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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 during 1985–1998. The association between military spending and corruption is investigated by using cross-section and panel regression techniques. The results suggest that corruption is 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. The results can be interpreted as evidence that defense spending may be used as a component of an indicator of the quality of governance. © 2001 Elsevier Science B.V. All rights reserved.

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1. 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 civil service (Rauch and Evans, 2000); the level of public sector wages (van Rijckeghem and Weder, 1997); rule of law, particularly anticorruption legislation and the availability of natural resources

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(Leite and Weidmann, 1999); the economy's degree of competition and trade openness; and the country's industrial policy (Bhagwati, 1982; Krueger, 1993).[1,2]

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 (Schleifer and Vishny, 1993; Murphy et al., 1993; 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 et al., 1998). These studies have shown that corruption is likely to have a detrimental impact on economic efficiency, growth, equity, and the overall welfare of a society. 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; 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 government authority for private benefit (Bardhan, 1997; Tanzi, 1998). Corruption also involves some notion of illegality, and has been defined as "behavior 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" (Nye, 1967, p. 419; Klitgaard, 1988, p. 23). Corruption is defined by Schleifer and Vishny (1993), whose focus is on privatization, as "the sale by government officials of government property for personal gain" (p. 599).

This paper empirically investigates the relationship between corruption and military spending. Various aspects of military spending lend themselves to acts of

[1] 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 (Johnson et al., 1998) and competition (Ades and di Tella, 1999) are also used to measure the extent of distortion in the economy.

[2] In cross-section studies, a number of time-invariant explanatory variables are often used in corruption models. These are the index of ethnolinguistic fractionalization, measuring the probability that two randomly selected persons from a given country do not belong to the same ethnolinguistic group (Taylor and Hudson, 1972; 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 et al. (1998) also use religion and legal systems as controls in corruption equations.

corruption. The basic hypothesis proposed in this paper is that corruption is 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, our investigation is the first systematic cross-country empirical analysis relating military spending with corruption.[3] Our study supplements 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.[4] It has been estimated that bribes account for as much as 15% of the total spending on weapons acquisition (Tanzi, 1998).[5] Hines (1995) observes that trade in military aircraft is particularly susceptible to corruption.

The paper is organized as follows. Section 2 delineates the channels that link corruption to military spending. Section 3 sets out the model of military spending and corruption and the data set is described. The empirical results are reported in Section 4. Section 5 concludes.

2. Corruption and military spending

Corruption is a multifaceted phenomenon that can affect military spending through a variety of channels. Corruption may be affected by supply-side considerations, in the sense that arms producers may resort to 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 as follows.

• Foreign suppliers may bribe the officials of countries importing arms and military equipment. This can be facilitated by the tax code of arms-exporting

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

[4] 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.

[5] 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.

countries, according to which bribery may be deducted as a cost. Payment of bribes to foreign officials is typically not considered as a criminal act in these countries. To address this issue, the OECD called for greater transparency in the legal treatment of bribery to foreign counterparts among member countries (OECD, 1997).[6]

• Since the mid-1980s, a persistent fall in military spending throughout the world has increased competition among arms producers.[7] The end of the Cold War and the breakup of the former Soviet Union changed countries' perceived threats and national security priorities. In some countries, the defense industry was saddled with idle capacities and huge fixed sunk costs. Large R&D costs have often 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.[8,9]

Demand-side considerations are listed below.

• 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 among suppliers encourages rent seeking and provides incentives for officials to engage in malfeasant behavior (Ades and di Tella, 1999; Kimenye and Mbaku, 1996; Mbaku, 2000).

• The secrecy surrounding defense outlays gives rise to corruption. In general, there is less transparency in government operations in the defense sector, particu-

[6] The OECD Convention on Combating Bribery of Foreign Public Officials 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." 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.

[7] See Gupta et al. (1996) and IMF (2000) for further details.

[8] This argument does not apply in the case of countries where the bulk of military procurement is not carried out through the standard commercial channels. In these countries, the supply of military equipment may have involved donations of surplus military equipment from former colonizers, and from other suppliers during the Cold War (Levine, 1975; Gould, 1980). Non-commercial access to military equipment has also been important in "embargoed" countries. Nevertheless, corruption may still occur in these non-commercial transactions, but it takes a different form from the types described above. It may involve, for instance, bribes paid to the employees of parastatal companies that trade and/or produce military equipment. These companies have often been set up to circumvent the sanctions imposed on formal bilateral trade in "embargoed" countries (Ellis, 1998).

