Greece, Portugal, Spain: New evidence on the economic effects of military expenditure using the new SIPRI data

Eftychia Nikolaidou

Eftychia Nikolaidou is Associate Professor of Economics at the University of Cape Town, Cape Town, South Africa. She may be reached at efi.nikolaidou@uct.ac.za.

Abstract

This article first compares old with newly updated and extended SIPRI military expenditure data for Greece, Portugal, and Spain. Using the new data to confirm or reject earlier findings, it then replicates a Solow growth model application employed in a 2012 study by Dunne and Nikolaidou. In addition, the article provides new evidence on the military expenditure–economic growth nexus for these three countries using the extended data that now cover the post-global financial crisis and European debt crisis years. The use of the new SIPRI data does not lead to rejection of the earlier findings for Greece and Portugal but does reject the formerly negative and statistically significant effect of military burden on growth for the case of Spain.

Newly revised and extended military expenditure data made available by the Stockholm International Peace Research Institute (SIPRI) provide both an opportunity and a potential challenge to researchers who have analyzed the relation between military spending and economic growth. The potential challenge lies in that the new data—for many countries extended from 1988 back to the early 1950s—may possibly lead to revisions of the research community's earlier findings. The opportunity lies in the ability to identify and possibly establish more stable, statistically robust relationships between military spending and economic growth over a much longer time period than was hitherto possible.

In 2012, J. Paul Dunne and Eftychia Nikolaidou published an analysis of the effects of military burden, that is, the ratio of military expenditure over GDP, on economic growth focusing on the 15 core European Union countries. The availability of SIPRI's revised and extended data makes it worthwhile to reinvestigate their paper by focusing on three of these countries, namely Greece, Portugal and Spain.[1]

These three countries are particularly interesting cases for such a study for a number of reasons. First, in comparison to other EU countries, their military expenditure data has seen the most revisions in the new SIPRI data. Second, characterized as "peripheral European economies," they share similar economic features and have suffered the most from the recent economic and debt crises. Third, all three emerged from military dictatorships in the mid-1970s and Greece in particular (followed by Portugal) has been a big defense spender since then, a factor that has partly contributed to the Greek debt crisis.[2]

This article, then, first compares the old SIPRI military data series with the revised ones to identify common patterns in the data revisions. Second, to test the validity of earlier findings it replicates the growth model used in Dunne and Nikolaidou (2012), for the same time period (1960–2007), but employing the new military expenditure data. Third, the article provides new empirical evidence for the same model but over the extended time frame 1960–2014 which therefore includes the post-crisis years. And, fourth, the article explicitly accounts for the impact of the global financial crisis and the European debt crisis on these economies' growth through the use of dummy variables. The final section summarizes and concludes this article.

Greece, Portugal, Spain: Evolution of military expenditure

Within the European Union and the eurozone, interesting variations in military burden and economic performance exist. The European debt crisis brought to the front the vulnerabilities of the so-called peripheral EU countries: Greece, Portugal, and Spain. All three are economically weak and Greece and Portugal in particular have been high-level military spenders for a long period (Greece after the collapse of its military junta in 1974 and Portugal for the duration of its own military regime which collapsed in 1975).[3]

All three are members of the EU, the eurozone, and NATO. Sharing many similarities in terms of economic performance, they show differences in their patterns of military expenditure. Throughout the 1960s and into the early- to mid-1970s, all showed high rates of economic growth (7.6, 6.0, and 7.8 percent, respectively, for Greece, Portugal, and Spain; see Figure 1) when, with the onset of the first global oil crisis, the three economies entered a deep recession as did most western,

industrialized economies. The recession coincided with the collapse of the dictatorships in all three countries as well and, in the case of Greece, 1974 was, moreover, the year of the conflict with Turkey over the island of Cyprus. The transition toward parliamentary democracy led to internal political and economic changes and a desire for international recognition. All three joined the then-European Community as a means of strengthening their economic and political situation. When they did join, however, their relative economic backwardness made them the EU's poorest countries. The 1970s crises led to a huge drop in investment for all three of the countries (see Figure 2) and substantial increases in government debt after 1975, a problem that has become more serious over the last two decades, especially for Greece.[4]

