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Corruption and Military Spending

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Abstract

Anecdotal evidence relates corruption with high levels of military spending. This paper tests empirically whether such a relationship exists. The empirical analysis is based on data from four different sources for up to 120 countries in the period 1985–98. The association between military spending and corruption is ascertained by using panel regression techniques. The results suggest that corruption is indeed associated with higher military spending as a share of both GDP and total government spending, as well as with arms procurement in relation to GDP and total government spending. This evidence indicates that defense spending can be considered for constructing governance indicators.

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I. INTRODUCTION

In recent years, increasing attention has been devoted to understanding the reasons for, and economic consequences of, corruption. The existing literature can be divided into two broad strands. The first focuses on the determinants of corruption. Various studies have shown that the main factors affecting the scope and breadth of corruption are the quality of the bureaucracy; the level of public sector wages (van Rijckeghem and Weder, 1997); rule of law, particularly anticorruption legislation; the availability of natural resources (Leite and Weidmann, 1999); the economy's degree of competition and trade openness; and the country's industrial policy (Bhagwati, 1982; and Krueger, 1993).[2] [3]

The second strand of literature shifts attention from the determinants to the consequences of corruption. Recent studies have analyzed the impact of corruption on, among other things, output growth (Shleifer and Vishny, 1993; Murphy, Shleifer, and Vishny, 1993; and Mauro, 1995), the quality of public infrastructure and public investment (Tanzi and Davoodi, 1997), foreign direct investment (Wei, 1997), and income inequality and poverty (Gupta, Davoodi, and Alonso-Terme, 1998). These studies have shown that corruption is likely to have a detrimental impact on economic efficiency, growth, equity, and welfare. In the early literature, however, ethical considerations aside, corruption was seen as a means to achieve a higher degree of economic efficiency by "greasing the wheels" of government and overcoming cumbersome government regulation. By corollary, the absence of corruption would prevent the smooth functioning of markets, government, and economic institutions (Leff, 1964; Huntington, 1968; Lui, 1985; Beck and Maher, 1986; and Lien, 1986). More recently, the negative aspects of corruption have been found to outweigh its efficiency-enhancing properties (Kaufmann and Wei, 1999).

A comprehensive definition of corruption is lacking in the literature. Different aspects of the problem are often highlighted in different definitions depending on the object of investigation. Nevertheless, corruption can be generally described as the abuse of public power for private benefit (Bardhan, 1999; and Tanzi, 1998). It also involves some notion of illegality and is not confined to the public sector. Corruption has been defined as "behavior

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[2] Economies experiencing exchange rate controls are likely to have other distortions that provide opportunities for rent seeking and hence corruption (Wei, 1999). Indicators of regulatory discretion (Kaufmann, 1997) and competition (Ades and di Tella, 1999) are also used to measure the extent of distortion in the economy.

[3] In cross-section studies, a number of time-invariant explanatory variables are often used in corruption models. These are the index of ethnolinguistic fragmentation, measuring the probability that two randomly selected persons from a given country do not belong to the same ethnolinguistic group (Taylor and Hudson, 1972; and Mauro, 1995); the distance from the equator, measured as the distance in latitudes of a given country's capital from the equator; and the share of a country's population that speaks English at home (Hall and Jones, 1999). These variables are expected to capture cultural factors including the strength of a culture of arms-length relationships and societal acceptance of corruption, and the possibility that ethnolinguistic divisions in society create opportunities for rent seeking. La Porta and others (1998) also use religion and legal systems as controls in corruption equations.

which deviates from the formal duties of a public role because of private-regarding (personal, close family, private clique) pecuniary or status gain; or violates rules against the exercise of certain types of private-regarding behavior" (Klitgaard, 1988, p. 23). Corruption is defined by Shleifer and Vishny (1993) as "the sale by government officials of government property for personal gain" (p. 599).

This paper deals with the relationship between corruption and military spending. Various aspects of military spending lend themselves to acts of corruption. The basic hypothesis put forward in this paper is that corruption is likely to be correlated with (1) the share of defense outlays in both GDP and total government spending; and (2) military procurement in relation to both GDP and total government spending. To our knowledge, this is the first systematic cross-country empirical analysis relating military spending with corruption.[4] There is anecdotal evidence for a wide variety of countries that details instances of payment of commissions and bribes associated with public spending on the military, in particular on arms procurement.[5] Experts have estimated that bribes account for as much as 15 percent of the total spending on weapons acquisition (Tanzi, 1998).[6] According to Hines (1995), trade in military aircraft is particularly susceptible to corruption.

The paper is organized as follows. Section II delineates the channels through which corruption is likely to be associated with military spending. In Section III, the econometric model of military spending and corruption is set forth and the data set used for its testing is described. The empirical results are reported in Section IV. Section V concludes.

II. Corruption and Military Spending

Because corruption is a multifaceted phenomenon, it affects military spending through a variety of channels. Corruption may be affected by supply-side considerations, in the sense

[4] In analyzing the relationship between corruption and government spending, Mauro (1997) provides some evidence that military spending is associated with corruption.

[5] While addressing a press conference in Manila on October 1, 1999, Mark Pieth, Chairman of the OECD Working Group on bribery said "If you look at the figures, far more [bribes] are actually paid in industrialized countries, for example, in the arms trade." Corruption can also be found in the form of campaign financing in return for favorable legislation for continued spending on military R&D and for lifting bans on exports of arms, sometimes even seeking involvement of government officials to actively promote such trade. See Lambsdorff (1998) and Naylor (1998) for more information and anecdotal evidence of corruption in arms trade and procurement.

[6] In fact, the internet has become an important vehicle for the dissemination of corruption indicators, case studies, anecdotal evidence, reports, and surveys. See the Transparency International website (www.transparency.de) for a wealth of information on this subject. In the case of corruption and military spending, see the World Policy Institute website (www.worldpolicy.org) for some anecdotal evidence of corruption in military procurement. Also, the website of the Stockholm International Peace Research Institute, SIPRI (www.sipri.se), contains information on arms production, arms transfers, military expenditures and military technology, as well as links to many sites with information on this subject.

that arms producers may resort to giving bribes or inappropriate commissions to win contracts, and/or demand-side considerations, insofar as the military may engage in activities which are prone to corruption.

