Public Spending and Its Impact on the Pre-WWII Greek Economy: A Comparative Analysis for Civilian and Military Expenditure

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ABSTRACT

This paper examines the economic effects of public spending on Greek economic growth over the period 1842-1938. In less developed countries, such as late-19th- and early-20th-century Greece, public spending played an important role in the construction of key infrastructures and the provision of basic public health and education systems. Such expenditures augment physical and human capital, enhancing aggregate production possibilities and boosting growth and development. As has been shown, the composition of public spending can be an important determinant of its impact on a country's level of economic development. To test for such differential composition effects, the Greek public spending time series was divided into two broad categories: civilian and military expenditure. The results reported here point to a significant positive effect on growth in the case of civilian expenditure but not for military spending.

1. Introduction

Public spending is widely considered an important tool of economic intervention. It can act as a significant stimulus during periods of economic recession or, in the case of less developed countries, provide finance for key infrastructure development and for the provision of basic public health and education systems. Not surprisingly, the economic effects of public spending are probably one of the most controversial and feverishly debated issues in eco-

nomic literature (*inter alia*: Aschauer, 1989; Irmen and Kuehnel, 2009; Wu et al., 2010; Fournier, 2016). Ever since the time of Adam Smith and David Ricardo, the composition of government spending has been known to be an important determinant of economic growth. However, the effect of spending varies significantly across different budgetary outlays. Consequently, many empirical studies, in assessing and quantifying the economic consequences of government outlays, prefer to use individual budgetary categories of spending rather than aggregate public expenditures in order to obtain more insight into their differential effects (*inter alia*: Chu et al., 2020; Balaev, 2019; Lupu et al., 2018; Fournier and Johansson, 2016).

Such studies commonly distinguish between "productive" and "unproductive" public spending (Devarajan, 1996). Although there is no formal, universally accepted classification, public investments on infrastructure such as transport and communication networks are invariably treated as quintessentially "productive" public spending. Such outlays facilitate and promote private sector economic activity as well and thus support economic growth and development (Aschauer, 1989; Barro and Sala-i-Martin, 1992). This is particularly true for developing and less developed countries where major deficiencies of infrastructure and basic networks such as roads, railways or telecommunications pose a large obstacle to economic development. A similar, growth-promoting role is also attributed to public education expenditures, since they augment human capital that acts as a growth accelerator and development facilitator (*inter alia*: Barro, 1991; Gundlach, 1997; Fournier and Johansson, 2016). In brief, public spending that invests in the enhancement of physical or human capital positively affects aggregate production potential and boosts growth and development (Fournier, 2016; Ahuja and Pandit, 2020)

A more contentious issue in the literature is the economic effect of military spending, as framed by the opportunity-cost approach associated with the "guns versus butter" dilemma. More often than not, it is treated as a textbook case of "unproductive" government expenditure since it has important economic implications, especially for less developed countries with comparatively smaller endow-

ments of resources. For instance, military spending can siphon off scarce funds from other expenditures, such as investment on infrastructure or public provision of basic education and health systems, that have been found to have a more beneficial impact on the economy and its development (*inter alia*: Awaworyi-Churchill and Yew, 2018; Dunne and Tian, 2013, 2016; Drèze, 2006). Nevertheless, military spending can also exert a stimulative impact on aggregate demand via the utilization and mobilization of spare capacity. In addition, technological progress induced by military spending can spill over into the civilian economy and thus buttress growth (*inter alia*: Dunne and Smith, 2020; Emmanouilidis and Karpetis, 2020). Perhaps of more interest for our present purposes are the channels proposed by Benoit (1973, 1978) in his seminal contributions on the growth effects of military spending. These include the beneficial effects of public works such as ports, roads and railways constructed to meet pressing military needs but with important positive spillover effects for the civilian economy, at least in underdeveloped countries such as late-19th- and early-20th-century Greece.

This paper examines the economic effects of public spending in Greece from the early years of national independence in the mid-19th century[1] to the years just before World War II, covering the period 1842-1938. It uses data that were recently published by the Bank of Greece (henceforth BoG) as part of the activities of the South-East European Monetary History Network (SEEMHN).[2] The dataset offers consistently compiled series on many macroeconomic variables, including public spending (Lazaretou, 2014).[3] To allow for possible

[1] Following the London Protocol of 1830 that gave birth to Greece as an independent sovereign state, the modern Greek state was formally established with the Treaty of London in 1832 (Kalyvas, 2015; Kostis, 2018).

