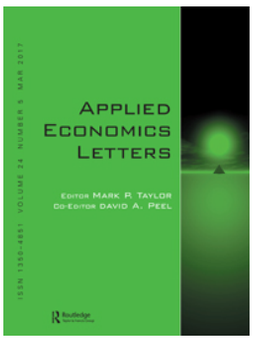

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Applied Economics Letters

ISSN: 1350-4851 (Print) 1466-4291 (Online) Journal homepage: https://www.tandfonline.com/loi/rael20

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To cite this article: António Afonso & José Alves (2017) Reconsidering Wagner's law: evidence from the functions of the government, Applied Economics Letters, 24:5, 346-350, DOI: 10.1080/13504851.2016.1192267

To link to this article: https://doi.org/10.1080/13504851.2016.1192267

APPLIED ECONOMICS LETTERS, 2017
VOL. 24, NO. 5, 346–350
http://dx.doi.org/10.1080/13504851.2016.1192267

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Reconsidering Wagner's law: evidence from the functions of the government

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ABSTRACT
We revisit Wagner's law by function of government expenditure. Using data of 14 European countries between 1996 and 2013, we apply panel data and SUR methods to assess public expenditure–income elasticities. We find that some functions of government spending for a few countries (e.g. Austria, France, the Netherlands and Portugal) validate Wagner's law. For the Netherlands, expenditures with environment protection increase more than proportionately to economic growth, and for France that is the case of spending in housing and community amenities. In addition, Greece is the only country where two public spending items react more than one to one to growth.

KEYWORDS
Fiscal policies; government spending; SUR estimation; Wagner's law

JEL CLASSIFICATIONS
C33; E62; H50; O47.

I. Introduction

The role of the state in the economy has been a recurring debated subject, between politicians and the academic community. The different perspectives about the government effect on macroeconomic dynamics has led to the analysis of government spending effects on economic activity.

The German economist Adolph Wagner in 1883 highlighted patterns in the relationship between the increase of public expenditures and economic growth, his so-called 'Law of increasing state activity'. According to Peacock and Scott (2000), this law refers to an absolute and relative increase of the government within the economy, namely an expansion on providing defence, administrative, law, and education and welfare services, among others.

We assess government expenditures' response to an increasing economic activity, namely to verify an empirical validation of Wagner's law by dissecting the expenditures by function of government, via the Classification of Functions of the Government (COFOG) nomenclature.

Our results show that, when we analyse the various function of government expenditure, there are some evidences of Wagner's law. Specifically, and analysing the behaviour of public expenditures of individual countries of our sample, we find that some countries such as Austria and France highlight some patterns which suggest the validation of the law.

The remaining of this article is organised as follows. Section II provides the literature review. Section III presents the methodology, the data and sources. Section IV provides the empirical analysis. The last section presents the conclusions.

II. Literature

Regarding earlier the articles studying Wagner's law, we can mention Ram (1987) who find no support for the law for a set of 115 countries during 30 years. Bairam (1995) finds that only government spending not related with defence supports the verification of the law for the US.

Wahab (2004) splits the government expenditure–economic activity relationship between periods of strong and weak growth, finding a limited evidence of Wagner's law. Akitoby et al. (2006) determine a long-term relationship between economic activity and public expenditure, using data of 51 countries for 32 years. Kolluri and Wahab (2007) formulate a new methodology to test Wagner's law, and give support to Wagner's law for OECD countries but not for EU countries.

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The opinions expressed are those of the authors and not necessarily those of the respective employers.

Shelton (2007) disaggregates the various rubrics of public spending and argues that the empirical validations depend upon the preferences of fiscal policies set by governments. Furthermore, Durevall and Henrekson (2011) study the ratchet effect hypotheses for Sweden and UK since the XIX century until 2006, and mostly find no long-run evidence of Wagner's result.

Magazzino (2011) studies the connection between spending and growth for Italy during 20 years at a disaggregated level, concluding that economic affairs and education favours the law. For a 23 OECD countries (1970–2006), Lamartina and Zaghini (2011) conclude that the poorer the country is, the higher is the elasticity between public expenditures and economic growth, and also support the Wagner's perspective. Brückner et al. (2012) use panel data techniques and validate Wagner's phenomenon only when considering the upper bound for long-run estimations of income-government spending elasticity.