Supply-side considerations are:

- Foreign suppliers may bribe the officials of countries importing arms and military equipment. This can be facilitated by the tax code of arms-exporting countries, according to which bribery may be deducted as costs. Payment of bribes to foreign officials is typically not considered as a criminal act in these countries. To address this issue, the OECD has recently called for greater transparency in the legal treatment of bribery to foreign counterparts among member countries (OECD, 1997).[7]

- Since the mid-1980s, there has been a persistent fall in military spending throughout the world and this trend has increased competition among arms producers.[8] The end of the Cold War and the breakup of the former Soviet Union have changed countries' perceived threats and national security priorities. In some countries, the defense industry is saddled with idle capacities and huge fixed sunk costs. The industry has undergone considerable restructuring in the recent past and large R&D costs have compelled arms producers to scout aggressively for markets abroad (see www.worldpolicy.org/arms/papi2rep.txt for more information) by, for instance, resorting to bribery.[9]

Demand-side considerations are:

- Governments are typically the sole providers of defense services. Certain aspects of defense provision are particularly susceptible to corruption. Regulations typically confer power on the officials in charge of authorizing contracts. Limited competition

[7] The OECD Convention on Combating Bribes and Corruption in International Business Transactions, in effect since February 15, 1999, makes it a "crime to offer, promise, or give a bribe to a foreign public official in order to obtain or retain institutional business deals. It also puts an end to the practice according tax deductibility to bribe payments made to foreign officials." So far, 18 countries, including a nonmember country of the OECD (Bulgaria), have signed the Convention. See www.oecd.org/daf/nocorruption/index.htm, for more details. The United States' Foreign Corrupt Practice Act of 1977 also makes it a crime for American firms to bribe foreign government officials.

[8] See Gupta, Schiff, and Clements (1996) and Gupta and others (1999), for further details.

[9] The combination of cost negligence on the part of arms importers and the monopsonistic nature of the military procurement process creates opportunity for overinvoicing in procurement contracts. As a result, the companies paying bribes and commissions can subsequently recover these costs, at least in part, by (i) overpricing arms and ammunition; (ii) overcharging for spare parts and minor add-ons which are specific to the system and of which they are the lone producer; and (iii) obtaining lucrative contracts to train the officers of the armed forces in the use of the weapons purchased.

among suppliers encourages rent seeking and provides incentives for officials to engage in malfeasant behavior (Ades and di Tella, 1999).

- The general secrecy surrounding defense outlays gives rise to corruption. There is less transparency in government operations, particularly with respect to procurement of military equipment.[10] Defense contracts are often excluded from freedom of information legislation, where relevant; and are also often drawn in secrecy and under considerable discretionary power by the authorities. Administrative procedures in military spending may not be closely monitored by tax and customs administration authorities and defense contracts may not be liable to standard budget oversight (such as auditing and legislative approval).

- The stock of defense assets—such as military-controlled land, hardware, testing grounds, transport vehicles, and facilities such as housing and training centers—tends to be large and provide further opportunities for corruption. By controlling land, for instance, the military often controls the use and exploitation of natural resources.[11] The military is also known to engage in business operations in a number of countries, ranging from producing arms, military equipment, and steel, to managing airports and duty-free shops. Commercial activities by the military may limit entry of private firms and encourage smuggling and commodity stockpiling.

- There are additional features of military spending that make it particularly open to corruption. Defense projects tend to be relatively capital-intensive and therefore increase willingness of firms to bribe government officials to help them win a contract or tender.[12] Access to information on the design and/or specifications of a tender can also be acquired by bribing government officials in the tender process.[13]

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[10] See www.transparency.de for further details. Military procurement is defined in this paper principally as nonwage outlays, such as the purchase of services, arms, and military equipment.

[11] In a number of countries, natural resource tax revenues are earmarked to finance military spending or extrabudgetary funds for military use. The military are also responsible for issuing licenses and concessions for logging and mining and for transportation of natural resources, particularly crude oil and fuel.

[12] Indeed, corruption has also been shown to alter the composition of government spending in favor of capital-intensive projects (Rose-Ackerman, 1996; Tanzi and Davoodi, 1997; and UNDP, 1997). It also increases public investment, particularly in unproductive projects, thereby squeezing public resources away from current expenditures such as operations and maintenance (Mauro, 1997).

[13] It can also be argued that bureaucrats in poor countries may opt for imports of complex technology, rather than more standardized—and possibly more appropriate—technology, because it is hard to detect improper valuation and/or overinvoicing in the former case (Bardhan, 1997). Corruption may in this case induce excessive capital intensity in government procurement. In many developing countries, advanced weapons are purchased even in the absence of adequately trained soldiers who can use them.

III. THE THEORETICAL MODEL AND EMPIRICAL EVIDENCE

A. The Theoretical Model

There is no unique theoretical model of military spending. The model developed by Hewitt (1991, 1992, and 1993) adopts a public-choice framework for analyzing the relationship between military spending and overall government expenditures. His model and subsequent applications do not deal with the association between corruption and military outlays, or indeed any other type of government spending.

We have modeled the relationship between corruption and military spending as follows. Government spending (G) is a composite of military (M) and nonmilitary (N) outlays, such that $G = M + N$. Let government spending be financed through taxation such that $G = T$, where $T = \tau Y$, T is taxation, Y is national income, and $0 \le \tau \le 1$. To complete the model, a utility function (U) is maximized. Let the utility function be twice-continuously differentiable on private consumption (C), and government spending (G), with $U_i > 0$ and $U_{ii} < 0$, for $i = C, G$. For simplicity, define $U(C,M,N) = C^{\beta} M^{\gamma} N^{\delta}$, where $\delta = 1 - \beta - \gamma$. Finally, for algebraic tractability, we assume no private investment.

Omitting time indices for notational simplicity, the utility maximization problem becomes:

$$\text{Max } U(C,M,N), \tag{1}$$

subject to:

$$Y = C + G, \tag{2}$$

$$G = M + N. \tag{3}$$

In this corruption-free model, the first-order conditions for utility maximization yield:

$$\frac{M}{Y} = \frac{\gamma}{\beta}(1-\tau) \text{ and } \frac{M}{G} = \frac{\gamma}{\beta}(1-\tau)\frac{Y}{G}.^{14} \tag{4}$$

By equation (4), for a given level of taxation (τ), the share of military (and nonmilitary) spending in income (and total government spending) depends on the parameters of the utility function (γ and β). A higher γ, relative to β, leads to an increase in military spending relative to private consumption. Against this background, the association between corruption

[14] Note that, similarly, $\frac{N}{Y} = \frac{\delta}{\beta}(1-\tau)$ and $\frac{N}{G} = \frac{\delta}{\beta}(1-\tau)\frac{Y}{G}$.

and military spending can be described as follows. Let the parameters of the utility function (β, γ, and δ) be affected by corruption (R) such that equation (4) becomes:

$$\frac{M}{Y} = \frac{\gamma(R)}{\beta(R)}(1-\tau) \text{ and } \frac{M}{G} = \frac{\gamma(R)}{\beta(R)}(1-\tau)\frac{Y}{G}.^{15} \tag{5}$$

By equation (5), $\frac{\partial(M/Y)}{\partial R} = (1-\tau)\left[\frac{\gamma_R\beta - \beta_R\gamma}{\beta^2}\right]$ and $\frac{\partial(M/G)}{\partial R} = (1-\tau)\frac{Y}{G}\left[\frac{\gamma_R\beta - \beta_R\gamma}{\beta^2}\right]$, where $\gamma_R = \frac{d\gamma}{dR}$ and $\beta_R = \frac{d\beta}{dR}$. In this case, $\frac{\partial(M/Y)}{\partial R} > 0$ and $\frac{\partial(M/G)}{\partial R} > 0$ if $\frac{\gamma_R}{\gamma} > \frac{\beta_R}{\beta}$. In other words, corruption is associated with higher military spending as long as the utility maximiser perceives an increase in military outlays as an opportunity to use public spending for private benefit and hence achieve a higher utility level. Conversely, corruption is not associated with higher military spending in relation to GDP and total government spending.

