studies model structural breaks to evaluate shifts in the long-run; others test for positive or negative deviations from the trend in the short-run, implying asymmetric adjustment in the long-run (see Durevall and Henrekson (2011)).

The present study aims to detect any endogenous nonlinearities within an analysis of the long-run relationship between the variables of interest. The specific purpose is to contribute to the analysis of WL within the Italian economy based on historical time series from 1862 to 2009. Italy is an interesting case-study because it was a late-comer to industrialization that caught up in the late 19th century and then exhibited an excellent economic performance that enabled it to join the G7 group in the 1970s. This long time span is considered to be an appropriate framework for empirically assessing WL since it captures the evolution of government expenditure in response to the country's social and economic progress. Over such a long period, Italy underwent a number of economic and socio-political changes that represent potential sources for nonlinearities in the data including WWI and WWII, the Great Depression, and the socio-political turmoil of the post-war period. Such events might be the causes of different asymmetric responses in government spending to variations in national income. If this is the case, failure to take these data features into account could induce biased empirical results and misleading conclusion.

The main contributions of the paper are the following. Firstly, unlike previous studies, nonlinear cointegration is considered in order to analyse WL. The methodology of Hansen and Seo (2002) is applied to incorporate the possibility of threshold effects in the cointegrating relationship, nesting linear cointegration and allowing for the potential existence of one or more regimes. Secondly, support for WL in the Italian case over the period 1862–2009 can be identified only when the strong asymmetric responses of government spending during WWI and WWII are taken into consideration. Robustness checks recognize nonlinear behaviour of government spending driven by temporary higher military expenditure. Hence, the presence of asymmetric adjustments in the response of government spending may explain why the bulk of empirical evidence concerning WL is inconclusive. Finally, our paper also differs from existing studies of Italy because it relies on up-to-date series of national income and public spending provided on the occasion of the 150th anniversary of Italy's unification. The research department of the Bank of Italy, together with academics from other institutions, presented a reconstruction of new Italian national historical accounts, now in Baffigi (2015). These new series were the basis for the recently published *Oxford Handbook of the Italian Economy since Unification* (Toniolo, 2013), a volume including eighty-five pages of quantitative data on the Italian economy since 1861. Italy's State General Accounting Department also published a special issue on total government expenditure and on its specific economic and functional items (actual payments in fiscal years) since Italy's political unification (RGS, 2011). Broadly speaking, our data differ from existing literature (e.g., Magazzino (2012) and Kuckuck (2014)) which uses either shorter time spans or not-revisited historical data or different public accounting methods (actual payments vs accrued expenses). Note that in the sequel, we intend to detail the differences between the new series on national income and public spending and those used by recent papers testing WL for Italy.

The paper is organised as follows. Section 2 provides an overview of the empirical literature regarding WL. The econometric framework in relation to linear and nonlinear cointegration is described in Section 3. Section 4 describes the data in detail and comments on some stylized facts. Section 5 presents the empirical results. Robustness checks are presented in Section 6. Section 7 concludes and offers suggestions for future research.

2. Wagner's Law

The long-run relationship between the size of the public sector and economic growth remains an important stylized fact accepted in the literature of public economics. Wagner (1883) offers a simple explanation for this: the growth of government expenditure is a consequence of the expansion of the state driven by a country's social and economic development. The urbanization and greater division of labour that accompany industrialization require, for example, more government regulation and higher expenditure on contractual enforcement and law and order. Other causes are the growing need to finance large-scale investments of benefit to the general public (i.e. infrastructures) and the supposed superior income-elasticity of publicly provided goods and services, such as education, welfare, but also national security or defence.

In line with Wagner's conception of a developing society, North (1985, p. 392) stresses the role of technological progress: " technological changes have led to an enormous increase in specialisation and division of labour, and therefore a radical change in relative prices which fundamentally altered the traditional structure of the polity, the family, and economic organisation. The variety of interest groups that emerged from this expanded division of labour led to political pluralism. The demand for new institutional forms of organisation to replace functions previously undertaken by the family and traditional economic organisation could not be completely realized by voluntary organisations because of moral hazard, adverse selection, and the demand for public goods".

Most of the empirical literature focuses on developed or developing economies over relatively short time spans, generally starting from the 1960s. The majority compare the results for industrialized and emerging economies in order to confirm the relationship between level of development and WL, although there are significant differences between a modern state in the 19th century and recent developing economies, in terms of culture, institutions and the conception of the state's role.

By contrast, the analysis of WL in a long-run perspective, for a single country or countries with similar social, economic and political conditions has attracted much less attention. Few studies analyse very long time spans and generally reject WL. Henrekson (1993) and Bohl (1996) find no support for WL in Sweden from 1861 to 1990 or in the United Kingdom from 1870 to 1995, respectively; Ghate and Zak (2002) do not find any empirical evidence in the United States from 1929 to 2000; Durevall and Henrekson (2011) find direct evidence in favour of WL only for Sweden and the United Kingdom for a time period from around 1860 to 1970. There are, however, shorter time spans during which WL holds. For example, Oxley (1994) for the United Kingdom, Thornton (1999) for Denmark, Germany, Italy, Norway, Sweden, and the United Kingdom, and Durevall and Henrekson (2011) for Sweden and the United Kingdom confirm the validity of WL in the 50 year period preceding World War I. Recently, Kuckuck (2014) examines UK, Denmark, Sweden, Finland and Italy, finding that a long-run equilibrium between public spending and economic growth does exist but WL is seen to be more valid during the early stages of development.

In order to test WL, the literature assumes different functional forms linking public spending and national income. The present paper applies the following specification

$$g_t = \alpha + \theta\, y_t \tag{1}$$

where g is the logarithm of total government expenditure in nominal terms as a share of nominal GDP, and y is the logarithm of real