[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.

larly with respect to procurement of military equipment, than in other sectors.[10] Defense contracts are often excluded from freedom of information legislation, where available; 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).[11]

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.[12] 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 that make military spending particularly open to corruption. Defense projects tend to be relatively capital-intensive, which increases willingness of firms to bribe government officials to help them win a contract or tender.[13] Access to information on the design and/or specifications of a tender can also be acquired by bribing government officials in the tender process.[14]

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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] Defense-related operations may not always be consolidated in the budget. For instance, the revenues of state-owned enterprises in the defense sector may be transferred to off-budgetary funds that in turn finance spending on defense. Again, the existence of off-budgetary funds and operations is not confined to the defense sector but is likely to be pervasive in this sector, particularly in developing countries, where the coverage of the public sector may not be comprehensive and budgetary oversight inadequate.

[12] 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.

[13] 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; 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).

[14] 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. Again, the importation of inadequate technology is not unique to the military but is more likely to occur in certain types of public procurement, of which defense is a key example.

3. The theoretical model and empirical evidence

3.1. The theoretical model

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

In line with this strand of literature, 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 $G=M+N$, and is financed through taxation such that $G=T$, where $T=\tau Y$, T is taxation, Y is national income, and $0 \leq \tau \leq 1$. To complete the model, we specify a utility function U that is 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, we adopt the form $U(C,M,N)=C^{\beta}M^{\gamma}N^{\delta}$, where $\delta = 1-\beta-\gamma$. Finally, for tractability, we assume no private investment.

We omit time indices for notational simplicity. The utility maximization problem is then:

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

subject to:

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

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

In this corruption-free model, utility maximization requires:

$$\frac{M}{Y}=\frac{\gamma}{\beta}(1-\tau) \quad \text{and} \quad \frac{M}{G}=\frac{\gamma}{\beta}(1-\tau)\frac{Y}{G}.^{15} \tag{4}$$

By Eq. (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 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 Eq. (4) becomes:

$$\frac{M}{Y}=\frac{\gamma(R)}{\beta(R)}(1-\tau) \quad \text{and} \quad \frac{M}{G}=\frac{\gamma(R)}{\beta(R)}(1-\tau)\frac{Y}{G}.^{16} \tag{5}$$

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

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

By Eq. (5),

$$\frac{\partial(M/Y)}{\partial R} = (1-\tau)\left[\frac{\gamma_R\,\beta - \beta_R\gamma}{\beta^2}\right] \text{ and}$$

$$\frac{\partial(M/G)}{\partial R} = (1-\tau)\frac{Y}{G}\left[\frac{\gamma_R\,\beta - \beta_R\gamma}{\beta^2}\right],$$

where

$$\gamma_R = \frac{\mathrm{d}\gamma}{\mathrm{d}R} \quad \text{and} \quad \beta_R = \frac{\mathrm{d}\beta}{\mathrm{d}R}.$$

In this case,

$$\frac{\partial(M/Y)}{\partial R} > 0 \quad \text{and} \quad \frac{\partial(M/G)}{\partial R} > 0 \quad \text{if} \quad \frac{\gamma_R}{\gamma} > \frac{\beta_R}{\beta}.$$

Corruption therefore affects the parameters of the utility function, but is not introduced in the model as an argument of the utility function. That is, 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 to achieve a higher personal utility.

3.2. Empirical evidence

By Eq. (5),

$$\frac{M}{Y} = f(\gamma,\beta,\tau,R) \quad \text{and} \quad \frac{M}{G} = h\left(\gamma,\beta,\tau,R,\frac{Y}{G}\right).$$

Because γ, β, τ and R are not directly observable, the impact of corruption on military spending can be estimated as follows:

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

and

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

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;[17] and the International Country Risk

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

Guide (ICRG) index.[18,19] The 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.[20] 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 et al., 1999). The ratio of government spending to GDP is also routinely used as an explanatory variable in structural models of military spending (see for example, Hewitt, 1992).

We proceed with an empirical analysis of the relationship between corruption and military spending using annual data for up to 120 countries in the period 1985–1998. Country selection was based primarily on the availability of internationally comparable data on military spending and arms imports for a sufficiently long time span. The list of countries is set out in Appendix A. The relevant variables are defined in Appendix B. Descriptive statistics are reported in Appendix C.

3.3. Military spending trends and corruption

Data show that there has been a downward trend in worldwide military expenditures during the 1990s.[21] The reduction in military spending has been described as a peace dividend (Knight et al., 1996). According to the World Economic Outlook database of the IMF, the share of military expenditures in GDP fell gradually from 5.1% in 1985 to 3.4% in 1990 and to 2.1% in 1999. As a share

[18] 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.

[19] 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 et al., 1998).

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

[21] For further details, see Hewitt (1993), Bayoumi et al. (1995), and Knight et al. (1996).

of total government spending, military outlays fell from 14.2% in 1990 to 10.0% in 1999.