B. Empirical Evidence

By equation (5), $\frac{M}{Y} = f(\gamma, \beta, \tau, R)$ and $\frac{M}{G} = h(\gamma, \beta, \tau, R, \frac{Y}{G})$. Because γ, β, τ and R are not directly observable, the impact of corruption on military spending can be estimated as follows:

$$(\frac{M}{Y})_i(t) = \theta_0 + \theta_1 R_i(t) + \theta_2 C_i(t) + \varepsilon_i(t), \tag{6a}$$

and

$$(\frac{M}{G})_i(t) = \zeta_0 + \zeta_1 R_i(t) + \zeta_2 (\frac{G}{Y})_i(t) + \zeta_3 C_i(t) + \varepsilon_i(t), \tag{6b}$$

where t is a time index and i indexes the countries in the panel, $M/Y_i(t)$ is the ratio of military spending to GDP, $M/G_i(t)$ is the ratio of military spending to total government spending, $G/Y_i(t)$ is the ratio of government spending to GDP, $R_i(t)$ is a corruption indicator, $C_i(t)$ is a vector of controls, and ε_{it} is an error term.

The corruption indicators used here are the Transparency International (TI) index, compiled by Goettingen University;[16] and the International Country Risk Guide (ICRG) index.[17] [18] The

[15] Note that, similarly, $\frac{N}{Y} = \frac{\delta(R)}{\beta(R)}(1-\tau)$ and $\frac{N}{G} = \frac{\delta(R)}{\beta(R)}(1-\tau)\frac{Y}{G}$.

[16] Available via the Internet: http://www.transparency.de.

control variables are as follows. Real GDP per capita is used as a scale variable. Secondary school enrolment measures the country's level of social development. The urbanization rate and the age dependency ratio measure the demand for public goods and services.[19] The size of the armed forces, measured as the number of military personnel per thousand population, proxies for pressures on the government's wage bill. Large armies increase the operating costs of government, and hence military spending. Military spending in neighboring countries, defined as the unweighted average of neighboring countries' ratio of military spending to GDP, is an indicator of regional tension and a country's perceived threats that may lead to an increase in military spending (Davoodi and others, 1999). The ratio of government spending to GDP is also routinely used as an explanatory variable in structural models of military spending.

In what follows, the empirical analysis of the relationship between corruption and military spending is carried out using annual data for up to 120 countries in the period 1985–98. The list of countries is provided in the Appendix. The relevant variables are defined in Appendix Table 7. Descriptive statistics are reported in Appendix Table 8.

C. Military Spending Trends and Corruption

Data show that there has been a downward trend in worldwide military expenditures in recent years.[20] This reduction in military spending over time has been identified as a peace dividend (Knight, Loayza, and Villanueva, 1996). According to the World Economic Outlook database, the share of military expenditures in GDP fell gradually from 5.1 percent in 1985 to 3.4 percent in 1990 and to 2.1 percent in 1998. As a share of total government spending, military outlays fell from 13.9 percent in 1990 to 9.4 percent in 1998.

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[17] The ICRG index measures corruption in a country as perceived by foreign investors. It varies from 0 (most corrupt) to 6 (least corrupt). Corruption is defined as the likelihood of a government official "to demand special payments," whether "illegal payments are expected throughout lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, police protection, or loans." See Knack and Keefer (1995), for further details.

[18] The ICRG index spans 1985 through 1998 while the TI index covers the period 1995 onward. To create a single continuous index from 1985 to 1998, the ICRG index was rescaled by multiplying it by 10/6 and then splicing the two indices, as in Tanzi and Davoodi (1997). Mauro (1995) presents a detailed analysis of different corruption indices, including the ones used in this paper, and shows that these indices are highly correlated. A sensitivity analysis of the econometric results using different corruption indices tends to yield robust parameter estimates (Gupta, Davoodi, and Alonso-Terme, 1998).

[19] Real GDP per capita, the urbanization rate, and the age dependency ratio have also been used in military spending equations (Hewitt, 1991, 1992, and 1993; and Davoodi and others, 1999).

[20] For further details, see Hewitt (1993); Bayoumi, Hewitt, and Schiff (1995); and Knight, Loayza and Villanueva (1996).

This downward trend in worldwide military spending is confirmed by other sources of data on military expenditures: the Stockholm International Peace Research Institute (SIPRI), the International Institute for Strategic Studies (IISS), and the U.S. Arms Control and Disarmament Agency (ACDA). In a sample of 71 countries, SIPRI reports a fall in worldwide military expenditures to 2.4 percent of GDP in 1997 from 3.3 percent of GDP in 1990. For a sample of 89 countries, IISS data show that worldwide military expenditures fell by 0.7 percent of GDP since 1990 to 2.5 percent of GDP in 1997. The data produced by ACDA, available only up to 1995, show a decline in military spending for 102 countries of 1.1 percent of GDP since 1990 to 2.7 percent of GDP in 1995.[21]

The association between corruption and military spending is illustrated in Figure 1. Panels A and B plot the corruption index against the ratios of military spending to GDP and total government expenditures, respectively, for all countries in the sample. The downward-sloping trend lines suggest that more corrupt countries tend to have higher military spending as a share of GDP and total government expenditures.[22] The bivariate correlation between the military spending-to-GDP ratio and corruption is –0.15 (Appendix Table 9).

