INSTITUTIONAL DETERMINANTS OF MILITARY SPENDING

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Abstract: Drawing on a database for 1988-2006 containing information on 157 countries, we investigate the effects on military spending of government form, electoral rules, concentration of parliamentary parties, and ideology. From an OLS regression on pooled data, our results show that presidential democracies spend more than parliamentary systems on defense, whereas the presence of a plurality voting system will reduce the defense burden. Our findings suggest that, in contrast to theoretical predictions in the literature, institutions do not have the same impact on the provision of all public goods. We present as well evidence regarding the effect of ideology on defense spending.

Keywords: Military Spending; Politics; Institutions

JEL codes: H11, H41, H56.

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1. Introduction

Understanding the determinants of defense burdens has important ramifications as military spending is a key issue in post-conflict situations, potentially undermining the economic growth of poor and corrupt countries. Further, the vicious circles that can be formed by military spending, economic growth and conflict make it even more important that these determinants be understood.

Marked differences exist in defense burdens across countries and over time. The difficulty in accounting for military expenditure lies in the fact that many factors have to be taken into consideration: threats posed by either other countries or internal rebellion, membership of an alliance, population, wealth and the characteristics of the political system.

The empirical literature examining these issues (Rosh, 1988; Dunne & Perlo-Freeman, 2003a, 2003b, Dunne *et al.*, 2008; Gadea *et al.*, 2004; Yildirim, J. & S. Sezgin, 2005; Collier & Hoeffler, 2007; Nikolaidou, 2008) has shed some light on our overall understanding of military spending. Yet, there are a number of areas that need to be explored which might further this knowledge, but they have received little consideration to date. Principally, the range of political regimes considered in the existing empirical literature is somewhat narrow with most studies adopting various measures of democracy as an explanatory variable of military expenditure, and all concluding that democracies spend less than autocracies do on defense.

However, no distinction is made regarding the specific systems adopted in these democracies, which far from being one-dimensional categories are better considered in terms of their multi-dimensionality.[1] Indeed, constitutions provide for presidential and parliamentary democracies, establish plural and proportional electoral rules, among many

[1] This approach is based on Persson, Roland & Tabellini (1997 and 2000) and Persson & Tabellini (1999 and 2003), who have made a considerable contribution to the literature on economics and political science by studying the link between constitutional systems and economic policy.

other factors. As such, regime type – seen as much more than the simple distinction between democracy and autocracy - defines the structure of incentives in which agents take their decisions. And so, there may well be a relationship between the different dimensions of democracy and military spending that has not, to the best of our knowledge, been studied yet.

A number of theoretical studies have in fact stressed the importance of identifying the specific traits of each democracy. Persson, Roland and Tabellini (2000), henceforth PRT, predict that there tends to be an underprovision of public goods in presidential democracies under systems of plurality rule,[2] which leads us to assume that there would be a negative relationship between presidential democracies and military spending.

Yet, a number of political science studies suggest just the opposite. Linz (1990, 1994) argues that presidential systems are more prone to civil conflict than are parliamentary democracies, because of a lack of flexibility and the dual legitimacy[3] that arises from the election of both president and parliament. Indeed, Reynal-Querol (2005) analyzed the relation between political systems and civil conflict and found that less inclusive systems –for example, presidential regimes- are more prone to civil war. Were this to be the case, it could be argued that a relation might exist between proneness to conflict and military expenditure.

According to Linz (1994), in the case of growing institutional conflict in a presidential democracy between president and parliament, no democratic principles are in place to resolve the discord. In such circumstances, the military can act as a leveraging power, giving them a role in the civil power game that enhances its importance in a presidential system. Thus, it seems plausible that this position of the army in presidential systems can result in higher

[2] PRT consider the main characteristic of a presidential democracy to be the separation of proposal powers within the legislature. Basically, the direct election of the executive does not provide any incentives for the maintenance of a stable majority to support the government. Therefore, there is no particular tendency towards legislative cohesion, which is rather a feature of parliamentary democracies. An empirical exercise has been conducted to test this prediction, but its results were much weaker than expected (Persson & Tabellini, 1999).
[3] Dual legitimacy refers to the fact that, because both the president and the parliament are elected democratically, both enjoy the legitimate right to exercise their rights and powers. In case of conflict between these two institutions, there are no clear-cut constitutional means for dealing with it, which can take the conflict to a higher level.

spending. In other words, the military might be seen to be using their power and influence in a presidential system to control the state, thus securing for themselves higher rents and greater investment in the army.

In this paper we test the relation between form of government –presidential or parliamentary, electoral rules –plural or proportional, concentration of the parliamentary party groups and military spending. We also test the effect of ideology on defense burdens. Our results contradict in part the theoretical prediction made in PRT (2000), since our empirical evidence on military expenditure shows that presidential democracies spend more than their parliamentary counterparts, and that countries operating plurality voting systems spend less than countries operating systems of proportional representation.

The contribution of this paper, which merges two different streams of the literature, military spending and political economy, is twofold. First, to our knowledge, it is the first multivariate estimation to include institutional characteristics as determinants of defense spending. Second, it is the first empirical study to show that in pooled data military expenditure is higher in presidential than in parliamentarian systems. These findings should serve to trigger more theoretical research that can help shed more light on the effects of different constitutions on military spending, and highlight the importance of institutional variables on military expenditure.

The paper is organized as follows. The next section briefly discusses the importance of studying the determinants of military spending. Then we review the literature on defense burdens. Next we present the empirical strategy adopted in the paper. After completing the estimations, we discuss the results for pooled data, paying particular attention to the results following the inclusion of institutional variables in the equations. We also discuss the role played by ideology in decisions regarding military spending. Finally, we offer our concluding remarks.

2. Military spending, wars and economic growth.

The determinants of military spending need to be understood for three practical reasons: first, because of the role played by military spending in post-conflict situations; second, because of the effects of this expenditure on economic growth; and, third, because of the vicious circles that can be formed by defense expenditure, economic growth, and war.