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 US Arms Control and Disarmament Agency (ACDA). In a sample of 96 countries, SIPRI reports a fall in worldwide military expenditures to 2.1% of GDP in 1998 from 3.3% of GDP in 1990. For a sample of 89 countries, IISS data show that worldwide military expenditures fell by 0.7% of GDP since 1990 to 2.5% of GDP in 1998. The data produced by ACDA, available only up to 1997, show a decline in military spending for 107 countries of 1.1% of GDP since 1990 to 2.7% of GDP in 1997.[22]

The association between corruption and military spending is illustrated in Fig. 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.[23] The bivariate correlation between the military spending-to-GDP ratio and corruption is -0.15 (Appendix D).

Procurement is an important channel through which corruption affects military expenditures, as we have suggested above. Panels C and D of Fig. 1 plot the corruption index against military procurement (arms imports) as a share of GDP and total government expenditures, respectively, for all countries that we examine. Arms imports are taken as a proxy for procurement because most countries in the sample do not produce arms domestically. The trend lines are also downward sloping. The correlation coefficient between arms imports as a share of GDP and corruption is -0.29 (Appendix D).

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 affects 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 specify in full all

[22] In line with the fall in military spending in the 1990s, ACDA data show a reduction in the size of the armed forces per thousand 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 thousand population to 5.7 per thousand 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, 1999, 2000, *World Economic Outlook, October 1999:* Box No. 6.1, pp. 138–140).

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

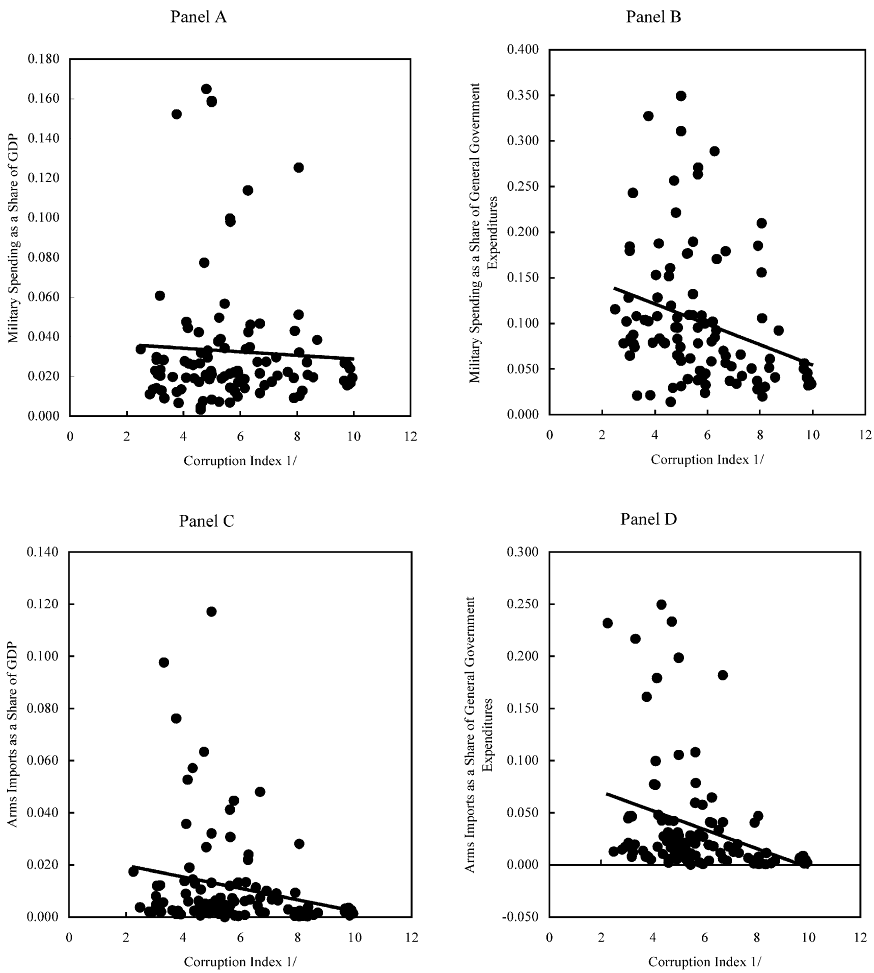

Fig. 1. Corruption and military spending. Source: IMF staff calculations. 1/ A high score in the corruption index indicates a low level of corruption.

military outlays, reflecting 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 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.

4. Results

4.1. Cross-sectional analysis

Table 1 presents the results of the estimation of Eqs. (6a) and (6b), 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% 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).[24,25]

4.2. Panel regression analysis

Because the cross-sectional estimation of Eqs. (6a) and (6b) does not capture the time dimension of the relationship between corruption and military spending, the models were reestimated as a panel.[26] Three basic 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 (FEM). To deal with possible reverse causality biases, the models have also been estimated by two-stage least squares (2SLS) and generalized method of moments (GMM).