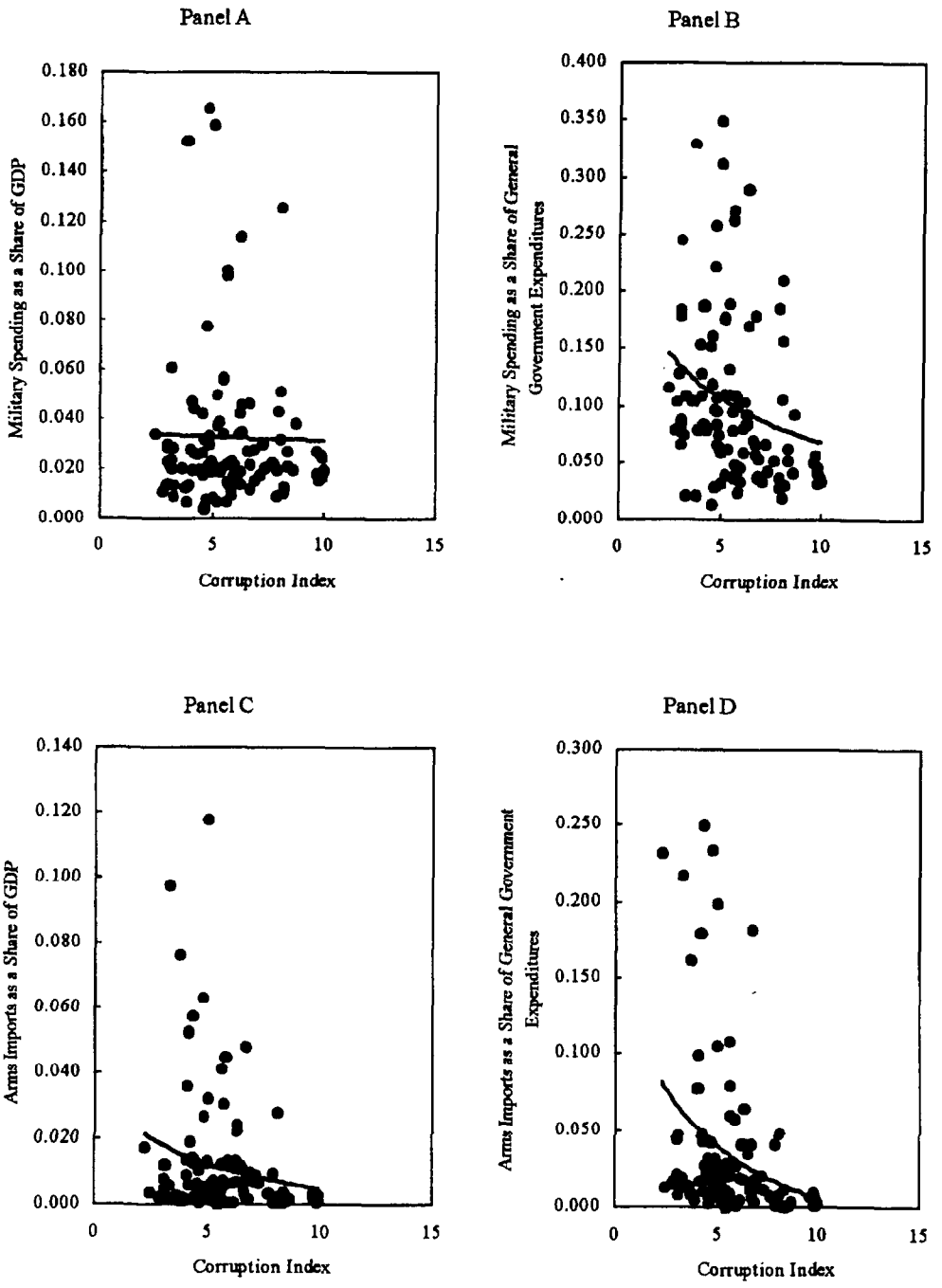
Procurement is an important channel through which corruption affects military expenditures, as suggested above. Panels C and D of Figure 1 plot the corruption index against military procurement (arms imports) as a share of GDP and total government expenditures, respectively, for all countries under examination. The trend lines are also downward sloping. The correlation coefficient between arms imports as a share of GDP and corruption is –0.29 (Appendix Table 9).

Some caution is required in this type of empirical analysis. Lack of suitable, good-quality data has been the main deterrent to empirical research on corruption and its association with military and other types of spending. The notable constraints are: (1) data on all the possible channels through which corruption is likely to affect military spending are simply not available; (2) information on military assets and military engagements in commercial activities is hard to come by and often unreliable; (3) in most countries, budgetary data do not capture in full all military outlays, given the confidential nature of military activities; and (4) a focus on arms trade flows is an imperfect proxy for military procurement and neglects purchases of domestically produced military equipment. Corruption indices tend to focus on subjective assessments of business risk and efficiency and financial corruption and do not

[21] In line with the fall in military spending in the 1990s, ACDA data show a reduction in the size of the armed forces per 1,000 population between 1990 and 1995. According to data for 134 countries, the size of the armed forces has fallen since 1990 for all regions in the world from 6.7 per 1,000 population to 5.7 per 1,000 population, except in the newly industrialized Asian countries. Countries in Africa and the Western Hemisphere have the smallest armed forces as a share of population (IMF, 1997 and 1999, *World Economic Outlook, October 1999:* Box No. 6.1, pp. 138–140).

[22] A high score in the corruption index indicates a low level of corruption.

Figure 1. Corruption and Military Spending



Source: IMF staff calculations.

necessarily take into account issues related to procurement of military equipment. These indices do not distinguish between "small" and "large" corruption; the latter type is more likely to occur in the case of military procurement activities.

IV. Results

A. Cross-Sectional Analysis

Table 1 presents the results of the estimation of equation (6), based on cross-country means for the entire time period covered by the data. The corruption variable has the expected sign and is statistically significant at the 10 percent level when the ratios of military spending to GDP and to government spending are used as the dependent variables. No statistically significant association was found between corruption and the ratio of arms imports to GDP or government spending. The coefficients of the control variables suggest that a larger share of military spending in GDP is associated with lower development indicators (GDP per capita, gross secondary school enrolment, and higher urbanization rates), higher age dependency ratios, higher government spending in relation to GDP, higher defense spending in neighboring countries, and larger armies (per thousand population).[23]

B. Panel Regression Analysis

Because the cross-sectional estimation of equation (6) does not capture the *time dimension* of the relationship between corruption and military spending, the models were reestimated as a panel.[24] Three different panel data estimators are considered: pooled OLS; one-way (country dummy) fixed effects, estimated by OLS; and random effects, estimated by GLS. Model selection is based on log-likelihood and the adjusted R^2 for the pooled OLS and fixed-effects estimator.

Military spending equations

Table 2 reports the results of the estimation of equation (6a) in which the ratio of military spending to GDP is used as the dependent variable. The explanatory variables account for 52 percent to 55 percent of the variation in military spending across countries and over time, depending on model specification. The F-test is significant at classical confidence levels for all models. In the baseline model, the corruption indicator has a negative, although statistically insignificant, impact on military spending. In Model 1, the control variables are

[23] A political regime variable has also been included in the set of control variables in cross-sectional military spending regressions.

[24] Other cross-sectional studies (Mauro, 1997) have shown a relatively weak association between military spending and corruption.

included in the estimating equation.[25] The corruption indicator has the expected sign: the societies that are perceived as being more corrupt have a higher share of military spending in GDP. The point estimate suggests that a one-percent increase in the corruption index is associated with an increase in military spending as a share of GDP of 0.32 percent.

It can be argued that the true relationship between military spending and corruption involves a distributed lag. To deal with this possibility, Model 2 was estimated with the corruption indicator lagged three years.[26] The results are consistent with the previous findings. The point estimate is nevertheless lower than in Model 1, which is not surprising given the lagged response.