2.1 Military spending and post-conflict situations

Military expenditure might be seen as acting as a deterrent on warring parties and, as such, this expenditure would be a regional public good. Nonetheless, Collier & Hoeffler (2006) showed that in post-conflict situations military spending increases the risk of renewed civil conflict. In their study, they show that a government's military spending acts as a signal of its intentions. To understand the underlying rationale, note that the military capability of the rebels is more significantly undermined the longer peace is maintained post-conflict, and so rebel groups lose their bargaining power in post-conflict situations. Then, although the government should negotiate a peace settlement that is acceptable to the rebels, it is likely to be rejected owing to a time-consistency problem. In the absence of any guarantees that the government will uphold the same peace conditions despite the rebels' loss of power, military spending signals the government's intentions. High spending indicates a high probability of non-fulfillment of the peace treaty, increasing the risk of renewed conflict, and vice versa.

Therefore, money invested in the military acts as a regional public bad effect. In other words, in tense situations with a recent history of blood and strife, military spending acts as a signal of the government's commitment to peace. Having said this, it is important to ask whether there are any particular institutional characteristics that might promote defense spending. That is, are there any structural elements in a political-economic system that might undermine a peace process? If so, what are these characteristics? These questions are best

understood if we could identify the determinants of military spending - in particular, the institutional determinants.

2.2. The effect of military spending on economic growth

The first papers[4] analyzing whether military spending promoted or depressed growth were published by Benoit (1973 and 1978). These studies looked at 44 developing countries between 1950 and 1965 and reported a positive association – the Benoit hypothesis - between military spending and growth.

This triggered a second wave of research in the field carried out by Deger (1981), Deger & Sen (1983), Deger & Smith (1983) and Faini, Annez & Taylor (1984), who all reported a negative relation between military spending and growth.[5] However, Frederiksen & Lonney (1983) found that the relationship between military spending and growth was positive for rich and negative for poor countries.

Later, Knight *et al.* (1996), with a sample of 79 countries for the period 1971 to 1985, showed two different effects of military expenditure on economic performance. The first was a "crowding-out" effect whereby military spending was found to reduce the stock of resources available for other productive investments, exerting a negative effect on the rate of investment in fixed productive capital. The second was a distortion in relative prices since military spending is not governed by the market and, hence, they recorded a reduction in allocative efficiency.

Other studies have failed to find a relationship between growth and the defense burden. Sala-i-Martin *et al.* (2004) selected 67 variables that have been shown to be correlated with growth, including defense spending. They used a Bayesian approach to find the posterior inclusion probability of each variable in the growth regression. Only 18 variables presented

[4] See Maizels & Nissanke (1986) for a survey of this early literature.

[5] Nabe (1983) considered an index of social development which included education and health indicators; the relation was also negative.

an inclusion probability higher than 10%: Ranking the variables according to their probability, military spending was 45th with a probability of 2.1%.

Aizenman & Glick (2006), in a study that provides further insights into this relationship, show the existence of non-linear interactions between military spending, external threats and corruption. By constructing variables that interact military spending with levels of external threat and corruption, they show that in countries facing low levels of threat, military spending reduces growth, while in countries facing high levels of threat, military expenditure promotes growth. Likewise, when corruption levels are low, they show that military spending has a positive impact on growth, while this impact is negative when corruption levels are high.[6]

In short, the effect of military expenditure on growth seems to be nonlinear. A negative effect of military spending on growth for countries with low levels of government can be expected, whereas the contrary is also true. Thus, reductions in military expenditure can, in certain countries, foster growth. But, which path should governments follow in order to reduce military expenditure? Is the political path sufficient? A better understanding of the determinants of military spending should help answer these questions.

2.3. Vicious circles between military spending, growth and war

Vicious circles can form involving military spending, growth and war. Collier and Hoeffler (2002) found that, while African countries had a similar incidence of conflict as other developing countries, the risk on that continent was higher because of its economic characteristics. By contrast, Africa's social characteristics do not increase the risk of civil conflict since fractionalized societies are safer than homogenous ones as rebel groups

[6] Kollias *et al*. (2007) estimate the relationship between growth and military expenditure in the European Union (EU15) for the period 1961-2000. They show the existence of a growth-inducing effect in the short run and a positive feedback in the long run. Since we can consider EU countries to have low levels of corruption, this paper confirms one of the results of Aizenman & Glick (2006).

encounter many difficulties in maintaining their cohesion. Consequently, it is the economic failure of Africa that would seem to make this continent more prone to civil war.

Though military spending is not the sole cause of low growth rates, it might play a role as has been noted. Thus, cutting military spending is not only important for the role it plays in post-conflict situations or for the effect it has on growth in corrupt countries, but also because it would help break the vicious circle of conflict in which some countries have become trapped in recent decades.

Thus, there are at least three pressing reasons for examining the determinants of defense spending: the role it plays in post-conflict situations, its effects on growth and the vicious circles formed by military spending, growth and war.

3. Related empirical literature

Two types of model have been used to examine the determinants of military spending (Dunne & Perlo-Freeman; 2003a): firstly, the arms race model (Richardson, 1960), which focuses primarily on the military spending of potential enemies or allies to explain defense spending; and secondly, models that include economic, political and strategic factors (Dunne & Perlo-Freeman; 2003a, 2003b and 2008; Gadea *et al*., 2004; Yildirim & Sezgin, 2005; Collier & Hoeffler, 2007; Nikolaidou, 2008).