4.3. Military spending equations

Table 2 reports the results of the estimation of Eqs. (6a) in which the ratio of military spending to GDP is used as the dependent variable. The explanatory variables account for 52% to 55% of the variation in military spending across countries and over time, depending on model specification. The F-test is signifi-

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

[25] To deal with the possibility of reverse causality, we re-estimated the equations using the two-stage least squares estimator. Corruption was instrumented by the ethnolinguistic fractionalization index, the share of people speaking English at home, and distance from the Equator, as discussed above. As reported in the literature, all explanatory factors are correctly signed and statistically significant at classical levels. In the second-stage regressions, in general, the coefficient of corruption in the government spending equations loses significance. In the arms procurement equations, the corruption coefficients are significant, albeit only at the 10% level, but no longer correctly signed. The coefficients are also smaller in magnitude when the equations are estimated by two-stage least squares.

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

Table 1
Corruption and military spending: cross-sectional analysis, 1985–1998

	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*** (−1.880)	−0.44*** (−1.673)	−0.76 (−1.495)	−0.62 (−1.172)
Real GDP per capita	−0.005 (−0.039)	−0.05 (−0.355)	−0.45*** (−1.717)	−0.18 (−0.654)
Gross secondary school enrollment	−0.23 (−1.431)	−0.19 (−1.142)	−0.47 (−1.499)	−0.05 (−0.149)
Age dependency ratio	0.50 (1.324)	0.51 (1.346)	0.91 (1.237)	0.67 (0.881)
Urbanization rate	−0.09 (−0.473)	−0.08 (−0.404)	−0.48 (−1.151)	−0.43 (−1.066)
Government spending as share of GDP	0.66** (3.201)	−0.34 (−1.623)	1.28** (2.993)	0.32 (0.767)
Average of military spending of neighbors	0.29** (2.868)	0.26* (2.468)	0.47* (2.404)	0.28 (1.344)
Soldiers per thousand population	0.53** (6.554)	0.53** (6.514)	0.87** (5.279)	0.22 (1.350)
Constant	−0.39 (−0.452)	−0.48 (−0.540)	5.30** (3.006)	3.62* (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

(*), (**), and (***) denote, respectively, significance at the 5%, 1%, and 10% 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, 1985–1998 (Dependent variable: military spending as a share of GDP)

	Baseline	Models				
		(1)	(2)	(3)	(4)	(5)
Corruption	−0.03 (−0.627)	−0.32** (−3.420)	−0.21* (−2.061)	−0.08 (−1.035)	−0.41* (−2.064)	−0.38* (−2.050)
Real GDP per capita		−0.02 (−0.342)	−0.0001 (−0.001)	−0.52** (−3.066)	0.07 (0.570)	0.10 (0.873)
Gross secondary school enrollment		−0.22** (−3.151)	−0.19* (−2.458)	−0.05 (−0.297)	−0.19 (−1.313)	−0.21 (−1.575)
Age dependency ratio		0.44** (2.711)	0.56** (3.161)	−0.05 (−0.008)	0.50 (1.605)	0.51*** (1.714)
Urbanization rate		−0.03 (−0.393)	−0.06 (−0.596)0	0.46 (1.178)	−0.08 (−0.433)	−0.07 (−0.421)
Government spending as share of GDP		0.56** (7.098)	0.56** (6.302)	0.43** (5.124)	0.49** (3.638)	0.49** (3.592)
Average of military spending of neighbors		0.26** (5.890)	0.27** (5.402)	0.21** (2.341)	0.27** (3.061)	0.27** (3.074)
Soldiers per thousand population		0.48** (13.916)	0.46** (11.774)	0.15 (1.243)	0.45** (7.403)	0.43** (8.028)
IMF-supported program dummy				−0.14** (−3.097)	−0.03 (−0.294)	−0.76 (−0.084)
Conflict-country dummy						0.36** (2.740)
Constant	−3.72** (−35.899)	−1.03** (−2.843)	−1.28** (−3.184)	−0.91** (−1.930)	−1.51*** (−1.963)	−1.81* (−2.383)
Estimator	GLS	OLS	OLS	FEM	GMM	GMM
No. of observations	1249	430	374	430	332	332
Adjusted R squared		0.55	0.52	0.56		
F-test		66.51	51.15	33.59		
LM test	462.72 [0.000]			593.52 [0.000]		
Hausmann test	0.03 [0.866]					
P-test (overidentification of instruments)					0.918	0.833

(*), (**), and (***) denote, respectively, significance at the 5%, 1%, and 10% 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 3 years in Model 2. Significant values of the Lagrange Multiplier (LM) test reject the pooled regression model (OLS). Significant values of the Hausmann test reject the random effects model (GLS). P-value in brackets. FEM denotes the fixed effects estimator. GMM denotes the generalized method of moments estimator. In all models, a high score on the corruption index indicates a low level of corruption.

cant at classical confidence levels for all models. In the baseline model, the corruption indicator has a negative, although statistically insignificant, impact on military spending.[27] In Model 1, the control variables are included in the estimating equation.[28] 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 1% increase in the corruption index is associated with an increase in military spending as a share of GDP of 0.32%.