Kumar, Webber, and Fargher (2012) study the issue for New Zealand for 47 years, and concludes for the law verification. Afonso and Jalles (2014) study the causal relationship between spending and growth for 155 countries over 30 years. The conclusions support the idea of a GDP per capita causality on government expenditures and, furthermore, the existence of Wagner's law.

Kuckuck (2014) studies the validity of the law for five countries, concluding that the stronger is the evidence of Wagner's phenomenon, the lower is the development stage of each country. Lastly, Fedeli (2015) assesses the linkage between regional per capita health care expenditures and per capita GDP for the Italian case between 1982 and 2009, reporting evidence of Wagner's law.

III. Methodology and data

Methodology

We assess Wagner's law using two approaches. First, we will apply a panel data methodology to compute the relevant coefficient regarding the law. In this framework, we use three data sets: 1) full sample; 2) periods with an economic growth rate at or above its trend and 3) periods with an economic growth below its trend. In the second approach, we apply a SUR estimation, distinguishing each function of government expenditure–economic growth elasticity for every country in our sample. In the SUR approach, we do not split between above and below economic growth time trend.

Therefore, our regression for each function of government expenditure (GOVEXP) and for both approaches, for country i ($i = 1, \ldots, N$) at time t ($t = 1, \ldots, T$), is represented in the following form:

$$\Delta \mathrm{GOVEXP}_{i,t} = \gamma + \beta \Delta \mathrm{RGDP}_{i,t} + \eta_i + \varphi_t + \varepsilon_{i,t} \quad (1)$$

where η_i, φ_t are the country-specific and time effects, respectively, and $\varepsilon_{i,t}$ is the independent errors across countries. For Wagner's law validation we may obtain a statistical significance of an elastic symmetric relationship between government expenditure and economic growth, which would imply in our case that $\Delta \mathrm{GOVEXP} \geq \Delta \mathrm{RGDP}$, i.e. the estimated regression coefficient of real GDP must be greater or equal than one ($\beta \geq 1$).

For the first approach, we estimate (1) with 2SLS and the White diagonal covariance matrix, in order to control for possible endogeneity problems and in order to assume a residual heteroscedasticity, respectively.

Data

The model is estimated for the period between 1996 and 2013 for 14 European countries: Austria (AT), Belgium (BE), Denmark (DK), Finland (FI), France (FR), Germany (DE), Greece (GR), Ireland (IE), Italy (IT), the Netherlands (NL), Portugal (PT), Spain (ES), Sweden (SE) and the United Kingdom (UK).

Our data was retrieved from International Monetary Fund sources. For the data regarding the evolution of economic activity, we use the annual growth rate of gross domestic product at constant prices (RGDPGR) from World Economic Outlook. From the Government Financial Statistics, we use the annual growth rate of the following statistics of expenditures by function of government in percentage of GDP: culture, recreation and religion (CUL); defence (DEF); economic affairs (ECO); education (EDU); environment protection (ENV); health (HEA); housing and community amenities (HOU); public order (PUBOR); expenditures on general

Table 1. Summary statistics for the panel – 1996–2013 (annual growth rates).

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
RGDPGR	1.87	2.85	−8.86 GR (2011)	11.18 IE (1997)	252
CUL	1.42	10.64	−44.44 SE (2000)	50.00 DE (1997)	251
DEF	−1.35	8.24	−35.00 NL (2011)	34.78 DE (1999)	251
ECO	1.74	26.44	−70.16 GR (2011)	268.57 GR (2010)	251
EDU	0.32	4.61	−10.96 NL (2012)	37.93 DE (2003)	251
ENV	1.27	12.25	−69.23 AT (1997)	50.00 SE (2001)	251
HEA	1.49	4.52	−10.94 DE (2012)	25.86 IT (2006)	251
HOU	0.66	36.90	−94.83 IT (1996)	500.00 IE (2003)	251
PUBOR	1.08	6.92	−12.50 DK (2011)	71.43 DE (2011)	251
PUBSER	−1.16	6.23	−22.95 GR (1999)	23.33 DE (2006)	251
SOCPRO	0.65	4.50	−23.68 GR (2000)	22.46 GR (2009)	251

Source: IMF, WEO, GFS and own calculations.

public services (PUBSER) and social protection (SOCPRO).[1] We present in Table 1 the respective summary statistics.