Arms race models based on bilateral relationships have proved unsuccessful in explaining the determinants of military expenditure (Majeski and Jones, 1981). It would seem that security is a multilateral, not a bilateral concern, as Rosh (1988) explains in developing the concept of a security web. Rosh argues that security is the most influential explanatory variable determining military spending and that most threats to security are posed by bordering countries. It is for this reason that policymakers in developing countries scrutinize the military budgets of countries in their geographical region. Thus, the study averages

military expenditure as a percentage[7] of the gross national product of the neighboring states of developing countries, along with the GNP of states in their security web, i.e., those states that might participate in a dispute beyond their immediate borders. The results reveal security webs as having the most important, significant and positive effect on military spending.

Recently, Dunne & Perlo Freeman (2003b) found that the determinants of military spending changed after the end of the Cold War. Although Rosh (1988) showed a country's security web to be the most important factor, the main type of conflict over the last two decades has, in fact, been civil war (Harbom and Wallensteen, 2007). This suggests that the determinants of military spending have indeed changed with countries becoming less concerned with the arms race and more worried about internal strife[8].

In addition to these papers that highlight the importance of security issues, a second wave of research has focused on three types of variable in order to explain military spending: socioeconomic, strategic and political variables (Dunne *et al*., 2003a, 2003b and 2008; Gadea *et al*., 2004; Yildirim & Sezgin, 2005; Collier & Hoeffler, 2007; Nikolaidou, 2008). The methodologies adopted in these papers differ. Thus, for example, Dunne & Perlo-Freeman (2003a) use static and dynamic panel data analysis, Dunne & Perlo-Freeman (2003b) use cross-country data, Dunne *et al.* (2008) use panel data regressions and Collier & Hoeffler (2007) use a pooled data regression analysis. Although their results are largely similar, a number of discrepancies are worth noting.

Among the socioeconomic variables examined are population, national income measures, trade and external aid. Population has been shown to have a significant and negative effect

[7] Dunne & Perlo-Freeman (2003b) criticize this measure because they consider that the absolute level of military force facing a country is a better measure of the threat it faces. Therefore, they use the total level of military spending in the Security Web as an explanatory variable.

[8] Dunne & Perlo-Freeman (2003b) confirm this by showing that the fall of the Berlin Wall represented a structural break. Results show that civil wars have had a significantly higher coefficient in the post-Cold War period.

(Dunne *et al*., 2003a, 2003b and 2008; Collier & Hoeffler, 2007)[9]. Dunne & Perlo-Freeman (2003b) offer two explanations for this. First, they consider that having a large population in itself offers security and, secondly, that larger populations might make civil consumption needs more of a priority than security needs (Dunne & Perlo-Freeman; 2003b, pp. 31).

When using GNP as a measure of national income, Dunne *et al.* (2003a, 2003b and 2008) reported it to be insignificant (Dunne & Perlo-Freeman, 2003a and 2003b), while Dunne *et al.* (2008) found it to have a significant and negative effect on military expenditure. By contrast, Collier & Hoeffler (2007) use GDP per capita as their measure and found it to be significant and positive. According to these authors, this finding reflects the fact that a state's capacity to tax and borrow increases with development.

Trade has a positive and significant effect in a dynamic panel specification that takes into account the Cold War and post-Cold War years, whereas in the static fixed effects model it is also significant but its sign is negative (Dunne & Perlo-Freeman, 2003a).

In Collier & Hoeffler (2007) the relationship between development aid and military expenditure is examined. The authors were concerned that aid might in fact be financing military spending. Their results show that aid has a significant and positive effect on military expenditure and that, on average, 11.4% of development aid leaks into defense budgets.

Studies examining strategic variables have looked at external wars, civil wars, security webs, external threats, internal threats, potential enemies and regional dummies. The external and civil war variables seek to capture a country's participation in war. Most studies use data for pre- and post-Cold War periods and include both variables, showing a significant and positive effect on military spending. External war is defined as a dummy variable that takes a value of 1 when a country is involved in an international war. Results show that it increases military spending (Dunne & Perlo-Freeman, 2003a, 2003b and 2008; Collier & Hoeffler,

[9] This result holds except in the dynamic panel estimation and for the Cold War period estimation under fixed effects (Dunne & Perlo-Freeman, 2003a)

2007). Civil war is characterized as an index variable that ranks from 0 to 4 (Dunne & Perlo-Freeman, 2003a, 2003b and 2008) and as a dummy that takes a value of 1 if a country experiences an internal conflict with at least 1000 battle-related deaths per year (Collier & Hoeffler, 2007). However it is defined, it is significant and positive in most studies.

Some strategic variables – including the security web - seek to capture the effect on military spending of threats from other countries or opposition groups. Dunne & Perlo-Freeman (2003a) adopt Rosh's definition (see above) and run a regression of military spending on it along with a potential enemy variable (identifying the countries with the greater potential for conflict within each security web) and other control variables. With static panel data, the security web is found to be insignificant while potential enemies is significant, which suggests that the greatest threats are posed by the latter. In dynamic panel regressions, both variables were significant and positive.

Dunne & Perlo-Freeman (2003b) define their security web variable as total military spending within the web and not as an average of the states' military burdens. They claim that this definition captures the threat imposed by neighboring countries better, while the average defense burden represents the effort expended by countries in developing their armies. As in Dunne & Perlo-Freeman (2003a), they include the *potential enemies* variable. In this study both are significant and positive. Collier & Hoeffler (2007) define both a neighborhood threat and emulation variables. The threat variable is the sum of a state's neighbors' military expenditure, divided by the home country's GDP, while the emulation variable is defined in line with Rosh (1988). When both are included in the regressions, only the emulation variable is significant. Collier & Hoeffler (2007) suggest that the level of threat is captured by the external and internal threat variables (see below), which would explain the non significance of the neighborhood threat variable. Thus, they chose to drop this threat variable and to maintain the emulation variable only.

Collier & Hoeffler (2007) consider both external and internal threats. The external threat is a dummy variable that takes a value of 1 when a country has been involved in an international war after World War II. Its effect is significant and positive. By contrast, the internal threat is the predicted probability of a civil war breaking out, based on the methodology outlined in Collier & Hoeffler (2002). Its effect is also significant and positive.