It can be proposed 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 3 years. It can be argued that the inclusion of the lagged, rather than contemporaneous, values of the corruption indicator reduces the risk of bias in parameter estimates due to reverse causality.[29] 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 Eq. (6b). Table 3 reports the results. 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.[30]

[27] The LM and Hausmann tests recommend rejection of the OLS model and the GLS coefficients are reported instead. In what follows, the FEM/GLS coefficients are reported, together with the LM and Hausmann tests, whenever the OLS model is rejected.

[28] The age dependency ratio and the urbanization rate may be proxying 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.

[29] We also experimented with different lag structures (1, 5, 7, and 10 years) yielding consistent results.

[30] To deal with the possibility of reverse causality, we also used the instrumental variables estimator to re-estimate the regressions in Tables 2 and 3 treating the contemporaneous values of 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). The set of instruments used in the cross-sectional regressions are time-invariant and therefore cannot be used in the panel regressions. Lagged corruption is correctly signed and statistically significant in the first-stage regressions. In the second-stage regressions, corruption remains negatively signed. The coefficients are smaller in magnitude than those estimated by OLS for the uninstrumented lagged values of corruption. The *t*-statistics are also typically lower but still in general significant at classical levels. When the fixed-effects estimator was used, the models were estimated in first differences, given the bias due to the correlation between the fixed effects and the lagged dependent variable. The results, omitted to economize on space, are in line with those reported in the tables. Lagged corruption remains correctly signed and statistically significant in the first-stage regressions. In the second-stage regressions, corruption remains negatively signed, although smaller in magnitude. Significance is nevertheless only obtained at the 10% level.

Table 3
Corruption and military spending: panel regression analysis, 1985–1998 (Dependent variable: military spending as a share of government spending)

	Baseline	Models				
		(1)	(2)	(3)	(4)	(5)
Corruption	− 0.54** (− 11.147)	− 0.37** (− 4.261)	− 0.20* (− 2.049)	− 0.10 (− 1.425)	− 0.42** (− 2.136)	− 0.39* (− 2.114)
Real GDP per capita		0.04 (0.746)	− 0.05 (− 0.355)	− 0.53** (− 3.187)	0.09 (0.761)	0.12 (1.056)
Gross secondary school enrollment		− 0.24** (− 3.574)	− 0.20** (− 2.763)	− 0.08 (− 0.449)	− 0.19 (− 1.290)	− 0.21 (− 1.567)
Age dependency ratio		0.51** (3.406)	0.68** (4.135)	− 0.15 (− 0.254)	0.60** (2.007)	0.60* (2.100)
Urbanization rate		0.008 (0.094)	0.01 (0.109)	0.50 (1.299)	− 0.09 (− 0.510)	− 0.08 (− 0.501)
Government spending as share of GDP		− 0.48** (− 6.506)	− 0.52** (− 6.303)	− 0.54** (− 6.436)	− 0.51** (− 3.716)	− 0.50** (− 3.632)
Average of military spending of neighbors		0.27** (6.553)	0.29** (6.155)	0.22** (2.867)	0.24** (2.911)	0.25** (2.969)
Soldiers per thousand population		0.44** (13.248)	0.41** (11.006)	0.13 (1.189)	0.45** (7.515)	0.44** (8.147)
IMF-supported program dummy				− 0.14** (− 3.357)	− 0.05 (− 0.549)	− 0.26 (− 0.298)
Conflict-country dummy						0.37** (2.843)
Constant	− 1.63** (− 19.151)	− 1.41** (− 4.164)	− 1.88** (− 4.972)	− 0.85 (− 1.882)	− 1.69* (− 2.230)	− 1.98* (− 2.66)
Estimator	OLS	OLS	OLS	FEM	GMM	GMM
No. of observations	1221	430	371	430	334	334
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]		
P-test (overidentification of instruments)					0.480	0.748

(*), (**), and (***) denote, respectively, significance at the 5%, 1%, and 10% 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 3 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. GMM denotes the generalized method of moments estimator. In all models, a high score on the corruption index indicates a low level of corruption.

4.4. 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 Eqs. (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 Tables 2 and 3. The results suggest that corruption is associated with higher procurement spending, as illustrated in Fig. 1.[31]

To deal with reverse causality, the equations were also re-estimated using the two-stage least squares (2SLS) estimator, as the government spending equations. Overall, in the panel regressions reported in Tables 2–5, both OLS and 2SLS estimators yield similar parameter estimates. Given the adequacy of the instruments in the first-stage regressions, it is fair to say that taking account of the information provided in the time dimension of the panel reduces the risk of bias in the parameter estimates due to reverse causality. This is particularly true when lagged, rather than contemporaneous, values of the corruption indicator are included in the estimating equations. In the cross-sectional equations, however, for which the literature offers more guidance on the choice of instruments, the results are weaker for the 2SLS regressions.