As Figure 1 shows, the GDP growth averages even in the late 1970s were still relatively high, certainly when compared to the poor performance that was to follow in the 1980s. (Greece, especially, turned in an average growth rate record of only 0.78 percent.). The 1990s found all three economies in an equally uninspiring situation as in the 1980s and in the next decade (the 2000s) growth rates averaged 2.8 percent for Greece and Spain while Portugal experienced a much lower rate of only 0.94 percent for the decade. For all three countries, and particularly for Greece and Portugal, the economic situation deteriorated tremendously with the onset of the 2008 global financial crisis and the ensuing European debt crisis. Greece and Portugal signed a bail-out package offered by the EU, the European Central Bank, and the International Monetary Fund. Spain, a much larger and stronger economy in comparison to Greece and Portugal, avoided the deep recession—and the bail-out package. All countries suffered a big reduction in gross domestic investment after the crisis, the most profound decrease faced by Greece (Figure 2).[5]

Turn now to the countries' military expenditure. Figure 3 shows clear differences in the evolution of the countries' military burden (the ratio of military expenditure to GDP). Throughout the period, Spain carried the lowest burden among the three countries, averaging around 2 percent of GDP. An increase to about 3 percent occurred by the mid-1980s, due to a push to develop an indigenous arms industry and the subsequent expansion of arms production. In Greece and Portugal, things are quite different. Clearly visible, 1974 was a critical year for both countries. Portugal had a high military burden (higher than Greece) for the years prior to 1974 and after that a dramatically decreased one, with the opposite pattern observed for Greece. The reduction of the Portuguese military burden after 1974 is attributed to the end of its dictatorship but most importantly to the fall of its colonial empire. For Greece, the Turkish invasion of Cyprus in 1974

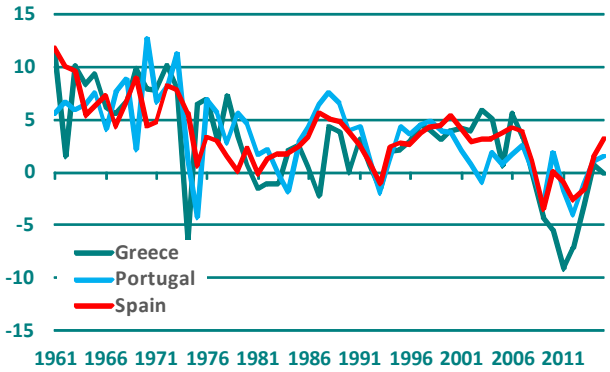

Figure 1: GDP growth (percent) for Greece, Portugal, and Spain, 1961-2015. *Note*: Growth rates are calculated from figures in constant USD2010. *Source*: World Bank.

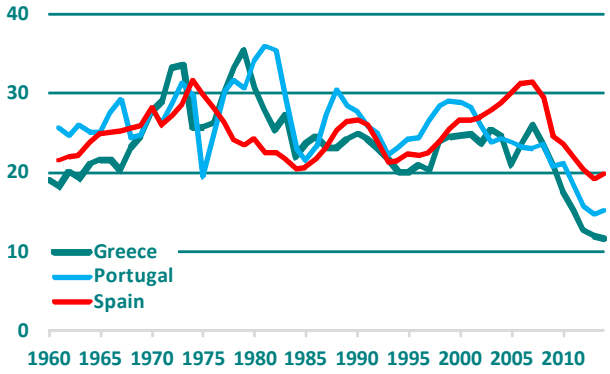

Figure 2: Investment as a share of GDP. *Source*: World Bank.

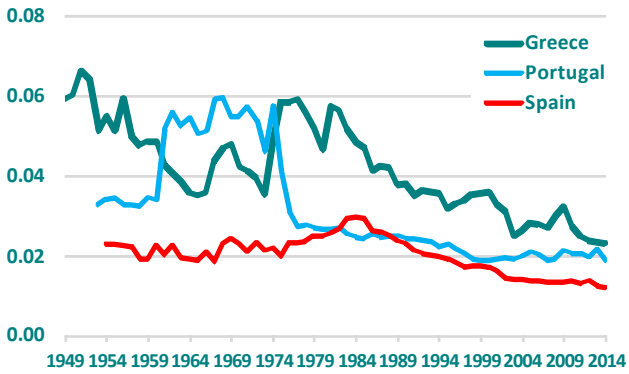

Figure 3: Military burden for Greece, Portugal, and Spain (new SIPRI data). *Source*: SIPRI.

marked a huge increase in military burden. This has remained high ever since then due to continuing disagreements and conflicts with its neighbor. Greece continued excessive military spending up until and even shortly after the onset of the Greek

debt crisis. After 2008 both Greece and Portugal saw dramatic decreases in their military expenditure. This descriptive record of interesting patterns is particularly valuable to analyze when revised and longer time series are available.[6]

Brief literature review

The theoretical analysis of military expenditure remains a difficult task given the complex nature of this type of spending (a combination of economic, political, strategic, cultural, psychological, and moral aspects). In the relevant literature, most of the empirical work is based on either a Keynesian or neoclassical framework. More recent work uses exogenous and endogenous growth models.