[2] The data were compiled by the central banks of Albania, Bulgaria, Greece, Romania, Serbia, Turkey and Austria, which participated in the project "South-Eastern European Monetary and Economic Statistics from the 19th Century to World War II". The data are freely accessible: https://www.bankofgreece.gr/en/publications-and-research/research/research-networks/seemhn/the-seemhn-data-volume.

[3] The data volume is available at: https://www.bankofgreece.gr/RelatedDocuments/SEEMHN%20Data%20Volume%202014.pdf.

differential effects between different types of public spending, the public expenditure series was split into two broad categories: civilian and military. Apart from total government expenditure, military spending is in fact the only individual budget category included in the relevant public finances dataset. It is used to derive the two categories of public spending in the comparative empirical estimations. Section 2 offers a descriptive presentation of public spending in Greece during the period examined. Total as well as disaggregated public spending comparative statistics are presented and connected with the economic policies pursued, major publicly financed infrastructure and development projects, and armed conflicts that stoked military expenditure during the period we cover. In Section 3, we briefly discuss the empirical methodology we used, while in Section 4 we present and compare our findings for the two categories of expenditure. Section 5 concludes.

2. Public spending and the pre-WWII economy: a bird's eye view

Following the War of Independence that began in 1821, the international community formally recognized the modern Greek state as a sovereign entity in 1832 with the Treaty of London. The treaty was co-signed between the Great Powers – Great Britain, France and Russia – and the Ottoman Empire. In the decades that followed, the newly born state's sovereign territory gradually expanded, either pursuant to international agreements or (mainly) as the result of war (Koliopoulos and Veremis, 2010; Kalyvas, 2015; Kostis, 2018). From its inception as a sovereign state up to the years immediately preceding World War II, Greece was involved in a number of major national and international military confrontations and wars: the Greek-Turkish War of 1897, the Balkan Wars of 1912-13, World War I and the Greek-Turkish War of 1919-22. Indeed, it could be argued that during the entire period under review Greece was constantly in a state of military alert and mobilization. As a result, throughout the period military expenditure was by far the largest single budgetary

item of government spending. Between 1833 and 1938, it averaged around 39.3% of total public spending, or 9.4% of GDP (Milex/GDP). Unsurprisingly, it was appreciably higher during wartime (Table 1). For example, during the Balkan Wars of 1912-13 military spending averaged 16.4% of GDP and 58.6% of total government expenditure. Greece's 1917 entry in WWI on the side of the Triple Entente (France, Russia and Britain) caused the defence budget to explode from 5.4% of GDP in 1917 to 26.1% in 1918, or from 45.8% to 75.7% of the total budget. The financial burden of the 1919-22 Greek-Turkish War was even greater. Military expenditure averaged 23.9% of GDP and a staggering 70.4% of total government spending.

Table 1
Greek military spending during wars

	Milex/GDP	Milex/Total Spending
Greek-Turkish War 1897	15.6%	58.1%
Balkan Wars 1912-1913	16.4%	58.6%
World War I 1917[1]-1918	15.8%	60.8%
Greek-Turkish War 1919-1922	23.9%	70.4%

[1] The year Greece entered WWI.

Source: Authors' calculations using the BoG database.

During the pre-WWII period, annual GDP growth averaged 3.4%, with noteworthy differences between sub-periods (Table 2). On average, GDP grew by 2.8% per year in the 19th century, as against an appreciably higher rate of 4.4% between 1900 and 1938. The comparatively better economic performance during the latter period was achieved despite the fact that Greece was involved in armed confrontations for almost one third of those years. In the years between 1900 and 1938, Greece fought in the two Balkan Wars of 1912-13, entered WWI in June 1917, and immediately thereafter fought in another war with Turkey during 1919-22. Alongside these wars, one also has to count acute domestic political strife and con-

flict. In fact, for a short period during the National Division of 1915-17 (a quasi civil war) there were two different governments: the democratically elected one in Salonica and the appointed royalist one in Athens (Kalyvas, 2015; Koliopoulos and Veremis, 2010).

Table 2
GDP growth rates per decade

1834-39	7.6%	1890-99	0.8%
1840-49	-0.2%	1900-09	2.8%
1850-59	4.8%	1910-19	5.2%
1860-69	2.2%	1920-29	5.2%
1870-79	2.2%	1930-38	4.2%
1880-89	4.4%		

Source: Authors' calculations using the BoG database.