Finally, these papers consider a number of political features, but in a somewhat limited manner as we seek to show below. Most studies include a measure for democracy when they run military spending regressions. The correlation is always significant and negative (Dunne & Perlo-Freeman, 2003a, 2003b and 2008). Polity IV[10] measures of democracy and autocracy are used. They compute the difference between the measure of democracy (from 0 to 10, where the rising quality of democracy receives higher values) and the measure of autocracy (from 0 to 10, where the regime is increasingly more autocratic at higher values). Thus, they obtain a measure of democracy that ranks between -10 (perfect autocracy) and 10 (perfect democracy).

Collier & Hoeffler (2007) also consider a measure of democracy. Using the Polity IV data set, they measure the general openness of political institutions on a scale of 0 (low) to 10 (high). They also find a highly significant negative relationship[11].

The democracy and autocracy scores of Polity IV (Jaggers & Gurr, 1995) are constructed taking into account the competitiveness of political participation, the regulation of political participation, the competitiveness of executive recruitment, the openness of executive recruitment and the constraints on the chief executive. However, these measures do not allow the effect of other specific constitutional features to be examined. For example, is the military expenditure of presidential systems higher or lower than that of parliamentary systems? What

[10] The Polity IV Project codes the authority traits of states in the world system for purposes of comparative and quantitative analysis. See Jaggers & Gurr (1995) and http://www.systemicpeace.org/polity/polity4.htm

[11] Yildirim & Sezgin (2005) use a different measure of democracy and investigate its relation with military spending. They found it to be negative and significant.

effect does the electoral system have? Does the concentration of the parliamentary party groups matter in the case of defense spending? Does the political color of the government affect it? In this paper we seek to answer these and other questions.

4. Empirical strategy: sample, data and the model

Our sample contains data for 157 countries for the period 1988 to 2006. The countries considered are those for which military expenditure information exists in the SIPRI (Stockholm International Peace Research Institute) database.

The model we estimate is based on the standard models of the determinants of military defense, which include threat, emulation and socioeconomic variables, as well as the variable "democracy" (as in Dunne & Perlo-Freeman (2003a, 2003b, 2008), and Collier & Hoeffler (2007).

$$Lmexp_{it} = \beta_0 + \beta_1 Civilwar_{it} + \beta_2 Previouswar_{it} + \beta_3 Emulation_{it} + \\ + \beta_4 Alliance_{it} + \beta_5 Lpopulation_{it} + \beta_6 LGDPpc_{it} + \beta_7 Democracy_{it} + \beta_8 Trend_{it} + \\ + \beta_9 Africa_{it} + \beta_{10} Europe_{it} + \beta_{11} Asia_{it} + \varepsilon_{it}$$

Table 1 provides information on the variables, the data source, and the expected effect on military expenditure. The explanatory variables can be grouped in three categories. The first category includes the threat variables: Civil war, Previous war, Emulation, and Alliance. The second includes the socioeconomic variables: Population and GDP per capita. Finally, we have the institutional variables: Democracy, System, Pres(idential), Plurality, Pres(idencial)plu(rality), Concentration and Ideology. Moreover, in order to capture the effects of time we include a Trend variable and to capture continental fixed effects we include dummy variables for Africa, Asia and Europe.

(Insert table 1 around here)

As the main purpose of this paper is to analyze the effects of several institutional variables on military spending, we add variables of an institutional nature to consecutive regressions, as defined in Table 1. Table 2 shows the variables considered at each step. All regressions, however, included the threat and socioeconomic variables. The first regression was run for a sample that included both autocratic and democratic countries and includes the variable "democracy". The second regression was also run considering autocracies and democracies though here we contrasted the effect of both the form of government and the electoral system in these countries. The third regression was run for a sample of democratic states and once again the institutional variables included the form of government and the electoral system. The fourth regression was run once again on the sample of democracies and the interaction variable "Presplu". Finally, regressions 5, 6 and 7 repeated the same strategies as in 2, 3 and 4, but they included a variable to capture the *ideology* of the executive.

. It is worth providing a more detailed explanation of some of the institutional variables, and, in particular, of the differences between presidential and parliamentary democracies, on the one hand, and between plurality and proportional voting systems, on the other. In a presidential democracy the president is elected directly by the people and as such is considered to have a direct mandate. In such a system, the legislature and the executive are separate parallel structures, which means each is free to monitor the actions of the other. In a presidential system, there is a clear-cut separation of powers between the executive and the legislative. By contrast, in a parliamentary democracy the president is elected indirectly by the legislature and there is no clear-cut separation of powers. The executive is drawn from the legislature and it is accountable to that body.

(Insert table 2 around here)

In the case of electoral systems, a plurality voting system is a winner-takes-all system, where the winner is the person with the most votes. Conversely, proportional representation

seeks to match the percentage of votes received by each party and the proportion of seats it holds in parliament.

Thus, it is more than apparent that such differences will affect the political process and the economic decisions taken in each country. And, consequently, there may well still be an unexplained link between constitutions and military expenditure.

5. Results and discussion

We carried out pool data regressions.[12] In subsection 5.1 we discuss the results of these regressions when institutional variables are included, while in section 5.2 we consider the "Ideology" variable. The latter seeks to be an exploratory discussion as we wish to highlight the fact that individuals not only take decisions as a response to certain incentives, but also operating within their mental framework of the world or ideology.

The regressions pool the data for the countries and over the time period, yielding a different number of observations (ranging from 1,048 to 2,367), depending on the variables considered.

5.1. The impact of constitutional type on military spending

The results for each specification can be seen in Table 3. The correlation matrix is included as Appendix A. Moreover, variance inflation factor (VIF) tests were conducted to test the severity of multicollinearity, producing values that ranged from 1.66 to 1.80. Thus, we can conclude that there is no troublesome linear relationship between the independent variables. Additionally, the Breusch-Pagan test was used to test whether the variances were heterogeneous. Our results indicate that the disturbances are non-spherical. To correct for this, we conducted our estimates using robust estimators.