Supply-side models of the defense–growth relationship within the neoclassical framework derive from the aggregate production function. Models developed by Feder (1983), Ram (1986), and Biswas and Ram (1986) use military expenditure as an exogenous variable and estimate its dynamic real effects on output. While extensively employed in the literature, they have attracted substantial criticism (e.g., see Dunne, Smith, and Willenbockel, 2005) and as such other growth models were then applied in the defense economics literature, e.g., models based on Barro (1990), the augmented Solow model, Romer (2000), and Taylor (2000).

Overall, while the empirical results offer no consensus on the economic effects of military spending, the most common finding is that military burden has either no, or a negative, statistically significant effect on the economic growth of developing countries. The survey by Dunne and Tian (2013) suggests that studies using post-cold war data tend to find significant negative effects. Empirical evidence for the focal countries in this article, with the exception of Greece is limited. To my knowledge, apart from the 2012 Dunne and Nikolaidou study that includes Spain among other EU countries, there is no study on the defense–growth relationship that focuses on Spain itself. As regards Portugal, previous work is limited to the causality studies by Dunne and Nikolaidou and by Shabaz, *et al*., published in 2005 and 2013, respectively. The first study did not find a causal relationship between military expenditure and economic growth while the second concluded that military expenditure does cause economic growth, but this finding was not confirmed with the formal growth modeling approach employed in Dunne and Nikolaidou (2012). Given these inconclusive results (probably due to the use of different models, approaches, and time frames), the newly available revised SIPRI data presents researchers with an opportunity to reinvestigate the military expenditure–economic growth nexus for these counties. Thus, the next section outlines the approach and presents the empirical results.[7]

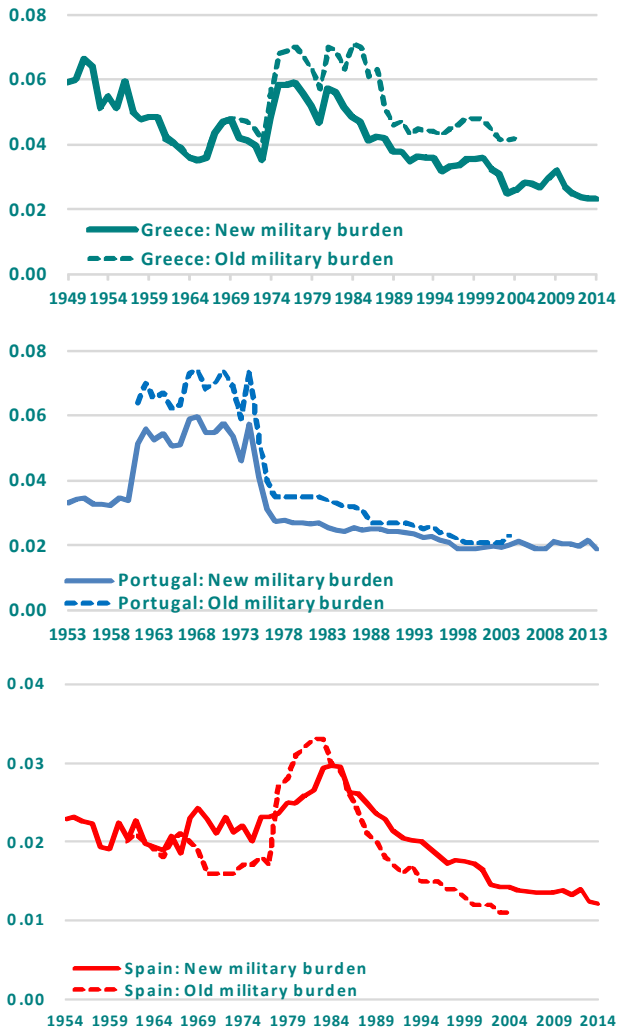

Figure 4: New and old SIPRI military expenditure (and military burden) data (Greece, Portugal, and Spain).