Throughout the period in question, state and public policies played an instrumental role in the economy, with most non-military expenditure directed towards the construction of basic infrastructures that were almost totally lacking in the newly established state. These included rudimentary (by contemporary European standards) road and rail networks as well as port facilities to assist trade and facilitate producers' access to markets and urban centres. In 1872, four decades after the creation of the Greek state, the country's road network totalled only 502 kms. Within the next twenty years, thanks to a huge public infrastructure program, more than 3,290 kms of paved roads were built (Dertilis, 2006, p. 675). Even more impressive was the construction of railways: starting out from a meagre 9 kms of urban railway in central Athens, more than 900 kms of new lines were constructed by the end of 19th century, most of them still in use today. Apart from the obvious benefits for civilian economic activity, the construction of roads and railways served the country's defence needs by facilitating the rapid movement of troops, military equipment and supplies to the front in times of crisis.

Commercial port facilities in Piraeus, Patras and Syros, and above all the opening of the Corinth Canal (6.4 kms) connecting the

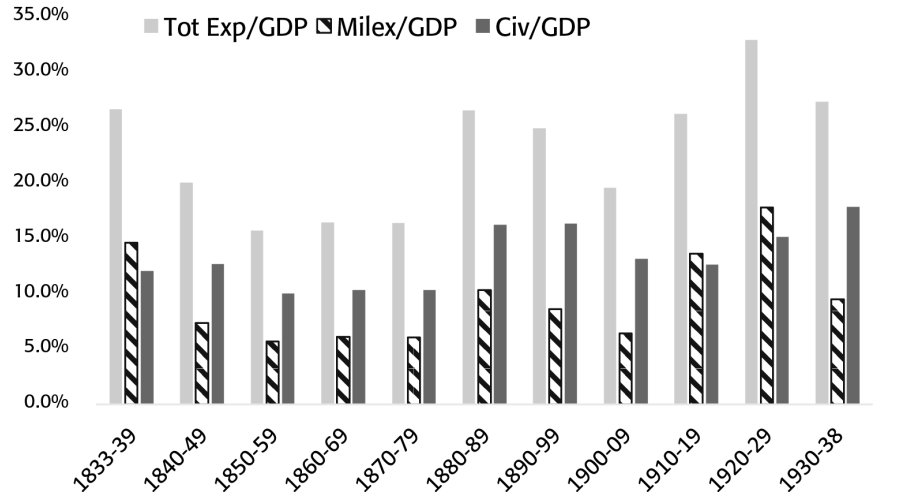
Ionian and the Aegean seas, were also financed through public expenditures. So were drainage works, as in the case of Copais, Giannitsa and Xynias lakes, undertaken to increase the area of fertile and arable land but also to combat diseases such as malaria. More broadly, the absence of a strong entrepreneurial domestic private sector meant that economic development could only be induced via extensive government intervention, with the concomitant spending on public infrastructures to support the feeble internal market. Infrastructures are one of the keys to a country's development prospects. As noted by Tsoulfidis and Zouboulakis (2016), these policies rested on the idea that loan-financed public spending on infrastructure, in conditions of underutilization of productive capacity, would increase employment and incomes and boost future public revenues. Thus, the government would be able to meet debt repayment obligations and reap the developmental and growth enhancing benefits resulting from the use of the infrastructure (Lazaretou, 1993, 1995; Tsoulfidis and Zouboulakis, 2016). However, the limitations of such loan-financed public spending, with the attendant dependence on international financial markets, was thrown into relief by the three sovereign defaults of 1843, 1893 and 1932 (Alogoskoufis, 2021; Conte, 2019; Ginammi and Conte, 2016, Lazaretou, 2005).

Over the period 1833-1938, total government spending averaged about 22.6% of GDP. The corresponding averages for military and non-military (civilian) spending were 9.4% and 13.2% respectively (Table 3). However, significant differences are found between subperiods (Figure 1). For example, the maximum ratio of government expenditure to GDP (TotExp/GDP) of 32.6% was recorded in the

Table 3
Summary statistics of military and civilian expenditure as a share of GDP, 1833-1938

	Tot Exp/GDP	Milex/GDP	Civ/GDP
Mean	22.6%	9.4%	13.2%
Max	56.7%	35.4%	32.3%
Min	11.8%	3.6%	6.4%