4.5. Does conditionality in adjustment programs play a role?

Policy advice from international financial institutions, in particular the IMF, 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.[32] To ascertain whether this is the case, a dummy variable was introduced to identify the countries in the sample that have, or have had,

[31] As in the case of the military spending equations, estimation of Eq. (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.

[32] 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 support productive investment and social development.

Table 4
Corruption and military spending: panel regression analysis, 1985–1998 (Dependent variable: arms imports as a share of GDP)

	Baseline	Models				
		(1)	(2)	(3)	(4)	(5)
Corruption	-1.07^{**} (−8.486)	-0.85^{**} (−3.776)	-0.82^{**} (−3.487)	-0.85^{**} (−3.812)	-1.10^{*} (−2.320)	-1.05^{*} (−2.216)
Real GDP per capita		-0.29^{*} (−2.063)	−0.19 (−1.298)	-0.42^{**} (−2.877)	-1.06^{*} (−2.216)	−0.37 (−1.288)
Average of military spending of neighbors		0.67^{**} (6.301)	0.69^{**} (6.502)	0.57^{**} (5.280)	0.50^{*} (2.224)	0.50^{*} (2.269)
Gross secondary school enrollment		−0.12 (−0.705)	−0.18 (−1.087)	−0.17 (−0.989)	−0.06 (−0.257)	−0.07 (−3.031)
Age dependency ratio		0.86^{*} (2.254)	0.90^{*} (2.332)	0.80^{*} (2.107)	0.92 (1.548)	0.91 (1.548)
Urbanization rate		-0.41^{***} (−1.856)	-0.46^{*} (−2.035)	−0.32 (−1.450)	−0.44 (−1.552)	−0.42 (−1.490)
Soldiers per thousand population		0.78^{**} (9.214)	0.73^{**} (8.393)	0.79^{**} (9.430)	0.73^{**} (6.277)	0.73^{**} (6.386)
Government spending as share of GDP		0.61^{**} (3.320)	0.59^{**} (3.082)	0.63^{**} (3.500)	0.59^{*} (2.041)	0.59^{*} (2.023)
IMF-supported program dummy				-0.46^{**} (−2.992)	-0.51^{*} (−2.633)	-0.49^{**} (−2.568)
Conflict-country dummy						0.29 (1.042)
Constant	-3.87^{**} (−17.139)	2.23^{*} (2.490)	1.95^{*} (2.209)	2.95^{**} (3.216)	3.02^{***} (1.867)	2.77 (1.587)
Estimator	OLS	OLS	OLS	OLS	GMM	GMM
No. of observations	888	340	333	340	291	291
Adjusted R squared	0.07	0.50	0.51	0.51		
F-test	72.02	43.12	44.17	40.25		
P-test (overidentification of instruments)					0.296	0.238

(*), (**), and (***) denote, respectively, significance at the 5%, 1%, and 10% 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 3 years in Model 2. GMM denotes the generalized method of moments estimator. 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, 1985–1998 (Dependent variable: arms imports as a share of government spending)

	Baseline	Models				
		(1)	(2)	(3)	(4)	(5)
Corruption	-0.87^{**} (-8.766)	-0.85^{**} (-3.778)	-0.82^{**} (-3.488)	-0.85^{**} (-3.814)	-1.10^{*} (-2.318)	-1.09^{*} (-2.214)
Real GDP per capita		-0.29^{*} (-2.068)	-0.19 (-1.303)	-0.42^{**} (-2.881)	-1.06^{*} (-2.214)	-0.37 (-1.290)
Average of military spending of neighbors		0.67^{**} (6.303)	0.69^{**} (6.504)	0.57^{**} (5.282)	0.50^{*} (2.224)	0.506^{*} (2.268)
Gross secondary school enrollment		-0.12 (-0.704)	-0.18 (-1.086)	-0.17 (-0.988)	-0.06 (-0.256)	-0.074 (-0.301)
Age dependency ratio		0.86^{*} (2.255)	0.90^{*} (2.334)	0.80^{*} (2.108)	0.92 (1.549)	0.91 (1.549)
Urbanization rate		-0.41^{***} (-1.857)	-0.46^{*} (-2.035)	-0.32 (-1.450)	-0.44 (-1.553)	-0.42 (-1.492)
Soldiers per thousand population		0.78^{**} (9.223)	0.73^{**} (8.402)	0.79^{**} (9.438)	0.73^{**} (6.282)	0.73^{**} (6.391)
Government spending as share of GDP		-0.39^{*} (-2.161)	-0.41^{*} (-2.145)	-0.37^{*} (-2.041)	-0.41 (-1.422)	-0.40 (-1.381)
IMF-supported program dummy				-0.46^{**} (-2.991)	-0.51^{**} (-2.624)	-0.49^{**} (-2.569)
Conflict-country dummy						0.29 (1.040)
Constant	-0.65^{**} (-3.665)	2.23^{*} (2.494)	1.95^{*} (2.213)	2.95^{**} (3.219)	3.02^{***} (1.868)	2.77 (1.588)
Estimator	OLS	OLS	OLS	OLS	GMM	GMM
No. of observations	795	340	333	340	291	291
Adjusted R squared	0.09	0.54	0.55	0.55		
F-test	76.84	49.87	51.50	46.39		
P-test (overidentification of instruments)					0.296	0.238