IV. Empirical analysis

The results displayed in Table 2 show the absence of evidence of Wagner's law. In fact, the few statistical significant coefficients of public expenditures obtained for some government spending functions support the existence of counter-cyclicality.

Nevertheless, in the SUR estimation we find some evidence of Wagner's law for some countries and functions of government expenditures (Table 3). In fact, for the expenditures regarding culture, recreation and religion, Portugal shows a greater than one statistical coefficient. With respect to defence, Austria shows an elasticity consistent with the German economist's proposition. Furthermore, Netherlands seems to increase more than proportionately the expenditures with environment protection, whilst for France, spending in housing and community amenities increase more than the GDP growth rate. In addition, Greece is the only country with two public spending–economic performance elasticities greater than one.

V. Conclusions

We assessed Wagner's proposition throughout functions of government spending for 14 EU countries for 18 years. Applying panel data and SUR estimation techniques we have found some evidence of Wagner's result.

Table 2. Panel coefficients estimates for Wagner's law, 1996–2013, 2SLS.

	CUL	DEF	ECO	EDU	ENV	HEA	HOU	PUBOR	PUBSER	SOCPRO
Explanatory variable: RGDPGR										
					Full sample					
	0.603	−0.325	0.285	0.001	−0.916	−0.378	−2.331	−0.033	−1.165***	−0.434**
	(0.436)	(0.425)	(2.066)	(0.170)	(0.817)	(0.279)	(2.374)	(0.254)	(0.300)	(0.180)
Obs.	238	238	238	238	238	238	238	238	238	238
R-squared	0.043	0.044	0.015	0.065	0.017	0.074	0.029	0.089	0.182	0.222
					Above time trend					
	0.006	0.604	−4.690	0.055	1.491	0.573	−0.682	0.279	−1.640**	−0.508
	(1.229)	(0.742)	(7.257)	(0.395)	(1.321)	(0.511)	(5.565)	(0.873)	(0.670)	(0.615)
Obs.	119	119	119	119	119	119	119	119	119	119
R-squared	0.161	0.023	0.262	0.086	0.044	0.008	0.068	0.077	0.197	0.520
					Below time trend					
	1.097	−0.110	−0.353	−0.776	−2.010	−0.321	−0.900	−0.982	0.130	0.136
	(2.979)	(1.483)	(4.012)	(1.030)	(1.398)	(0.822)	(4.202)	(0.765)	(0.676)	(0.492)
Obs.	104	104	104	104	104	104	104	104	104	104
R–squared	0.014	0.079	0.107	0.196	0.057	0.141	0.108	0.178	0.126	0.065

*, ** and *** represent statistical significance at levels of 10%, 5% and 1% respectively.

[1]The 10 United Nations COFOG categories are as follows: 01 – General public services; 02 – Defense; 03 – Public order and safety; 04 – Economic affairs; 05 – Environmental protection; 06 – Housing and community amenities; 07 – Health; 08 – Recreation, culture and religion; 09 – Education; 10 – Social protection.

Table 3. SUR estimation of Wagner's law, 1996–2013.