Figure 1
Military and civilian expenditure as a share of GDP



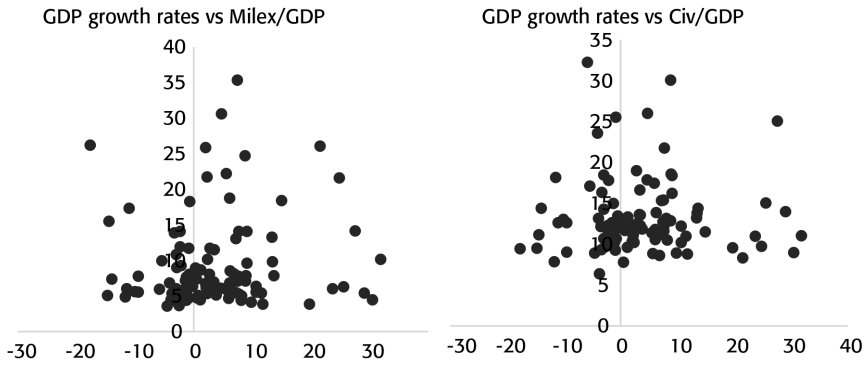
Source: Authors' calculations using the BoG database.

1920s while the minimum decade average of 15.5% was registered in the 1850s. The maximum decade average ratio of military spending to GDP was in the 1920s, while that of civilian expenditure (Civ/GDP) came in the 1930s. As mentioned, military expenditures constituted by far the largest budgetary category, averaging 39.3% of total government spending. This share reached a maximum of 75.7% in 1918, at the end of WWI and six months before the start of the Greek-Turkish War of 1919-22 (Table 1). The lowest share (15.7%) was recorded in 1889, the second-lowest (21.3%) in 1892.

3. The empirical methodology: a primer

In this section we conduct an empirical examination of the effects on economic growth of two broad categories of public expenditures – civilian and military. Figure 2 offers an initial visual observation of the two times series expressed as shares of GDP vis-

Figure 2
Scatter plots of military and civilian expenditure vs GDP growth rates



à-vis the growth rates of GDP. In both cases, the scatter plots do not reveal any strong relation (positive or negative) between the time series.

To investigate the issue further, we use the autoregressive distributed lag (ARDL) bounds testing approach to cointegration based on the unrestricted error correction model (UECM) proposed by Pesaran and Shin (1999) and later extended by Pesaran et al. (2001). This technique allows us to explore for the existence of a long-run relationship between the dependent and independent variables. Moreover, the ARDL framework offers versatile econometric advantages. First, apart from the desirable small sample properties, the bounds testing approach is used irrespective of whether or not variables are borderline I(0)/I(1). Second, a dynamic UECM can be derived from the ARDL bounds testing through a simple linear transformation. Third, the UECM integrates the short-run dynamics with the long-run equilibrium without losing any long-run information on the relationship between the variables (Pesaran and Shin, 1999; Pesaran et al., 2001). A UECM of the ARDL pattern can be expressed as follows:

$$\Delta LGDP_t = \beta_0 + \sum_{i=1}^{\pi_1} \beta_{1i} \Delta LGDP_{t-1} + \sum_{i=0}^{\pi_2} \beta_{2i} \Delta LMIL_{t-1} + \sum_{i=0}^{\pi_3} \beta_{3i} \Delta LCIV_{t-1} + \\ + \sum_{i=0}^{\pi_4} \beta_{4i} \Delta LPOP_{t-1} + \sum_{i=0}^{\pi_5} \beta_{5i} \Delta LM3M0_{t-i} + \zeta_1 LGDP_{t-1} + \zeta_2 LMIL_{t-1} + \\ + \zeta_3 LCIV_{t-1} + \zeta_4 LPOP_{t-1} + \zeta_5 LM3M0_{t-1} + \zeta_6 DummyDFLTS_{t-1} + \\ + \zeta_7 WarDummy_{it-1} + \eta_t \quad (1)$$

where Δ is the difference operator, L shows the natural logarithm, β_0 is a constant parameter, η_t is Gaussian white noise, and β_1, β_2, β_3, β_4 and β_5 are optimal lag lengths chosen. The parameters β_{1i}, β_{2i}, β_{3i}, β_{4i} and β_{5i} display the short-run dynamic coefficients, while ζ_1, ζ_2, ζ_3, ζ_4, ζ_5, ζ_6 and ζ^7 indicate the long-run multipliers of the equation. Concerning the variables, $L(GDP)$ is the GDP growth rate drawn from the BoG database,[4] $L(MIL)$ and $L(CIV)$ are the natural logarithms of the ratios of military and civilian expenditure, respectively, to GDP.