We also used the ratio of military spending to total government spending as the dependent variable, as in equation (6b). Table 3 reports the results. The explanatory variables account for 55 percent to 57 percent of the variation in military spending as a share of total government spending across countries and over time, depending on model specification. The F-test is significant at classical confidence levels for all models. As in the case of Table 2, different model specifications are used to test for the robustness of the parameter estimates reported in Table 3. All models suggest that the countries perceived as being more corrupt tend to have a higher share of military spending in total government spending.[27]

Military procurement equations

The findings reported above confirm the hypothesis that corruption is associated with higher military spending, and that countries with worse corruption indicators tend to spend more on defense outlays, as a share of both GDP and total governments spending. As noted above, procurement is likely to be an important channel through which corruption affects military expenditures. To test this hypothesis, we reestimated equations (6a) and (6b) using military procurement (arms imports) as a share of both GDP and total government spending. The regressions reported in Tables 4 and 5 use the same set of right hand-side variables as in

[25] The age dependency ratio and the urbanization rate may be proxying for the demand for government provision. Estimating the models without these control variables when the ratio of government spending to GDP is included in the estimating equation produced similar results.

[26] We also experimented with different lag structures (1, 5, 7, and 10 years).

[27] To deal with the possibility of reverse causality, we also used the instrumental variables estimator to rerun the regressions in Tables 2 and 3 treating corruption as endogenous. The selection of instruments is not trivial in this type of regression and we opted for the most conservative choice: the lagged values of the corruption index were used as instruments and different lag structures were experimented with (1, 5, 7, and 10 years). When the fixed-effects estimator was used, the models were estimated in first differences, given the bias associated with the fixed effects. The results, available upon request, are in line with those reported in the tables.

Tables 1–3. The results suggest that corruption is associated with higher procurement spending, as illustrated in Figure 1.[28] [29]

IMF-supported programs

IMF policy advice has focused, among others, on improving the composition of government expenditures in favor of programs with higher productivity, including those in support of human development.[30] To ascertain whether this is the case, a dummy variable was introduced to identify the countries in the sample that have, or have had, IMF-supported programs.[31] This dummy variable takes the value of one if a there is a program in a given year and zero, otherwise.

The results reported in Model 3 (Tables 2 to 5) suggest that IMF program countries tend to have lower military spending as a share of GDP and total government spending. Unlike Davoodi and others (1999), who consider a different time period and sample of countries in their analysis, we found the IMF dummy to be strongly significant when military procurement was used as the dependent variable.[32] In this case, military procurement tends to be lower in countries with IMF-supported programs.

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[28] As in the case of the military spending equations, estimation of equation (6b) assumes that the right-hand side variables are exogenous. To address concerns about the possible endogeneity of corruption, we also experimented with the instrumental variables estimator. Lagged values of the corruption index were used as the instruments. The results, available upon request, are in line with those reported in Tables 4 and 5.

[29] The military spending and procurement equations were also estimated with autocorrelation correction. This is because military spending levels in one given year may affect spending levels in subsequent years. The parameter estimates were found to be similar with and without autocorrelation correction, and were therefore omitted in the latter case.

[30] To support poverty reduction efforts in poor countries, a number of donors have banned export credits for the purpose of buying arms and military equipment. Others, in the context of debt relief for Heavily Indebted Poor Countries (HIPCs), have restricted credit guarantees to imports that do not support productive investment and social development.

[31] Davoodi and others (1999) also include an IMF program country dummy in the military spending regressions because IMF-supported adjustment programs are likely to affect both the level and the composition of government spending. Gupta, Schiff, and Clements (1996) show that countries with stand-by agreements and systemic transformation facility programs have a substantially larger decline in military spending as a share of GDP than countries with SAF/ESAF programs in the period 1990–95. The authors also show that program countries have relied more heavily than nonprogram countries on cuts in military spending to implement fiscal adjustment. See also Harris and Kusi (1992) for evidence of lower military spending in African countries with IMF-supported programs.

[32] When the military procurement variables are used as the dependent variable, the corruption indicator fails to be statistically significant at classical confidence levels. This may be attributed to the high correlation between corruption and the IMF-program dummy, and between the corruption index and the fixed effects (Tables 2 and 3).

Different data sources

The findings reported above are robust to the use of the different sources of military spending data referred to in Section III.C. These data sources differ primarily in country coverage and the definition of expenditures. The WEO data set contains defense budget outturns reported by IMF country desk officers and has the widest coverage of countries. SIPRI uses the NATO definition of defense spending and includes military pensions, military interest payments, and paramilitary expenditures in total outlays, but excludes police expenditures. IISS uses the NATO definition only for NATO countries, and defense budget outturns for non-NATO countries. These sources also differ in the treatment of calendar and fiscal year data. For instance, WEO and SIPRI data are calculated on a calendar year basis, while IISS uses a mix of fiscal and calendar year data. The timeliness with which data are reported also varies among these data sources.

Table 6 reports the estimations of equation (6a) using military spending data from WEO, ACDA, SIPRI, and IISS. The same sample of countries is used in these regressions. The association between corruption and military spending was found to have the correct sign and to be strongly significant, regardless of the data set used. The coefficients vary between –0.27 when SIPRI data are used and –0.35 when IISS data are used.[33]

Further robustness checks

To further evaluate the robustness of the results reported above, we also introduced a conflict-country dummy in the regressions.[34] In most model specifications, the conflict-country dummy was found to affect military spending positively, as expected, and to be statistically significant at classical confidence levels. A regional dummy was also included in the estimation of equations to identify the African countries in the sample. Africa had the vast majority of conflict countries in recent years.[35] We introduced a dummy variable to

[33] Note that while the sources of military spending data vary in different equations, only one source of data (WEO) is used for the government spending variable.

[34] We used SIPRI's definition of major armed conflict. Accordingly, a conflict is defined "as a prolonged combat between the military forces of two or more governments, or of one government and at least one organized armed group, and incurring the battle-related deaths of at least 1,000 people during the entire conflict. A conflict location is the territory of a state." SIPRI covers the post-1992 period. As in Davoodi and others (1999), for years prior to 1992, we use the list of conflict countries in Sivard (1993). The variable takes value one in conflict years for each country, and zero otherwise.

[35] Military outlays remain relatively high in Africa, at 2.3 percent of GDP in 1998, compared to 1.6 percent of GDP in Asia, and 1.3 percent of GDP in the Western Hemisphere. Military spending has been higher in Africa than in these two regions as a share of GDP throughout the 1990s, even if conflict countries are excluded from the analysis. Among developing and transition economies, Africa spends more as a share of GDP on the military than all other regions except the Middle East. As a share of government spending, military outlays fell to 8.5 percent in Africa in 1998 from 12.5 percent in 1990. This ratio is lower in Africa than all regions in the

(continued...)

identify the arms-exporting countries in the sample. In these countries, it can be argued that the relationship between military spending and corruption differs from that in arms-importing countries. The dummy was found to be statistically significant and positively associated with military spending. We also experimented with time dummies to capture the downward trend in military spending over time (Section III.C). These dummies were nevertheless not found to be statistically significant in a number of model specifications. Overall, the association between corruption and military spending is robust to the inclusion of these dummies.