[12] On the basis of the results of the Hausmann test, we could also have decided to choose a fixed effects estimation. However, we realized that there is not sufficient variability in the institutional variables "Pres", "Plurality" and "Presplu" to guarantee robustness. Therefore, fixed effects does not seem to be the right estimator, and we preferred to carry out an OLS.

(Insert table 3 around here)

The threat variables were “Civil war” and “Previous war”. Civil war was significant at the 1% level of probability and presented a positive sign as expected. Previous war, which captures tensions between and within countries, was significant at the 10% level and positive, suggesting that a past marked by conflict exerts pressure on defense spending for a considerable period of time.

The “Alliance” variable was significant at the 1% level and positive, indicating that when a country forms part of an alliance, military spending increases. Note that this is the first time this variable has been defined in terms of whether a country belongs to NATO or the Warsaw Pact. It might be thought that being a member of a collective defense system would lead to a reduction in military spending given that as all the member states are committed to their mutual defense in response to an attack by an external party, there would be relatively few threats from other countries and that when these came they would not be very challenging. However, our results show this hypothesis not to hold. The reason for this is that member countries are committed to maintaining a given level of defense spending.

The “Emulation” variable was significant at the 1% level and positive, implying that if the mean defense burden of your neighbors is higher than your own, your military spending will increase to a similar level.

The socioeconomic variables were “Population” and “GDP per capita”. The former was significant at the 1% level and negative, as expected from the literature. “GDP per capita” was significant at the 1% level and positive, which is in line with the results in Collier & Hoeffler (2007).

We also considered continental dummies for Africa, Europe and Asia as well as a trend variable to capture fixed effects and time effects. All were significant at the 1% level. The trend variable was negative, which implies that military spending falls slightly each year.

This result might capture the effects of the end of the Cold War since the sample data were first collected for 1988. All continental variables were positive, implying that Africa, Europe and Asia spend more on defense than America. We did not consider Oceania as few countries on this continent were included in the sample.

The "Democracy" variable was significant and negative, as expected from the literature. This implies that the military expenditure of democracies is not as great. That said, we are now in a position to broaden the analysis by examining the effect of different political systems given that they are not one-dimensional, but rather they present a range of different dimensions that can have a varied effect on military expenditure. The "Democracy" variable does capture certain dimensions, but not such features as the form of government or the electoral system. Thus the impact of presidential and parliamentary systems is not necessarily the same, while voting systems can also influence the decisions taken by the government and the legislature. It is these specific effects that are tested in this paper and which represent its main contribution.

The regression reported in column two gives insights as to how such characteristics as the form of government, the concentration of parties in the parliament and the electoral system influence military spending decisions. "System" is an index variable that is 0 if the political system is presidential, 1 if it there is an assembly-elected president and 2 if it is parliamentary. Note that non-elected executives receive a value of 0 on this variable. In this way we are able to consider the form of government of both democracies and autocracies. The variable was significant at the 1% level and negative, implying that parliamentary systems spend less on their military forces. However, since all autocratic governments are ranked as presidential systems using these variables, it might be argued that this variable actually captures the effect of democratic openness.[13]

[13] If we rerun regression 2 with "democracy", then the "system" variable is not significant, confirming that the latter variable captured the effect of democratic openness in each country.

For this reason, in the third regression, we included the "Pres" variable, which captures the form of government in the democracies.[14] The variable takes a value of 1 for presidential governments and 0 for parliamentary systems. It was significant at the 1% level and positive, implying that presidential democracies spend more on defense than parliamentary counterparts. If we include electoral systems, "Plurality" is a dummy that takes a value of 1 when there is a majority electoral system, while it takes a value of 0 when the electoral system is proportional. It was significant at the 5% level and negative. The "Concentration" variable is a Herfindahl index of the concentration of political parties in the parliament and it was not significant. The remaining variables in column 3 were significant and presented the expected sign, with the exception of the "Population" variable.

These results are of some importance because, to the best of our knowledge, this is the first time that the effects of the form of government and the type of voting system on military spending have been tested.

Defense spending is a public good, but again we obtain results that are partially inconsistent with what Persson and Tabellini (1999) and PRT (2000) predicted. The "Plurality" variable is in line with their predictions, but "Pres" is positive, rejecting the claim that there is an under provision of public goods in presidential democracies. Or, at least, there is no such under provision in defense.

In regression 4, we interact the "Pres" variable with the "Plurality" variable, obtaining "Presplu", which takes a value of 1 when the political system is presidential and majoritarian. The variable was negative but did not differ significantly from 0, contradicting once more theoretical predictions. Concentration of parties in the parliament was also insignificant.

There are two possible explanations for these empirical findings. First, the model in PRT (2000) considers that the voters in each district compete with each other for governmental

[14] We consider a country as being a democracy when the Polity IV democracy score is higher than its autocracy score.

redistribution of resources. This means voters from different districts are considered as never holding common interests. Nevertheless, a minimum level of defense spending might be considered as being in the best interests of each voter, regardless of the district in which they are resident. Thus, a framework in which districts have conflicting interests does not seem to be appropriate for understanding the determinants of military expenditure.

Second, other characteristics of presidential systems are not captured by PRT (2000). Linz (1990) argues that presidential democracies are more unstable and prone to conflict than parliamentary systems owing to their lack of flexibility and the dual legitimacy that belongs to both the parliament and the president. According to Linz, the military can play a leading role in presidential democracies since, at times, they act as a leveraging power. If this were the case and the military were capable of exerting this influence, this might be reflected in higher defense burdens.

Reynal-Querol (2005) shows that presidential democracies are more prone to civil war, because they are less inclusive than parliamentary systems. This and the other features of each system are not, however, formalized by PRT (2000). And it would seem, moreover, that the instability associated with presidential democracies might serve to increase defense expenditure.