Data and empirical analysis

Comparing SIPRI's old and new military expenditure data for Greece, Portugal, and Spain

Comparing the old and new military expenditure and military burden data, a striking result is obtained (see Figure 4). For Greece we note a downward revision in the series after 1974, the year that saw the collapse of its dictatorship and that coincided with the Turkish invasion of Cyprus. Although the two series follow the same overall pattern, the discrepancy between the old and the revised data is particularly high over the period 1975–1986. Is this because of a change in SIPRI's military expenditure definition, a revision of Greece's GDP, or a combination of the two? This is something that SIPRI should clarify.

For Portugal, we note a similar downward revision of its numbers. In contrast to the case of Greece, though, the big downward revision concerns mainly the years of the dictatorship. After 1975, the difference between the old and revised series becomes smaller. Finally, for Spain we see both upward and downward revisions in the series. For 1968–1978 (which includes the dictatorship years in Spain) data is revised upward; then downward between 1978–1984, and upward again thereafter. There is a need for some clarity regarding these changes, particularly when the revisions go both ways (upward and downward).

Replication and new evidence

Given the revisions in the military expenditure data of the three countries, it is of interest to consider the validity of earlier work, for example the 2012 work of Dunne and Nikolaidou. They analyzed the military expenditure–economic growth relation for 15 EU countries over the period 1960–2007. Here, I replicate their model over the same period but only for Greece, Portugal, and Spain. Given that these countries also suffered the most from the recent economic and debt crises, I also provide new evidence regarding the military expenditure–economic growth nexus using the extended, post-crisis data (1960–2014). Further, I employ the same model with and without a dummy variable for the 2008 crisis (and the 1974 crisis for Greece).

The model is an augmented Solow growth model with Harrod-neutral technical progress and is specified as follows:[8]

$$dlyp = c + lyp(-1) + dliy + liy(-1) + dlmy + lmy(-1) + ngd + t,$$

where *lyp* is the logarithm of GDP per capita (in constant USD2005), *liy* is the logarithm of investment as a share of GDP, *lmy* is the logarithm of military expenditure as a share of GDP, *ngd* is the labor force growth rate + 0.05, and *t* is a time trend. The *d* in front of a variable denotes first difference, and the *l* in front of a variable denotes a logarithmic transformation. Finally, (-1) at the end of a variable refers to a one-period lag.

The key assumption is that *my* (military expenditure as a share of GDP) affects factor productivity via level effects on the efficiency parameter which controls the labor-augmenting technical change. Further, *g* is the exogenous rate of Harrod-neutral technical progress. Given the different definitions of what constitutes the labor force across countries, labor force is proxied here by population size to construct the augmented labor force growth rate (*ngd*). Technology is proxied by the time trend (*t*). Data for military burden (military expenditure over GDP) is taken from SIPRI while data for all the other variables comes from the World Bank's *World Development Indicators* database.

Table 1, Panel A: Short-run estimates for Greece

	1960–2007		*1960–2014*	
	Old	*New*	*New*	*New & dummy*
c	–0.659**	0.270*	0.298**	0.119
lyp(–1)	–0.110	–0.135*	–0.149**	–0.075
Δliy	0.235***	0.020***	0.027***	0.020***
liy(–1)	0.165**	0.011	0.013**	0.010*
Δlmy	–0.046	–0.008	–0.004	–0.001
lmy(–1)	–0.012	–0.004	–0.004	–0.007*
ngd	–0.133**	–0.001	0.001	–0.011
t	0.003	0.0003	0.001	-0.001
D08				–0.004**
D74				–0.009***
R-sq.	0.579	0.577	0.664	0.720
SER	0.029	0.002	0.003	0.003
DW	1.989	2.237	1.931	1.801

Note: *, **, and *** denote statistical significance at the 10, 5, an 1 percent levels, respectively.

Table 1, Panel B: Long-run estimates for Greece

	1960–2007		*1960–2014*	
	Old	*New*	*New*	*New & dummy*
c	–5.99	2	2	1.6
liy	1.5	0.07	0.09	0.13
lmy	–0.11	–0.03	–0.03	–0.09
lngd	–1.21	–0.001	0.001	–0.13
t	0.03	0.001	0.001	0.01
D08				–0.05
D74				–0.13

For each of the three countries, the model is estimated as a log-linear reparameterized general first-order dynamic model

with the change in the log of GDP per capita (*lyp*) as the dependent variable. Tables 1, 2, and 3 present the short- and long-run estimates, in two panels, for Greece, Portugal, and Spain, respectively. For each country, the short- and long-run estimates are presented (1) using the old SIPRI data over the period 1960–2007, (2) using the new SIPRI data over the same period, (3) using the new (revised and extended) SIPRI data over the period (1960–2014), and (4) using the revised, extended SIPRI with a dummy variable for 2008 to denote the beginning of the economic crisis (and a dummy for 1974 for Greece as well).