As already discussed, the latter two variables capture any fiscally stimulated, aggregate demand effects on GDP and are the main variables of interest here. Government expenditures are widely regarded as an important stimulus to the economy especially during contractions (*inter alia*: Aschauer, 1989; Barro and Sala-i-Martin, 1992; Irmen and Kuehnel, 2009). However, as we remarked in the introduction, different types of public spending can have differing effects on the economy. Barro (1990) stresses that the composition of government spending is a decisive determinant of its economic impact. Stimulative properties have been attributed to defence spending,[5] albeit not to the same extent as other, more productive types of public expenditure, including spending on infrastructure, education and basic medical services that are crucial to the development prospects

[4] The data are available at: https://www.bankofgreece.gr/en/publications-and-research/research/research-networks/seemhn/the-seemhn-data-volume.

[5] For a detailed and critical discussion of the economic effects of military spending, see, among others, Dunne and Tian (2013, 2016), Dunne and Smith (2020).

and performance of a less developed country such as Greece in the 19th and early 20th centuries. Nevertheless, as Benoit (1973, 1978) points out, in developing countries the military sector can make a significant contribution to growth and development by providing education, medical care and technical training to its personnel. Education and technical skills acquired in the military are useful for the civilian economy once service members are discharged. Likewise, infrastructure such as ports, roads and railways constructed for military purposes are very important contributors to development. They positively affect economic activity, for example by facilitating trade between regions as well as in the international markets. In (1), in order to allow for monetary side effects on the economy, the money multiplier $L(M3M0)$[6] available from the BoG database is included. Finally, the growth rate of the population $L(POP)$ is also included in the estimations. The ARDL estimations cover the period 1842-1938.[7]

As we remarked earlier, major political and economic events characterized the period under scrutiny. These included three sovereign defaults in 1843, 1893, 1932 and participation in major conflicts such as the Balkan Wars and WWI (Table 1). Major war efforts drain valuable scarce resources and can have a significant impact on the national economy. To allow for war-specific effects on the main relationship examined, a series of 0-1 dummy variables (*WarDummy*) is included in (1) for each specific war: for the Greek-Turkish War of 1897 (*W97*), the Balkan Wars of 1912-13 (*BLK*), World War I (*WWI*), the Greek-Turkish War of 1919-22 (*ASMIN*). As an alternative specification of the war-effect on the economy, an all-war dummy (*ALLWAR*) is used that encompasses all the wars, replacing the four dummy variables in the estimations, and (1) is re-estimated with the inclusion of it alone. Similarly, another 0-1 dummy is included in (1) to capture the impact of the three sovereign defaults that occurred during this period (Ginammi and Conte, 2016; Tsoulfidis and

[6] Defined as the ratio of broad money (M3) to the monetary base (M0).
[7] The *M3M0* series is available from 1842 onwards.

Zouboulakis, 2016; Conte, 2019). The sovereign defaults dummy (*DFLTS*) takes a value of one in 1843, 1893 and 1932.

In addition, the F-test is conducted to test for the existence of a long run relationship between the dependent-independent variables of Eq. (1). The null hypothesis of no cointegration in Eq. (1) is H_0: $\zeta_1 = \zeta_2 = \zeta_3 = \zeta_4 = \zeta_5 = \zeta_6 = \zeta_7 = 0$, while the alternative is H_1: $\zeta_1 \neq \zeta_2 \neq \zeta_3 \neq \zeta_4 \neq \zeta_5 \neq \zeta_6 \neq \zeta_7 \neq 0$. It is crucial to note that the F-statistic obtained with the Wald test has a non-standard distribution, whose asymptotic critical values are provided by Pesaran et al. (2001). If the test statistic exceeds the respective upper critical value obtained from Pesaran et al. (2001) critical values, it can be argued that there is proof of a long-run equilibrium relationship. Otherwise, if the test statistic falls below the lower critical value, the null hypothesis of no cointegration cannot be rejected. In next step, we will evaluate the long-run relationship using the selected ARDL model via the error correction model. It will be estimated and modified to account for "spurious" effects; we chose the optimal lag orders between the covariates and growth rates using Akaike Information Criterion (AIC) and Schwarz Criterion (SBC) criteria as proposed by Pesaran et al. (1996).