In conclusion, therefore, the institutional variables that are able to identify the different dimensions of democracies appear to be significant. These variables, however, have never previously been taken into account as determinants of defense burdens, but it would seem that there are characteristics of political systems above and beyond measures of democracy/autocracy that determine budget expenditure decisions, including that of defense. However, the published theoretical models do not capture these dimensions that seem to have an impact on military spending. Thus, more theoretical research needs to be conducted so as to understand better the institutional determinants of military expenditure.

5.2. Further Research: Which carries greater weight, the constitution or ideology?

The constitution can be seen to define the rules of the political game in a given state, establishing as it were the incentives that govern its political system. Nonetheless, politicians are not ideologically neutral, having their own political preferences. If this were the case, it would mean that the rules of the game are not the only political variable that can be used to explain defense spending and that ideology should also be taken into account.

Bénabou (2008) develops a model of the ways in which ideology affects how the signals of the efficacy of public and market provision are processed and interpreted. However, there is no theoretical study examining the relationship between ideology and budget spending and as such we cannot rely on any theoretical prediction in order to test it. In this section we test whether there is a significant relationship between military spending and government beliefs in the hope of stimulating further research. The empirical strategy adopted is the same as that outlined above in subsection 5.1: we repeat regressions 2, 3 and 4, but here we add a variable that captures the ideology of the executive. The variable takes a value of 0 for left-wing, 1 for centrist and 2 for right-wing governments. The results are shown in Table 4.

In the first column, all the variables that were found to be significant above remained significant. However, the "System" variable, which was significant at the 1% level above, is now significant at the 10% level and while it is still negative, the coefficient is lower in absolute terms. The "Ideology" variable was significant at the 5% level and positive, implying that right-wing governments are more prone to spend on their military forces.

In the second column, the "Pres" variable is not significant, whereas in the earlier test it was at the 1% level. However, its sign remains positive. Likewise, the dummy variable for Europe also loses significance in this regression. In this case, "Ideology" is significant at the 10% level and positive.

Thus, on the basis of this evidence, it would seem that the most relevant political variable in accounting for military expenditure is the government's ideology. This suggests that as regards the determinants of defense spending, the type of political system is very much secondary to government ideology. However, we should stress that the sample used in conducting these regressions was much more limited, losing 658 and 320 observations respectively in comparison to the regressions reported in Table 3.

In fact, by including the "Ideology" variable, the sample loses observations from such countries as Armenia, Bangladesh, Benin, Burundi, Cambodia, Djibouti, El Salvador, Indonesia, Iran, Kenya, Liberia, Malaysia, Mauritius, Mongolia, Russia, Sudan, Venezuela, Zaire, etc. As the political systems in these countries differ quite markedly from western democracies, it is logical to conclude that the loss in significance of the "System" and "Pres" variables might be due, at least in part, to this reduction in the sample. When these observations are removed, the sample of countries is much more similar to that used by Persson & Tabellini (1999). Thus, the results we obtain might not be quite so surprising.[15] And, indeed, it would be interesting to have information of the political color of the governments for a much wider sample of countries, including the less developed ones. However, such information is not available.

(Insert table 4 around here)

In the third regression, the "Presplu" variable becomes significant at the 1% level and negative, whereas before it had been insignificant. The "Ideology" variable is significant at the 5% level and positive, confirming the evidence presented in Persson and Tabellini (1999), for the interaction between the variable of presidential democracies and elections conducted

[15] Persson & Tabellini (1999) found no significant relationship between the amount of spending in public goods and presidential democracies, on the one hand, or plurality voting systems, on the other. By contrast , a variable signaling democracies that are presidential and which have plurality systems was significant and negative. This was also true of our regressions.

under plurality rules, and the theoretical predictions in PRT (2000). However, we should also treat these results with caution as the significance and the negative sign of the "Presplu" variable might well reflect the loss of observations, as discussed above.

Nevertheless, our results (which are synthesized in table 5) show that, at least for some countries, ideology is an important determinant of military spending, but further research is needed to understand how political preferences affect budgetary decisions.

(Insert table 5 around here)

6. Concluding remarks

This paper seeks to contribute to the literature by including institutional variables in its empirical analysis of the determinants of military spending. By so doing, we are able to take into account the effects of form of government, electoral systems, concentration of the parliamentary parties, and ideology on the defense burden.

A total of 157 countries were considered for this study between 1988 and 2006. From our empirical analysis, we can infer that countries with a presidential democracy spend more on defense than their parliamentary counterparts. Moreover, countries operating plurality voting systems spend less than countries operating proportional representation. This effect of the institutional design of each country is of interest since the defense burden is of great importance in post-conflict situations as it could curtail growth in corrupt and poor countries. Therefore, we can conclude that there are certain structural characteristics of a political system that are of importance for reducing the risk of conflict and cutting military spending.

The regressions conducted here suggest that democratic institutions do not have the same impact on all public goods, in contrast to predictions in the literature. Thus, presidential democracies may well spend more heavily on defense while other public goods face under-provisions. Several factors account for our results, of which two are particularly influential. First, the lack of flexibility as well as the dual legitimacy that characterize presidential

systems, which give the army a certain leveraging power, can result in higher military expenditure. Second, the instability associated with presidential systems might also explain these results. Thus, these characteristics of presidential democracies might explain the different patterns of behavior observed in military expenditure compared to those recorded for other public goods.

This paper has also analyzed the impact of ideology on spending decisions revealing that right-wing executives tend to increase the defense burden. The inclusion of this variable meant that the form of government was now irrelevant, whereas the interaction between presidential democracies and a plurality voting system had a negative effect on the defense burden. However, these results should be treated with caution as the sample lost many observations from countries that could not be labeled as western-type democracies. We believe that this change in the results when including the ideological variable was due, at least in part, to the reduction in the variability of our sample.