Start with Greece. The first two numeric columns in Table 1, Panel A (for 1960–2007) show, for most variables, slightly smaller coefficients with the new SIPRI data but the signs of all variables (apart from the constant) remain the same. As before, the expected positive sign for the investment variable and the negative signs for GDP per capita growth, population growth, and for the military burden variables hold. Statistical significance, however, vanishes for the population growth variable when the new SIPRI data are used. The variable of interest—military burden (*lmy*)—is negative and statistically insignificant with either the old or new data. A similar story applies when the new SIPRI data are used over the extended time frame (1960–2014). When including the crises dummies (D08 for the economic crisis and D74 for the Cyprus crisis), the fit of the model improves and the negative coefficient on military burden becomes statistically significant (at the 10% level). The two dummies are highly significant and of the expected negative sign. As for the calculated long-run coefficients, military burden carries a negative sign in all four specifications. Albeit not statistically significant, it is certain that military burden does *not* have a positive effect on economic growth.

Moving on to Portugal (Table 2), note the improvement in the fit of the model and a somewhat stronger statistical significance of some of the coefficients when the new SIPRI data are used. With the old data, for 1960–2007 (Panel A, first column), the only statistically significant variable is labor force growth (*ngd*), and with the expected negative sign. This is maintained in the other three specifications, which now also produce consistent estimates, signs, and statistical significance for the investment variable. When it comes to the change in military burden per se (*Δlmy*), the coefficients are negative although not statistically significant. In contrast, the lagged log of military burden, *lmy*(–1), becomes positive and statistically significant at the 10% level with the new SIPRI data for the 1960–2007 period as well as for the 1960–2014 period when the dummy variable is included in the model. However, since *lyp*(-1) is not statistically significant in the final specification

Table 2, Panel A: Short-run estimates for Portugal

	1960–2007		*1960–2014*	
	Old	*New*	*New*	*New & dummy*
c	–0.179	–0.040	–0.281	–0.010
lyp(–1)	–0.060	–0.039	–0.017**	–0.041
Δliy	0.113	0.187***	0.197***	0.193***
liy(–1)	0.015	0.062*	0.062**	0.061**
Δlmy	–0.033	–0.023	–0.030	–0.020
lmy(–1)	-0.006	0.037*	0.026	0.039*
ngd	–0.010***	–0.112***	–0.116***	–0.109***
t	0.001	0.001	0.001	0.002
D08				–0.025***
R-sq.	0.491	0.722	0.749	0.766
SER	0.027	0.021	0.020	0.020
DW	1.948	2.202	2.167	2.23

Note: *, **, and *** denote statistical significance at the 10, 5, an 1 percent levels, respectively.

Table 2, Panel B: Long-run estimates for Portugal

	1960–2007		*1960–2014*	
	Old	*New*	*New*	*New & dummy*
c	–2.98	–1.03	16.47	–0.25
liy	0.25	1.54	4.12	1.5
lmy	–0.1	1.03	1.76	1
lngd	–1.65	–2.82	–7.06	–2.75
t	0.01	0.03	0.06	0.05
D08				–0.5

in Panel B (column 4 in the panel with the long-run estimates), one cannot claim that Portuguese military burden has a long-run effect on its economic growth.

Finally, look at the short-run and long-run estimates for Spain (Table 3). As for Portugal, statistical fit and diagnostics improve when the new data are used. Using the new data over

the old sample period (Panel A, column 2) or over the extended sample, with and without the crisis dummy (columns 3 and 4) yields consistent statistically significant results (at the 1% level) and with the expected signs for the GDP per capita and the investment variables. Labor force growth (*ngd*) is statistically significant with a negative sign in all specifications apart from when the model is estimated for the full sample without the dummy variable. Interestingly enough, the negative and statistically significant effect of the lagged value of military burden found when the old data are used (column 1) completely disappears in any of the specifications with the new data. In the long-run (Panel B), the statistically significant negative effect of military burden on economic growth ceases to exist when the new SIPRI data are employed.[9]