V. Conclusions

This paper has shown that corruption is associated with higher military spending as a share of GDP and total government expenditures, and with larger procurement outlays in relation to both GDP and government spending. Although some caution is needed, owing to the data limitations, the evidence reported in this paper is suggestive—but by no means conclusive—that countries perceived as being more corrupt tend to spend more on the military. In general, the results are robust to different model specifications, estimation techniques, and data sources. The paper further contributes to the ongoing debate in international fora on the choice of appropriate governance indicators, and supports the possible use of military spending in relation to GDP and total government spending as such indicators.

The key policy implication of this paper is that, other things being equal, policies aimed at reducing corruption will tend to improve the composition of government spending toward more productive, nonmilitary outlays. The natural policy prescription to attack corruption in military spending/procurement should be to introduce competition and reduce patronage at the level of officials receiving bribes. Although military spending is a monopoly of the State and contracts are often drawn in secrecy and under considerable discretionary power by the authorities, transparent procurement and tender regulations should be extended to the defense sector whenever feasible. Additional anticorruption measures should focus on the inclusion of defense contracts in freedom of information legislation, when available; enforcement of transparent administrative procedures in military spending; and close monitoring of arms imports by tax and customs administration authorities. Arms procurement contracts should also be liable to standard budgetary oversight (such as auditing procedures and legislative approval), in the same way as other expenditure programs in the budget.

Moreover, the fight against corruption in military procurement can be strengthened further through the implementation of the IMF Code of Good Practices on Fiscal Transparency.[36] Among the Code's key principles and practices are measures that would weaken the channels

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developing world and transition economies, except the Western Hemisphere and the transition economies of Central Europe (IMF, 1999, *World Economic Outlook, October 1999:* Box No. 6.1, pp. 138–140). See also Sollenberg, Wallensteen, and Jato (1999), for more details.

[36] Available at www.imf.org/external/np/fad/trans/code.htm.

through which corruption affects military procurement activities, and facilitate surveillance of economic policies by country authorities, financial markets, and international institutions. In particular, the Code aims at assigning clear roles and responsibilities in government and providing public access to information on government activities. Also, implementation of the Code would ensure that budget preparation, execution, and reporting are undertaken in an open manner; and fiscal information is subjected to independent assurances of integrity.

Table 1. Corruption and Military Spending: Cross-Sectional Analysis, 1985–98

	Dependent Variable			
	Military Spending as a Share of GDP	Military Spending as a Share of Government Spending	Arms Imports as a Share of GDP	Arms Imports As a Share of Government Spending
Corruption	-0.48***	-0.44***	-0.76	-0.62
	(-1.880)	(-1.673)	(-1.495)	(-1.172)
Real GDP per capita	-0.005	-0.05	-0.45***	-0.18
	(-0.039)	(-0.355)	(-1.717)	(-0.654)
Gross secondary school enrollment	-0.23	-0.19	-0.47	-0.05
	(-1.431)	(-1.142)	(-1.499)	(-0.149)
Age dependency ratio	0.50	0.51	0.91	0.67
	(1.324)	(1.346)	(1.237)	(0.881)
Urbanization rate	-0.09	-0.08	-0.48	-0.43
	(-0.473)	(-0.404)	(-1.151)	(-1.066)
Government spending as share of GDP	0.66**	-0.34	1.28**	0.32
	(3.201)	(-1.623)	(2.993)	(0.767)
Average of military spending of neighbors	0.29**	0.26*	0.47*	0.28
	(2.868)	(2.468)	(2.404)	(1.344)
Soldiers per thousand population	0.53**	0.53**	0.87**	0.22
	(6.554)	(6.514)	(5.279)	(1.350)
Constant	-0.39	-0.48	5.30**	3.62*
	(-0.452)	(-0.540)	(3.006)	(2.032)
No. of observations	79	79	79	77
Adjusted R squared	0.60	0.55	0.58	0.26
F-test	15.54	12.89	14.70	4.27

Notes: (*), (**), and (***) denote, respectively, significance at the 5 percent, 1 percent, and 10 percent levels. All models are estimated by OLS. The numbers in parentheses are heteroscedasticity-consistent *t*-statistics. All variables are defined in logarithms. In all models, a high score on the corruption index indicates a low level of corruption.

Table 2. Corruption and Military Spending: Panel Regression Analysis, 1985–98
(Dependent Variable: Military Spending as a Share of GDP)

		Models		
	Baseline	(1)	(2)	(3)
Corruption	-0.03	-0.32**	-0.21*	-0.08
	(-0.627)	(-3.420)	(-2.061)	(-1.035)
Real GDP per capita		-0.02	-0.0001	-0.52**
		(-0.342)	(-0.001)	(-3.066)
Gross secondary school enrollment		-0.22**	-0.19*	-0.05
		(-3.151)	(-2.458)	(-0.297)
Age dependency ratio		0.44**	0.56**	-0.05
		(2.711)	(3.161)	(-0.008)
Urbanization rate		-0.03	-0.06	0.46
		(-0.393)	(-0.596)0	(1.178)
Government spending as share of GDP		0.56**	0.56**	0.43**
		(7.098)	(6.302)	(5.124)
Average of military spending of neighbors		0.26**	0.27**	0.21**
		(5.890)	(5.402)	(2.341)
Soldiers per thousand population		0.48**	0.46**	0.15
		(13.916)	(11.774)	(1.243)
IMF-supported program dummy				-0.14**
				(-3.097)
Constant	-3.72**	-1.03**	-1.28**	-0.91**
	(-35.899)	(-2.843)	(-3.184)	(-1.930)
Estimator	GLS	OLS	OLS	FEM
No. of observations	1249	430	374	430
Adjusted R squared		0.55	0.52	0.56
F-test		66.51	51.15	33.59
LM test	462.72			593.52
	[0.000]			[0.000]
Hausman test	0.03 [0.866]			

Notes: (*), (**), and (***) denote, respectively, significance at the 5 percent, 1 percent, and 10 percent levels. All variables are defined in logarithms, except for the IMF dummy. The numbers in parentheses are heteroscedasticity-consistent *t*-statistics. The corruption indicator is lagged three years in Model 2. Significant values of the Lagrange Multiplier (LM) test reject the pooled regression model (OLS). Significant values of the Hausman test reject the random effects model (GLS). P-value in brackets. FEM denotes the fixed effects estimator. In all models, a high score on the corruption index indicates a low level of corruption.