All in all, we have shown that a consideration of institutional variables within the analysis of military spending can provide new insights and empirical evidence, and thereby enhance our understanding of this issue.

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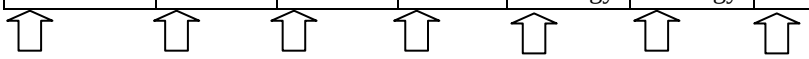
Table 1. Variable definition, data sources and expected effects.

Variable	Definition	Sources	Hypothesis
Ln military expenditure	Data for military spending as a percentage of GDP, from 1988 to 2007.	SIPRI (Stockholm International Peace Research Institute) (http://www.sipri.org/databases/milex).	-
Civil war	A dummy variable that takes a value of 1 if there is a conflict, with a minimum of 25 battle-related deaths per year and per dyad between the government of a state and at least one opposition group without intervention from other states.	PRIO (Peace Research Institute of Oslo http://www.prio.no/).	Positive.
Previous war	A dummy variable taking value of 1 if the country has been involved in a war during the period 1978-87.	PRIO (Peace Research Institute of Oslo http://www.prio.no/).	Positive.
Emulation	For country *i*, the sum of the defense spending of its neighboring countries is divided by the sum of national income of all these neighboring countries. National income is the real PPP-adjusted GDP (base year is 2005).	SIPRI and World Economic Outlook (http://www.imf.org/external/pubs/ft/weo/2009/01/weodata/index.aspx).	Positive.
Alliance	A dummy variable that takes a value of 1 for the years when the country belongs to a military treaty such as NATO and the Warsaw Pact. Since the Warsaw Pact was dissolved in 1991, all countries that were part of this alliance score 0 from 1992 onwards.	Authors' own.	Ambiguous.
Ln population	The logarithm of the total population of each country.	World Development Indicators.	Negative.
Ln GDP per capita	Measured as real PPP-adjusted GDP per capita (the base year is 2005).	World Economic Outlook.	Positive.
Democracy	The difference between a country's democracy and autocracy scores (See note).	Data source is Polity IV (Jaggers & Gurr, 1995).	Negative.
System	An index variable that takes a value of 0 if the political system is presidential, of 1 if it is an assembly-elected president, 2 if it is parliamentary.	Database of Political Institutions (http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20649465~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html).	Positive (PRT, 2000). Negative (Linz, 1990 1994).
Pres	A dummy variable that takes a value of 1 if the democracy is presidential and 0 if it is parliamentary. A country is considered to be a democracy when the Polity IV score of democracy is higher than its autocracy score (see *Democracy*).	Database of Political Institutions and authors' own. It is constructed from "system". All assembly-elected president democracies are considered parliamentarian.	Positive (PRT, 2000). Negative (Linz, 1990 1994).
Ideology	An index variable that takes a value of 0 if the government is left wing, 1 if it is centrist and 2 if it is right wing.	Database of Political Institutions.	No references.
Concentration	The sum of the squared seat shares of all parties in the parliament.	Database of Political Institutions.	Positive.
Plurality	A dummy variable that takes a value of 1 if there is a majority electoral system.	Database of Political Institutions.	Negative (PRT, 2000).
Presplu	A dummy variable that takes a value of 1 when the political system is presidential and majoritarian and 0 otherwise.	Database of Political Institutions.	Negative, (PRT, 2000).
Trend	A variable that captures the effects of time. It takes a value of one for the first year in the sample, 1988, and it increases by one for each passing year.	Authors' own.	Negative.
Africa	A dummy variable that takes a value of 1 for all countries on the African continent and 0 otherwise.	Authors' own.	No references.
Europe	A dummy variable that takes a value of 1 for all countries on the European continent and 0 otherwise.	Authors' own.	No references.
Asia	A dummy variable that takes a value of 1 for all countries on the Asian continent and 0 otherwise.	Authors' own.	No references.

Note: the scores for the Democracy variable are constructed by considering the competitiveness of political participation, the regulation of political participation, the competitiveness of executive recruitment, the openness of executive recruitment and the constraints on the chief executive. Each score ranges from 0 to 10. Therefore, "Democracy" ranges between -10 (perfect autocracy) and 10 (perfect democracy)

Table 2. Variables included in each regression.

Reg. 1	**Reg. 2**	**Reg. 3**	**Reg. 4**	**Reg. 5**	**Reg. 6**	**Reg. 7**
Democracy	-	-	-	-	-	-
-	System	-	-	System	-	-
-	-	Pres	-	-	Pres	-
-	Plurality	Plurality	-	Plurality	Plurality	-
-	-	-	Presplu	-	-	Presplu
-	-	-	-	Ideology	Ideology	Ideology



Standard regression: democracies and autocracies | Democracies and autocracies | Democracies | Democracies | Democracies and autocracies | Democracies | Democracies

Table 3. Static OLS regressions on pooled data.