Conclusion

The availability of revised data by SIPRI permits researchers to reinvestigate the military expenditure–economic growth relationship for many countries. In this articles, I examine the case of three peripheral EU countries, Greece, Portugal, and Spain. The main objective was to compare the coefficient estimates coming of the augmented Solow growth model published in Dunne and Nikolaidou's 2012 paper with those based on SIPRI's revised data but also to provide evidence over an extended time frame that would cover the post-crisis years. The choice of the three countries was not coincidental as they are among the EU countries with the heaviest SIPRI data revisions. In addition, they have similarities in their economic performance but also some difference in terms of their military expenditure patterns. Further, Portugal and Spain are underinvestigated in the relevant literature.

Replication of 1960–2007 period but using the new SIPRI data gave relatively consistent results for Greece in terms of the signs of the variables but smaller coefficient values. Also, there were some changes in the significance of the variables. Military burden, however, remained statistically insignificant. For Portugal, results using the new data were improved, yet military burden remains insignificant in the long-run estimates. Only for the case of Spain does the use of the revised data yield rather different results for the military burden variable. Specifically, the negative and statistically significant effect of military burden on economic growth found with the old SIPRI data, both for the short- and long-run, completely vanishes when the revised data are employed.

Results using the new SIPRI data over the extended time frame (1960–2014) are fairly consistent for all three countries regarding the effect of military expenditure on economic growth. For none of the countries do I find either a positive or negative effect that would be statistically significant. It should be mentioned that the 2008 crisis dummy does, however, show a statistically significant adverse effect on the economic growth of all three countries.

While it remains difficult to draw general conclusions, it is certain, though, that the empirical evidence using SIPRI's revised data does not point toward a positive effect of military

Table 3, Panel A: Short-run estimates for Spain

	1960–2007		*1960–2014*	
	Old	*New*	*New*	*New & dummy*
c	–0.117	0.990**	0.794*	1.069***
lyp(–1)	–0.090***	–0.184***	–0.118***	–0.184***
Δliy	0.246***	0.230***	0.303***	0.245***
liy(–1)	0.037	0.115***	0.086***	0.122***
Δlmy	–0.021	0.021	0.017	0.024
lmy(–1)	–0.026**	–0.008	0.017	0.003
ngd	–0.89**	–0.112***	–0.039	–0.089***
t	0.001	0.004***	0.002*	0.004***
D08				–0.035***
R-sq.	0.783	0.723	0.755	0.805
SER	0.013	0.013	0.014	0.013
DW	1.708	1.583	1.558	1.654

Note: *, **, and *** denote statistical significance at the 10, 5, an 1 percent levels, respectively.

Table 3, Panel B: Long-run estimates for Spain

	1960–2007		*1960–2014*	
	Old	*New*	*New*	*New & dummy*
c	–1.29	5.5	6.58	5.81
liy	0.41	0.67	0.75	0.66
lmy	–0.29	–0.04	0.17	0.02
lngd	–0.98	–0.61	–0.33	–0.48
t	0.01	0.02	0.02	0.02
D08				–0.19

expenditure on the economic growth for any of the three countries under investigation.

Notes

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1. Dunne and Nikolaidou (2012).

2. On the role of military expenditure in the Greek debt crisis, see Nikolaidou (2016). Some commentators include Ireland and even Italy in the "peripheral" EU but this article deals only with Greece, Portugal, and Spain.

3. Interesting variations: See Nikolaidou (2008).

4. Similarities and differences: See Dunne and Nikolaidou (2005) for a detailed overview.

5. Average growth rates: For the entire period 1961–2015 the average rates are 5.4, 5.6, and 3.9 percent, respectively, for Greece, Portugal, and Spain.

6. High Greek military burden: Nikolaidou (2008).

7. With the exception of Greece: See, e.g., Chletsos and Kollias (1995); Antonakis (1999); Kollias, Manolas, and Paleologou. (2004); Dunne and Nikolaidou (2001, 2012).

8. On the model's details see Knight, Loyaza, and Villanueva (1996) and Dunne and Nikolaidou (2012).

9. Long-run coefficients are calculated from the lagged output per capita and military burden. For instance, for the case of Spain (Table 3, Panel A, first column) –0.026/(–)(–0.090) = –0.29 is the coefficient of the military burden in the long-run. Given that both variables used to calculate the long-run coefficient were statistically significant in the short-run, the long-run result also is statistically significant.

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