The computational representation of the ARDL-RECM model is as follows:[8]

$$\begin{aligned}\Delta LGDP_t = {} & \gamma_0 + \sum_{i=1}^{\pi_1} \gamma_{1i} \Delta LGDP_{t-1} + \sum_{i=0}^{\pi_2} \gamma_{2i} \Delta LMIL_{t-1} + \sum_{i=0}^{\pi_3} \gamma_{3i} \Delta LCIV_{t-1} + \\ & + \sum_{i=0}^{\pi_4} \gamma_{4i} \Delta LPOP_{t-1} + \sum_{i=0}^{\pi_5} \gamma_{5i} \Delta LM3M0_{t-i} + \gamma_6 DummyDFLTS_{t-1} + \\ & + \gamma_7 WarDummy_{it-1} + \gamma_8 ECM_{t-1} + \eta_t \end{aligned} \tag{2}$$

where γ is a parameter disclosing the velocity of adjustment to the equilibrium level after a shock and ECM_{t-1} shows the one-period lagged error correction term. According to Pesaran and Pesaran

[8] The software *R* is used to conduct all statistical analyses herein.

(1997), it is vital to verify the constancy of the long-run multipliers by testing the error-correction model for the stability of its parameters. Consequently, they suggested (developed by Browns et al. 1975) the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMsq). Ensuring an inclusive picture of all dependent-independent variables, diagnostic tests are conducted, e.g., for serial correlation, functional form, normality, and heteroskedasticity.

4. Findings and discussion

We start the presentation of the findings with Table 4, which, alongside the descriptive statistics of all the variables used, reports the Pearson correlation coefficient and the *t*-statistics.[9] The very low correlation values suggest the absence of a long-run relationship between the dependent and independent variables. We proceed with tests that examine the time-series properties of the variables involved. As previously noted, the ARDL bounds testing methodology requires that the series should be integrated at I(0) or I(1) or I(0)/I(1) and none of the series should be I(2). Hence, for the stationarity tests we opt to apply two standard and well-established unit root tests: the Dickey Fuller generalized least squares, DF-GLS (Elliot et al. 1996), and the Phillips and Perron (1988). The results from estimating the two unit root tests are shown in Table 5. Both tests indicate that all the variables are stationary at first differences.

Table 6 presents the estimates for the Pesaran's ARDL bounds test on each model.[10] To verify the long-run relationship between the variables, we calculated the bounds test, the critical values of which are obtained from Pesaran et al. (2001). The results indicate that the value of the F-statistics is 28.28 for model 1 and 18.40 for model 2. It

[9] For robustness, we implemented Spearman and Kendall methods, but the findings are almost identical to Pearson's results.

[10] In model 1 a dummy for each war is included separately (W97, BLK, WWA, ASMIN), while in model 2 only an all-war dummy (ALLWAR) is incorporated.

is greater than the upper bound value. Thus, we reject at the 1% level the null hypothesis of no cointegration in favor of cointegration between GDP and the covariates.[11] On the basis of the AIC criterion, the results of the calculated long-run ARDL cointegration model are (1,3,0,0,2) for both models.

TABLE 4
Descriptive statistical and correlation analysis, 1842-1938

Variables	Mean	Min	Max	StdDev	Correlation	t-statistics
GDP	3.22	-17.72	30.45	9.5	-	-
MIL	9.08	3.61	30.65	5.95	0.076	0.744
POP	2.44	-2.63	77.2	8.32	0.059	0.580
M3M0	1.68	0.6	4.59	0.81	0.093	0.918
CIV	13.31	6.38	32.27	4.64	0.035	0.342

Note: StdDev = standard deviation.

TABLE 5
Unit root tests

Panel A	DF-GLS test		PP test	
Variables	Level	1st diff.	Level	1st diff.
lnGDP	-2.58	-3.31***	-125.88***	-136.49***
lnMIL	-1.67	-5.06***	-39.44***	-79.25***
lnCIV	-2.27	-4.78***	-39.06***	-103.26***
lnPOP	-2.75*	-2.98***	-96.53***	-121.86***
lnM3M0	-2.12	-2.57**	-15.13	-114.48***

Note: ***, ** and * denote significant at the 1%, 5% and 10% level, respectively.