(*), (**), and (***) denote, respectively, significance at the 5%, 1%, and 10% 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 3 years in Model 2. GMM denotes the generalized method of moments estimator. In all models, a high score on the corruption index indicates a low level of corruption.

IMF-supported programs.[33] This dummy variable takes the value of one if there is a program in a given year and zero, otherwise.

The results reported in Model 3 (Tables 2–5) suggest that IMF program countries tend to have lower military spending as a share of GDP and total government spending. Unlike Davoodi et al. (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.[34] In this case, military procurement tends to be lower in countries with IMF-supported programs.

Evidence of serial correlation in the residuals was found for most models. Serial correlation is expected because military spending levels in one given year affect spending levels in subsequent years. To address this issue and the possibility of heterogeneity and endogeneity of the regressors, the models were re-estimated by GMM.[35] In general, the results reported in Tables 2–5 are in line with the previous findings, but the IMF dummy loses significance in the military spending equations.

4.6. Military spending and involvement in armed conflict

A conflict-country dummy was introduced in the equations reported in Tables 2–5. We used SIPRI's definition of major armed conflict, 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 1000 people during the entire conflict. A conflict location is the territory of a state." SIPRI covers the post-1992 period. As in Davoodi et al. (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. In the military spending equations (Model 5, Tables 2 and 3), the conflict-country dummy was found to affect military spending positively, as

[33] Davoodi et al. (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 et al. (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 1990–1995. 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.

[34] 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).

[35] The instruments used are the explanatory variables included in the OLS models and the corruption index lagged one and two periods. We also experimented with different lag structures (3, 5, and 7 years).

expected, and to be statistically significant at classical confidence levels. In the military procurement equations (Model 5, Tables 4 and 5), the coefficient of the conflict-country dummy was found to be positively signed but not statistically different from zero.[36]

4.7. Further robustness checks

To further evaluate the robustness of the results reported above, we also introduced a dummy variable to identify the OECD member countries in the sample. OECD membership was found to be associated with higher military spending as a share of GDP (Table 6). A dummy variable was also introduced to 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 positively associated with military spending, but not statistically significant at classical levels of significance. Moreover, we experimented with time dummies to capture the downward trend in military spending over time (Section 3.3). The time dummy was not found to be statistically significant.[37] A regional dummy was also included in the estimation of equations to identify the African countries in the sample. The African dummy was found to be positively signed and statistically significant in most models when ACDA data are used in the construction of the dependent variable. This is not surprising because Africa had the vast majority of conflict countries in recent years.[38]

4.8. Different data sources

The findings reported above are robust to the use of the different sources of military spending data referred to in Section 3.3. 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

[36] The inclusion of the conflict-country dummy in the equations results in the loss of significance of the corruption indicator when the models are estimated by FEM and GLS, but not when the models are estimated by OLS.

[37] The results of the sensitivity analysis for the arms procurement equations (omitted to economize on space) are in line with the coefficients reported in Table 6.

[38] Military outlays remain relatively high in Africa, at 2.3% of GDP in 1999, compared to 1.4% of GDP in Asia, and 1.2% 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 (IMF, 2000, *World Economic Outlook, October 1999*: Box No. 6.1, pp. 138–140). See also Sollenberg et al. (1999), for more details.

Table 6
Corruption and military spending: panel regression analysis, 1985–1998 (Dependent variable: military spending as a share of GDP)

	(1)	(2)	(3)	(4)
Corruption	−0.38* (−2.050)	−0.34* (−2.089)	−0.41* (−2.109)	−0.38* (−2.033)
Real GDP per capita	0.10 (0.873)	0.24* (2.320)	0.11 (0.949)	0.10 (0.944)
Gross secondary school enrollment	−0.21 (−1.575)	−0.30* (−2.402)	−0.20 (−1.508)	−0.21 (−1.542)
Age dependency ratio	0.51*** (1.714)	0.33 (1.176)	0.60 (1.876)	0.52*** (1.738)
Urbanization rate	−0.07 (−0.421)	−0.14 (−0.918)	−0.07 (−0.459)	−0.07 (−0.448)
Government spending as share of GDP	0.49** (3.592)	0.59** (4.335)	0.48** (3.505)	0.49** (3.601)
Average of military spending of neighbors	0.27** (3.074)	0.25** (3.221)	0.27** (3.193)	0.27** (3.086)
Soldiers per thousand population	0.43** (8.028)	0.412** (8.489)	0.43** (7.984)	0.438** (7.872)
Conflict-country dummy	0.36** (2.740)	0.37** (2.970)	0.36** (2.714)	0.35** (2.640)
OECD dummy		0.37** (2.970)		
Arms exporters dummy			0.13 (1.124)	
Time trend				−0.26 (−0.129)
Constant	−1.8* (−2.383)	−2.29** (−3.28)	−1.80* (−2.461)	−2.29* (−3.283)
P-test (overidentification of instruments)	0.833	0.715	0.756	0.831