Table 3. Corruption and Military Spending: Panel Regression Analysis, 1985–98
(Dependent Variable: Military Spending as a Share of Government Spending)

		Models		
	Baseline	(1)	(2)	(3)
Corruption	-0.54**	-0.37**	-0.20*	-0.10
	(-11.147)	(-4.261)	(-2.049)	(-1.425)
Real GDP per capita		0.04	-0.05	-0.53**
		(0.746)	(-0.355)	(-3.187)
Gross secondary school enrollment		-0.24**	-0.20**	-0.08
		(-3.574)	(-2.763)	(-0.449)
Age dependency ratio		0.51**	0.68**	-0.15
		(3.406)	(4.135)	(-0.254)
Urbanization rate		0.008	0.01	0.50
		(0.094)	(0.109)	(1.299)
Government spending as share of GDP		-0.48**	-0.52**	-0.54**
		(-6.506)	(-6.303)	(-6.436)
Average of military spending of neighbors		0.27**	0.29**	0.22**
		(6.553)	(6.155)	(2.867)
Soldiers per thousand population		0.44**	0.41**	0.13
		(13.248)	(11.006)	(1.189)
IMF-supported program dummy				-0.14**
				(-3.357)
Constant	-1.63**	-1.41**	-1.88**	-0.85
	(-19.151)	(-4.164)	(-4.972)	(-1.882)
Estimator	OLS	OLS	OLS	FEM
No. of observations	1221	430	371	430
Adjusted R squared	0.09	0.57	0.55	0.90
F-test	124.25	71.27	56.94	47.12
LM Test				529.55
				[0.000]

Notes: (*), (**), and (***) denote, respectively, significance at the 5 percent, 1 percent, and 10 percent levels. All variables are defined in logarithms, except for the IMF dummy. The numbers in parentheses are heteroscedasticity-consistent *t*-statistics. The corruption indicator is lagged three years in Model 2. Significant values of the LM test reject the pooled regression model (OLS). P-value in brackets. FEM denotes the fixed effects estimator. In all models, a high score on the corruption index indicates a low level of corruption.

Table 4. Corruption and Military Spending: Panel Regression Analysis, 1985–98
(Dependent Variable: Arms Imports as a Share of GDP)

		Models		
	Baseline	(1)	(2)	(3)
Corruption	-1.07**	-0.85**	-0.82**	-0.85**
	(-8.486)	(-3.776)	(-3.487)	(-3.812)
Real GDP per capita		-0.29*	-0.19	-0.42**
		(-2.063)	(-1.298)	(-2.877)
Average of military spending of neighbors		0.67**	0.69**	0.57**
		(6.301)	(6.502)	(5.280)
Gross secondary school enrollment		-0.12	-0.18	-0.17
		(-0.705)	(-1.087)	(-0.989)
Age dependency ratio		0.86*	0.90*	0.80*
		(2.254)	(2.332)	(2.107)
Urbanization rate		-0.41***	-0.46*	-0.32
		(-1.856)	(-2.035)	(-1.450)
Soldiers per thousand population		0.78**	0.73**	0.79**
		(9.214)	(8.393)	(9.430)
Government spending as share of GDP		0.61**	0.59**	0.63**
		(3.320)	(3.082)	(3.500)
IMF-supported program dummy				-0.46**
				(-2.992)
Constant	-3.87**	2.23*	1.95*	2.95**
	(-17.139)	(2.490)	(2.209)	(3.216)
No. of observations	888	340	333	340
Adjusted R squared	0.07	0.50	0.51	0.51
F-test	72.02	43.12	44.17	40.25

Notes: (*), (**), and (***) denote, respectively, significance at the 5 percent, 1 percent, and 10 percent levels. All variables are defined in logarithms, except for the IMF dummy. The numbers in parentheses are heteroscedasticity-consistent *t*-statistics. The corruption indicator is lagged three years in Model 2. All models are estimated by OLS. In all models, a high score on the corruption index indicates a low level of corruption.

Table 5. Corruption and Military Spending: Panel Regression Analysis, 1985–98
(Dependent Variable: Arms Imports as a Share of Government Spending)

		Models		
	Baseline	(1)	(2)	(3)
Corruption	-0.87**	-0.85**	-0.82**	-0.85**
	(-8.766)	(-3.778)	(-3.488)	(-3.814)
Real GDP per capita		-0.29*	-0.19	-0.42**
		(-2.068)	(-1.303)	(-2.881)
Average of military spending of neighbors		0.67**	0.69**	0.57**
		(6.303)	(6.504)	(5.282)
Gross secondary school enrollment		-0.12	-0.18	-0.17
		(-0.704)	(-1.086)	(-0.988)
Age dependency ratio		0.86*	0.90*	0.80*
		(2.255)	(2.334)	(2.108)
Urbanization rate		-0.41***	-0.46*	-0.32
		(-1.857)	(-2.035)	(-1.450)
Soldiers per thousand population		0.78**	0.73**	0.79**
		(9.223)	(8.402)	(9.438)
Government spending as share of GDP		-0.39*	-0.41*	-0.37*
		(-2.161)	(-2.145)	(-2.041)
IMF-supported program dummy				-0.46**
				(-2.991)
Constant	-0.65**	2.23*	1.95*	2.95**
	(-3.665)	(2.494)	(2.213)	(3.219)
No. of observations	795	340	333	340
Adjusted R squared	0.09	0.54	0.55	0.55
F-test	76.84	49.87	51.50	46.39

Notes: (*), (**), and (***) denote, respectively, significance at the 5 percent, 1 percent, and 10 percent levels. All variables are defined in logarithms, except for the IMF dummy. The numbers in parentheses are heteroscedasticity-consistent *t*-statistics. The corruption indicator is lagged three years in Model 2. All models are estimated by OLS. In all models, a high score on the corruption index indicates a low level of corruption.

Table 6. Corruption and Military Spending: Panel Regression Analysis, 1985–98
(Dependent Variable: Military Spending as a Share of GDP)

	Data Sources			
	WEO	SIPRI	ACDA	IISS
Corruption	-0.32**	-0.27*	-0.30*	-0.35*
	(-2.816)	(-2.442)	(-2.276)	(-2.253)
GDP per capita	0.004	0.11***	-0.42**	-0.13
	(0.065)	(1.847)	(-5.682)	(-1.462)
Gross secondary school enrollment	-0.40**	-0.55**	-0.35**	-0.27*
	(-4.228)	(-6.038)	(-3.221)	(-2.111)
Age dependency ratio	0.30	0.30	-1.03**	0.29
	(1.500)	(1.585)	(-4.453)	(1.082)
Urbanization rate	0.11	-0.07	0.43**	0.007
	(1.070)	(-0.707)	(3.630)	(0.047)
Government spending as share of GDP	0.54**	0.68**	0.40**	0.57**
	(5.803)	(7.618)	(3.663)	(4.537)
Average of military spending of neighbors	0.44**	0.50**	0.59**	0.43**
	(8.145)	(9.766)	(9.411)	(5.978)
Soldiers per thousand population	0.40**	0.42**	0.49**	0.44**
	(8.931)	(9.967)	(9.359)	(7.242)
Constant	-0.30	0.29	1.79**	0.79
	(-0.650)	(0.653)	(3.291)	(1.263)
Adjusted R squared	0.59	0.67	0.56	0.45
F-test	51.20	70.06	43.96	28.80

Notes: (*), (**), and (***) denote, respectively, significance at the 5 percent, 1 percent, and 10 percent levels. All variables are defined in logarithms. The numbers in parentheses are heteroscedasticity-consistent *t*-statistics. The corruption indicator is lagged three years in Model 2. All models are estimated by OLS. The number of observations is 275. In all models, a high score on the corruption index indicates a low level of corruption.