TABLE 6
Bounds test results for models 1 and 2

	F-statistics	1% Critical bounds		5% Critical bounds		10% Critical bounds	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Model 1 (1,3,0,0,2)	28.28	2.88	3.99	2.27	3.28	1.99	2.94
Model 2 (1,3,0,0,2)	18.40	2.5	3.68	2.04	3.08	1.8	2.8

Notes: ***, **, *, indicates significant at the 1% 5% and 10% level, respectively. The numbers in brackets are lags used in the test.

[11] The critical values are for unrestricted intercept and no trend (Case III).

The long- and short-run results are shown in Table 7 (Panels A & B respectively) while the diagnostic tests are presented in Panel C. The latter do not seem to reveal any problems of normal distribution for the error term (Jarque–Bera test) nor of serial correlation. Auto-conditional heteroskedasticity is not present in the short-run model and no issues of white heteroskedasticity emerge. Finally, the CUSUM and CUSUM of squares tests verify that the parameters were stable over the period.

Regarding the two main variables of interest, we can observe that military spending has no statistically significant positive or negative effect on the growth rate of GDP. This is the case for both the long- and short-run results of the estimations. The findings do not yield any evidence in favor of a stimulative impact via the channels discussed in the previous sections. This is not the case with civilian (non-military) public spending, which appears to exert a statistically significant effect on growth both in the long- and the short-run estimations; however, the signs of the coefficients clearly indicate that this impact is not the same in both time-horizons.

Starting with the short-run results (Panel B in Table 7), these point to a strong, positive and lagged ($\Delta LCiv_{(-1)}$) effect on growth. This finding is in line with the argument that public spending is an important tool to stimulate the economy and support growth. This positive effect can be exerted via several channels including public investment in important infrastructures (roads, railways, ports) and the provision of basic public health and education systems, e.g., the introduction of free elementary education for all Greeks in the second half of the 19th century, which resulted in a significant increase in the number of schools (Lemontzoglou, 2020). Similarly, as discussed earlier, during the period in question public spending was an important source of finance for the provision of such public goods. For instance, public investment in infrastructure included the construction of basic road and rail networks as well as ports to facilitate both domestic and external trade. Thanks to these expenditures, the network of paved roads grew from 502 kms in 1872 to over 3,290 kms by the turn of the century. Similarly, the rail network in-

TABLE 7
Long- and short-run analysis for models 1 and 2

Variables	Model 1 (1,3,0,0,2)	Model 2 (1,3,0,0,2)
Panel A: Long-term relationship		
Constant	9.165**(3.536)	9.028**(3.759)
LPOP	0.493*(0.252)	0.441(0.382)
LMIL	0.141(0.282)	0.193(0.518)
LM3M0	2.600*(1.436)	2.094(1.478)
LCIV	-0.807***(0.290)	-0.754**(0.307)
Dummy DFLTS	6.111(4.084)	4.836(3.264)
Dummy ALLWAR	-6.043(4.578)	-
Dummy W97	-	-18.205*(7.216)
Dummy BLK	-	-2.300(6.075)
Dummy WWI	-	-6.654(9.169)
Dummy ASMIN	-	-3.850(7.046)
Panel B: Short-term error correction model		
ECT_{t-1}	-1.528***(0.097)	-1.525***(0.100)
ΔLPop	0.079(0.086)	0.030(0.087)
ΔLPop(-1)	-0.098(0.105)	-0.120(0.108)
ΔLPop(-2)	-0.078(0.089)	-0.098(0.090)
ΔLMil	0.199(0.186)	0.296(0.184)
ΔLM3M0	6.578*(3.261)	6.548**(3.218)
ΔLCiv	0.136(0.270)	0.224(0.272)
ΔLCiv(-1)	0.728***(0.233)	0.770***(0.232)
Dummy DFLTS	4.623(4.099)	5.373(4.041)
Dummy ALLWAR	0.204(4.091)	-
Dummy W97	-	-10.824**(6.211)
Dummy BLK	-	1.794(7.309)
Dummy WWI	-	8.853(6.703)
Dummy ASMIN	-	6.370(6.650)
Panel C: Diagnostic tests		
Test	**F-statistic**	**F-statistic**
χ2SERIAL	1.543	1.889
χ2ARCH	0.833	0.796
χ2WHITE	0.591	0.684
χ2RAMSEY	0.643	0.374
CUSUM	Stable	Stable
CUSUMSQ	Stable	Stable

Notes: *, ** and * denote 1, 5 and 10% significance levels, respectively. Standard errors are in parentheses. $ECT_{t-}1$ is the error correction term. χ2SERIAL stands for serial correlation, χ2ARCH for autoregressive conditional heteroskedasticity, χ2WHITE for white heteroskedasticity and χ2RAMSEY for Ramsey Reset test. CUSUM demonstrates cumulative sum while CUSUMSQ clarifies cumulative sum of squares.**

creased from a mere 9 kms to more than 900 kms by the end of 19th century (Dertilis 2006; Koliopoulos and Veremis, 2010). Drainage of lakes[12] that increased the area of fertile and arable land and hence augmented agricultural production was also publicly financed.