VARIABLES	(1)	(2)	(3)	(4)
civilwar	0.424	0.329	0.443	0.467
	(0.0426)***	(0.0480)***	(0.0605)***	(0.0607)***
previouswar	0.0611	0.0857	0.0944	0.110
	(0.0346)*	(0.0380)**	(0.0465)**	(0.0474)**
emulation	1.069	1.419	0.757	0.902
	(0.307)***	(0.357)***	(0.279)***	(0.304)***
alliance	0.326	0.203	0.271	0.248
	(0.0413)***	(0.0406)***	(0.0380)***	(0.0383)***
Lpop	-0.0456	0.0329	0.0183	0.0146
	(0.0122)***	(0.0122)***	(0.0158)	(0.0155)
lgdppc	0.103	0.0650	0.0517	0.0327
	(0.0126)***	(0.0151)***	(0.0172)***	(0.0171)*
democracy	-0.0398			
	(0.00317)***			
system		-0.0970		
		(0.0217)***		
Pres			0.137	
			(0.0438)***	
plurality		0.0515	-0.0865	
		(0.0314)	(0.0341)**	
presplu				-0.0454
				(0.0446)
concentration		0.147	0.134	0.0688
		(0.0735)**	(0.1068)	(0.1047)
Trend	-0.0127	-0.0141	-0.0176	-0.0153
	(0.00266)***	(0.00285)***	(0.00325)***	(0.00325)***
africa	0.170	0.362	0.203	0.153
	(0.0549)***	(0.0524)***	(0.0679)***	(0.0703)**
europe	0.139	0.309	0.214	0.162
	(0.0433)***	(0.0441)***	(0.0458)***	(0.0430)***
Asia	0.472	0.633	0.329	0.233
	(0.0512)***	(0.0529)***	(0.0630)***	(0.0608)***
Constant	0.555	-0.763	-0.383	-0.110
	(0.213)***	(0.232)***	(0.280)	(0.268)
Observations	2228	1944	1368	1368
R-squared	0.282	0.222	0.218	0.208
Prob>F	0	0	0	0
Mean VIF	1.80	1.73	1.73	1.66

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. Ideology regressions.

VARIABLES	(5)	(6)	(7)
Civilwar	0.415	0.432	0.446
	(0.0623)***	(0.0756)***	(0.0735)***
previouswar	0.0901	0.119	0.132
	(0.0454)**	(0.0524)**	(0.0517)**
Emulation	0.523	0.381	0.432
	(0.179)***	(0.201)*	(0.204)**
Alliance	0.208	0.301	0.282
	(0.0453)***	(0.0455)***	(0.0459)***
Lpop	0.0692	0.0129	0.0158
	(0.0145)***	(0.0193)	(0.0181)
Lgdppc	0.0670	0.0872	0.0675
	(0.0180)***	(0.0194)***	(0.0182)***
System	-0.0546		
	(0.0280)*		
Pres		0.0507	
		(0.0525)	
Ideology	0.0388	0.0330	0.0415
	(0.0177)**	(0.0182)*	(0.0179)**
Plurality	-0.0290	-0.0894	
	(0.0403)	(0.0420)**	
Presplu			-0.169
			(0.0554)***
concentration	0.203	0.076	-0.066
	(0.1098)**	(0.1513)	(0.1401)
Trend	-0.0222	-0.0231	-0.0215
	(0.00341)***	(0.00374)***	(0.00372)***
Africa	0.325	0.332	0.322
	(0.0587)***	(0.0728)***	(0.0740)***
Europe	0.255	0.0942	0.0461
	(0.0571)***	(0.0574)	(0.0519)
Asia	0.377	0.329	0.222
	(0.0747)***	(0.0875)***	(0.0839)***
Constant	-1.331	-0.499	-0.310
	(0.284)***	(0.369)	(0.332)
Observations	1286	1048	1048
R-squared	0.267	0.264	0.268
Prob>F	0	0	0
Mean VIF	1.78	1.83	1.72

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5. Expected results and empirical evidence.

Variables	Expected results	Empirical results
Pres	Negative sign according to PRT (2000).	Positive and significant at 1%, except when controlling for ideology.
Plurality	Negative sign according to PRT (2000).	Negative and significant at 5%, except when controlling for ideology.
Presplu	Negative sign according to PRT (2000)	Negative and significant at 1% when controlling for ideology.
Ideology	No references	Positive and significant at either 5% or 10%.

Appendix A

Correlation matrix

	Civilwar	Previouswar	Emulation	Alliance	Lpop	Lgdppc	Democracy	System	Pres	Plurality	Presplu	Ideology	Concentration	Trend	Africa	Europe	Asia
Civilwar	1																
Previouswar	0.5136	1															
Emulation	-0.0184	-0.0611	1														
Alliance	-0.0927	0.0355	0.0870	1													
Lpop	0.2992	0.5025	-0.1063	0.2714	1												
Lgdppc	-0.2166	-0.1576	0.1471	0.5597	0.0895	1											
Democracy	-0.2259	-0.1676	0.1142	0.4066	0.0454	0.7116	1										
System	-0.1009	-0.1776	0.0569	0.4427	-0.0013	0.5383	0.4770	1									
Pres	0.1186	0.1716	-0.0537	-0.4046	0.0384	-0.4940	-0.4251	-0.9712	1								
Plurality	-0.0723	0.0343	-0.1562	0.0098	0.2928	-0.1970	-0.1057	0.0108	0.0431	1							
Presplu	-0.0314	0.0451	-0.1246	-0.2471	0.1342	-0.4201	-0.3803	-0.6369	0.6558	0.5228	1						
Ideology	0.0083	0.0428	0.0667	-0.0000	0.0382	0.1280	0.0590	-0.0991	0.1179	-0.0092	0.0845	1					
Concentration	-0.0607	0.1076	-0.0662	-0.0939	-0.1310	-0.3061	-0.3032	-0.0890	0.0486	0.2821	0.0792	-0.1555	1				
Trend	-0.1035	-0.0202	-0.2198	-0.0029	0.0154	0.0572	-0.0072	-0.0768	0.0772	0.0323	0.0947	-0.0688	-0.0796	1			
Africa	-0.0835	0.1160	-0.0859	-0.2605	-0.1633	-0.4871	-0.4258	-0.2329	0.1903	0.1594	0.2688	-0.1431	0.4358	0.0834	1		
Europe	-0.1982	-0.2317	0.1829	0.5580	-0.0920	0.5158	0.3905	0.5633	-0.5423	-0.2736	-0.3951	-0.0502	-0.2993	0.0133	-0.3668	1	
Asia	0.5162	0.3192	-0.0758	-0.2064	0.3255	-0.1696	-0.0895	0.0423	-0.0230	0.1139	-0.0543	0.0146	-0.1006	-0.0391	-0.1550	-0.2906	1