Countries	CUL	DEF	ECO	EDU	ENV	HEA	HOU	PUBOR	PUBSER	SOCPRO
Austria	0.146	2.727***	−2.441	−0.990***	−0.173	−0.271	−4.107***	−0.033	−1.352***	−1.129***
	(0.527)	(0.599)	(2.704)	(0.160)	(1.908)	(0.239)	(1.577)	(0.373)	(0.357)	(0.122)
Belgium	−0.238	−0.030	−1.961	−1.348***	−2.697*	−1.518***	2.886	−1.118***	−1.321***	−1.632***
	(0.961)	(0.591)	(2.705)	(0.161)	(1.440)	(0.344)	(2.388)	(0.295)	(0.310)	(0.134)
Denmark	−1.649**	−1.885***	−2.164***	−1.373***	−2.186***	−1.489***	−3.405***	−2.132***	−1.213***	−2.039***
	(0.647)	(0.598)	(0.739)	(0.155)	(0.634)	(0.203)	(1.279)	(0.442)	(0.408)	(0.242)
Finland	−0.338	−0.550	−1.072***	−0.368***	−0.382	−0.369***	−0.878**	−0.571***	0.030	−0.465***
	(0.352)	(0.279)	(0.254)	(0.068)	(0.415)	(0.075)	(0.367)	(0.129)	(0.168)	(0.056)
France	−1.626***	−2.435***	−3.608	−1.426***	−4.601***	−1.626***	2.551**	−1.810***	−0.086	−1.329***
	(0.503)	(0.791)	(6.154)	(0.187)	(1.027)	(0.318)	(0.982)	(0.255)	(0.363)	(0.245)
Germany	1.451	−0.716	−2.246	−2.452***	0.524	0.317	−3.589**	−2.026**	1.158	0.007
	(1.774)	(1.148)	(3.964)	(0.730)	(0.930)	(0.478)	(1.615)	(0.988)	(0.726)	(0.328)
Greece	0.371*	−0.604	−1.868	0.092	1.294***	0.330**	2.808***	0.216	−1.763***	−0.202
	(0.195)	(0.379)	(3.617)	(0.170)	(0.299)	(0.165)	(0.399)	(0.145)	(0.267)	(0.335)
Ireland	−0.462	−0.702***	−0.746	0.039	−0.144	−0.041	−2.560	−0.333***	−0.575***	−0.393***
	(0.639)	(0.204)	(1.059)	(0.097)	(0.274)	(0.077)	(3.880)	(0.101)	(0.181)	(0.042)
Italy	0.178	−0.806	−1.578	−0.831***	0.022	−0.347	−3.904	−0.090	−0.493**	−1.453***
	(0.276)	(0.512)	(1.203)	(0.134)	(0.441)	(0.627)	(2.841)	(0.337)	(0.249)	(0.117)
Netherlands	0.579	0.128	0.263	−0.226	2.484***	−0.578*	0.011	−0.911***	−2.999***	−1.272***
	(0.449)	(1.116)	(1.251)	(0.286)	(0.639)	(0.312)	(0.943)	(0.315)	(0.577)	(0.114)
Portugal	1.589***	0.036	−1.299	−0.291**	−0.410	−0.497***	0.917	0.028	−1.893***	−1.227***
	(0.371)	(0.352)	(1.607)	(0.134)	(0.639)	(0.165)	(0.935)	(0.265)	(0.340)	(0.178)
Spain	0.030	−0.245	−1.567***	−1.246***	−0.895	−0.495**	−1.239	−0.480*	−1.357***	−0.943***
	(0.418)	(0.331)	(0.434)	(0.241)	(0.616)	(0.200)	(1.207)	(0.258)	(0.431)	(0.096)
Sweden	−0.889**	−0.572*	−1.210*	−0.770***	−2.223**	−1.045***	−2.203***	−1.078***	0.025	−0.886***
	(0.424)	(0.298)	(0.631)	(0.158)	(1.061)	(0.083)	(0.525)	(0.261)	(0.341)	(0.133)
United Kingdom	1.276	−0.656*	−1.260	−0.195	1.272	−0.762***	−0.598	−0.094	−0.267	−1.306***
	(1.045)	(0.370)	(3.621)	(0.380)	(1.397)	(0.219)	(1.130)	(0.458)	(0.606)	(0.143)

*, ** and *** represent statistical significance at levels of 10%, 5% and 1% respectively. The robust standard errors are in brackets.

Looking in detail to the public spending–economic growth elasticities, some functions of government spending for a few countries (e.g. France and the Netherlands) do validate Wagner's law. In addition, Greece is the only country where two public spending items react more than one to one to growth

Therefore, and even in some cases there is counter-cyclicality in several government spending items in the full panel sample, the existence of higher than unity elasticities vis-ã-vis economic growth hints at the Wagner's regularity.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

UECE is supported by Fundação para a Ciência e a Tecnologia (Portuguese Foundation for Science and Technology).

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