On the other hand, when we turn to the long-run results (Panel A in Table 7), civilian (non-military) public spending seems to have had a negative and statistically significant effect on the growth performance of the Greek economy. A tentative explanation for this important reversal of the effect identified by the ARDL estimations is that the period examined never saw a systematic long-term development policy implemented irrespective of changes of government. In fact, the often turbulent political history of the period[13] and the many short-lived governments probably adversely affected economic performance. Hence, the short-run stimulative effects of civilian public spending did not transform into a long-term development-promoting tool. An alternative explanation for this negative finding is that much of the public expenditures were loan-financed, especially those on large-scale public works. The modern Greek state has always been fiscally frail. Government revenues seldom sufficed to finance expenditures (Alogoskoufis, 2021). Consequently, public expenditures, particularly on large-scale infrastructure projects, were invariably financed by borrowing in the international money markets. Three sovereign defaults occurred during the period covered by the estimations: in 1843, 1893 and 1932 (Conte, 2019; Ginammi and Conte, 2016). Although the sovereign defaults dummy (*DFLTS*) introduced in the ARDL is not statistically significant, one could cautiously argue that loan-financed public spending, with the concomitant dependence on international financial markets, has limitations that exert a long-term negative effect on the economy and its growth performance.

Turning to the other variables in the ARDL (Table 7), it is worth

[12] The lakes Copais, Giannitsa and Xynias.

[13] Detailed accounts of Greek political history and partisan strife are found in Kalyvas (2015), Koliopoulos and Veremis (2010), and Kostis (2018), among others.

noting the statistically positive effect of the money multiplier (*M3M0*)[14] introduced in the estimations to capture the monetary side effects on growth. The coefficient is positive and statistically significant in both short-run models (Panel B) as well as in model 1 in the long-run results (Panel A). This finding is in line with what one would intuitively expect, given the importance of the banking system and its ability to provide ample liquidity and financing for economic and business activity. Finally, except for the 1897 War dummy variable (*Dummy W97*), all the other war dummies are not statistically significant. Apart from the costs of the war, Greece's defeat in the 1897 Greek-Turkish War also had significant domestic political repercussions, igniting political upheaval and social discontent that impacted the economy.

5. Concluding remarks

Using the database recently published by the BoG,[15] the paper examined the economic effects of public spending in Greece during the period 1842-1938. In less developed countries such Greece in the 19th and early 20th centuries, public spending is an important source of finance for the construction of key infrastructures and the provision of basic public health and education systems. It augments physical and human capital, thus positively affecting aggregate production possibilities and boosting growth and development (Fournier, 2016; Ahuja and Pandit, 2020). Empirical studies of the economic effects of public spending commonly distinguish between "productive" and "unproductive" public expenditures (Devarajan, 1996). Hence, to allow for differential effects between budgetary outlays, the Greek public spending series is split into two broad categories: civilian and military expenditure.

[14] Defined as the ratio of broad money (M3) to the monetary base (M0).

[15] Downloadable here: https://www.bankofgreece.gr/en/publications-and-research/research/research-networks/seemhn/the-seemhn-data-volume.

The results of the ARDL estimations do not reveal any statistically traceable effect in the case of military expenditures. This holds for both the long- and short-run findings. A short-run strong positive effect on growth is found in the case of civilian (non-military) public spending. During the period examined here, civilian public expenditure was an instrumental source of finance for extensive public works, the construction of infrastructure and the provision of basic health and education. All of these have a significant growth-enhancing effect that explains the short-run findings reported here. However, this positive effect is reversed in the case of the long-run results, where a statistically significant negative effect on growth emerges from the ARDL estimations. We tentatively propose that this may be attributable to the absence of a long-term development policy and/or to the fact that public spending, especially expenditures on major public works, was loan-financed and therefore undermined long-term economic performance.

Acknowledgements: The authors offer sincere thanks to an anonymous referee for constructive and insightful suggestions that helped improve the paper. The usual disclaimer applies

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