Appendix Table 7. Country Annual Data Used

1. Albania
2. Algeria
3. Angola
4. Argentina
5. Australia
6. Austria
7. Bahrain
8. Bangladesh
9. Belgium
10. Bolivia
11. Botswana
12. Brazil
13. Bulgaria
14. Burkina Faso
15. Cameroon
16. Canada
17. Central African Republic
18. Chile
19. China
20. Colombia
21. Congo, Dem. Republic of
22. Costa Rica
23. Côte d'Ivoire
24. Cuba
25. Cyprus
26. Czech Republic
27. Denmark
28. Dominican Republic
29. Ecuador
30. Egypt
31. El Salvador
32. Ethiopia
33. Fiji
34. Finland
35. France
36. Gabon
37. Gambia, The
38. Germany
39. Ghana
40. Greece
41. Guatemala
42. Guinea
43. Guinea-Bissau
44. Guyana
45. Haiti
46. Honduras
47. Hungary
48. India
49. Indonesia
50. Iran, Islamic Republic of
51. Ireland
52. Israel
53. Italy
54. Jamaica
55. Japan
56. Jordan
57. Kenya
58. Korea, Dem. People's Rep. of
59. Korea, Republic of
60. Kuwait
61. Lebanon
62. Libya
63. Luxembourg
64. Madagascar
65. Malawi
66. Malaysia
67. Mali
68. Malta
69. Mexico
70. Mongolia
71. Morocco
72. Mozambique
73. Myanmar
74. Namibia
75. Netherlands
76. New Zealand
77. Niger
78. Nigeria
79. Norway
80. Oman
81. Pakistan
82. Papua New Guinea
83. Paraguay
84. Peru
85. Philippines
86. Poland
87. Portugal
88. Romania
89. Russia
90. Saudi Arabia
91. Senegal
92. Sierra Leone
93. Singapore
94. Slovak Republic
95. South Africa
96. Spain
97. Sri Lanka
98. Sudan
99. Suriname
100. Sweden
101. Switzerland
102. Syrian Arab Republic
103. Taiwan
104. Tanzania
105. Thailand
106. Togo
107. Trinidad and Tobago
108. Tunisia
109. Turkey
110. Uganda
111. United Arab Emirates
112. United Kingdom
113. United States
114. Uruguay
115. República Bolivariana de Venezuela
116. Vietnam
117. Yemen, Republic of
118. Yugoslavia, Federal Republic of
119. Zambia
120. Zimbabwe

Appendix Table 8. Variable Definitions and Sources

Variable	Description	Source
CORIN	Corruption index.	ICRG, TI
GDPPC	Real per capita GDP in PPP terms.	World Bank: 1999 WDI
GESGDP	Ratio of government expenditure to GDP.	WEO, World Bank
AFTHP	Armed Forces per thousand population.	ACDA
DSGDP	Ratio of military spending to GDP.	WEO, SIPRI, ACDA, IISS
DEFSGE	Ratio of military spending to government expenditures.	WEO
AIMPSGDP	Ratio of arms imports to GDP.	ACDA, World Bank
AISDEF	Ratio of arms imports to military spending.	ACDA, WEO
AISGE	Ratio of arms imports to government expenditures.	ACDA, WEO
AVNEB	Unweighted average of military spending as a share of GDP of neighboring countries.	WEO
SENROL	Gross secondary school enrollment.	World Bank: 1999 WDI
URBAN	Urbanization rate.	World Bank: 1999 WDI
AGEDEP	Age dependency ratio.	World Bank: 1999 WDI
IMF program	Dummy variable taking value 1 for countries with IMF-supported program, and 0 otherwise.	IMF

Appendix Table 9. Descriptive Statistics
(Unweighted averages)

Variable	Mean	Standard Deviation	Minimum	Maximum	Number of Observations
DSGDP (ACDA)	4.4	6.4	0.2	95.6	833
DSGDP (IISS)	3.7	4.6	0.2	68.3	907
DSGDP (WEO)	3.3	4.2	0.2	86.2	1355
DSGDP (SIPRI)	3.2	3.5	0.2	48.5	964
AVNEB	3.7	3.4	0.5	19.2	1260
CORIN	5.7	2.2	0.8	10.0	1556
GDPPC	6,712	6,609	290	30,140	1383
AFTHP	7.55	8.51	0.41	62.17	1236
AIMPSGDP	1.1	2.7	0.0	36.5	997
DEFSGE	10.3	8.4	1.2	88.1	1326
AISGE	3.4	7.5	0.0	81.4	980
AISDEF	19.4	19.8	0.0	99.1	822
GESGDP	33.1	13.4	6.6	78.1	1605
SENROL	58.4	32.9	3.3	148.3	1140
AGEDEP	0.7	0.2	0.4	1.2	1074
URBAN	53.2	23.6	9.9	100.0	1547

Note: The sample covers 1985–98. All values are defined in percent form, except for CORIN, GDPPC, and AGEDEP.

Appendix Table 10. Raw Correlations

	DSGDP (WEO)	DEFSGE	AIMPSGDP	AISDEF	AVNEB	CORIN	GDPPC	AFTHP	GESGDP	SENROL	AGEDEP	URBAN
DSGDP (WEO)	1.00											
DEFSGE	0.89	1.00										
AIMPSGDP	0.57	0.57	1.00									
AISDEF	0.15	0.21	0.68	1.00								
AVNEB	0.68	0.60	0.62	0.28	1.00							
CORIN	-0.15	-0.38	-0.29	-0.32	-0.12	1.00						
GDPPC	0.02	-0.22	-0.08	-0.29	0.02	0.72	1.00					
AFTHP	0.41	0.31	0.37	0.20	0.40	0.16	0.22	1.00				
GESGDP	0.21	-0.16	0.12	-0.10	0.18	0.65	0.70	0.36	1.00			
SENROL	-0.10	-0.37	-0.16	-0.25	-0.08	0.75	0.83	0.23	0.74	1.00		
AGEDEP	0.18	0.38	0.23	0.27	0.24	-0.60	-0.68	-0.09	-0.50	-0.82	1.00	
URBAN	0.18	-0.08	0.07	-0.18	0.14	0.46	0.74	0.35	0.61	0.72	-0.56	1.00

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