(*), (**), and (***) denote, respectively, significance at the 5%, 1%, and 10% levels. All variables are defined in logarithms. The numbers in parentheses are heteroscedasticity-consistent *t*-statistics. The number of observations is 332 in all models. All models are estimated by GMM. In all models, a high score on the corruption index indicates a low level of corruption.

Table 7
Corruption and military spending: panel regression analysis, 1985–1998 (Dependent variable: military spending as a share of GDP)

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

(*), (**), and (***) denote, respectively, significance at the 5%, 1%, and 10% levels. All variables are defined in logarithms. The numbers in parentheses are heteroscedasticity-consistent t-statistics. The corruption indicator is lagged 3 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.

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 7 reports the estimations of Eq. (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.[39]

5. 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. The results are fairly robust to different model specifications, estimation techniques, and data sources. The paper 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 principal policy conclusion of this paper is that, other things being equal, we can expect policies aimed at reducing corruption to change the composition of government spending toward more productive, nonmilitary outlays. Corruption in military spending/procurement can of course be reduced through greater transparency and reduced patronage at the level of officials receiving bribes. Defense contracts could also be included in freedom of information legislation, when available. Arms procurement contracts could be liable to standard budgetary oversight (such as auditing procedures and legislative approval), in the same way as other expenditure programs in the budget.

Deficiencies in budget oversight and associated corruption are not unique to the defense sector. Transparent budget preparation, execution, and reporting, as well as subjecting fiscal information to independent assurances of integrity would

[39] 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.

however weaken the channels through which corruption affects public procurement, including in the military sector.

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Appendix A. Country annual data used

1. Albania	41. Guatemala	81. Pakistan
2. Algeria	42. Guinea	82. Papua New Guinea
3. Angola	43. Guinea-Bissau	83. Paraguay
4. Argentina	44. Guyana	84. Peru
5. Australia	45. Haiti	85. Philippines
6. Austria	46. Honduras	86. Poland
7. Bahrain	47. Hungary	87. Portugal
8. Bangladesh	48. India	88. Romania
9. Belgium	49. Indonesia	89. Russia
10. Bolivia	50. Iran, Islamic Republic of	90. Saudi Arabia
11. Botswana	51. Ireland	91. Senegal
12. Brazil	52. Israel	92. Sierra Leone
13. Bulgaria	53. Italy	93. Singapore
14. Burkina Faso	54. Jamaica	94. Slovak Republic
15. Cameroon	55. Japan	95. South Africa
16. Canada	56. Jordan	96. Spain
17. Central African Republic	57. Kenya	97. Sri Lanka
18. Chile	58. Korea, Dem. People's Rep. of	98. Sudan
19. China	59. Korea, Republic of	99. Suriname
20. Colombia	60. Kuwait	100. Sweden
21. Congo, Dem. Republic of	61. Lebanon	101. Switzerland
22. Costa Rica	62. Libya	102. Syrian Arab Republic
23. Côte d'Ivoire	63. Luxembourg	103. Taiwan

24. Cuba	64. Madagascar	104. Tanzania
25. Cyprus	65. Malawi	105. Thailand
26. Czech Republic	66. Malaysia	106. Togo
27. Denmark	67. Mali	107. Trinidad and Tobago
28. Dominican Republic	68. Malta	108. Tunisia
29. Ecuador	69. Mexico	109. Turkey
30. Egypt	70. Mongolia	110. Uganda
31. El Salvador	71. Morocco	111. United Arab Emirates
32. Ethiopia	72. Mozambique	112. United Kingdom
33. Fiji	73. Myanmar	113. United States
34. Finland	74. Namibia	114. Uruguay
35. France	75. Netherlands	115. República Bolivariana de Venezuela
36. Gabon	76. New Zealand	116. Vietnam
37. Gambia, The	77. Niger	117. Yemen, Republic of
38. Germany	78. Nigeria	118. Yugoslavia, Federal Republic of
39. Ghana	79. Norway	119. Zambia
40. Greece	80. Oman	120. Zimbabwe

Appendix B. 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 C. 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	6712	6609	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

The sample covers 1985–1998. All values are defined in percent form, except for CORIN, GDPPC, and AGEDEP.

Appendix D. 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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