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Corruption and the composition of government expenditure

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Abstract

This paper asks whether predatory behavior by corrupt politicians distorts the composition of government expenditure. Corruption is found to reduce government spending on education in a cross section of countries. © 1998 Elsevier Science S.A.

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1. Introduction

In a world in which governments do not always act in their citizens' best interest, corrupt politicians may be expected to spend more public resources on those items on which it is easier to levy large bribes and maintain them secret. This paper provides the first cross-country evidence that corruption does indeed affect the composition of government expenditure. In particular, education spending is found to be adversely affected by corruption.

Both economic theory and common sense suggest the types of government expenditure that provide more lucrative opportunities. First, the seminal contributions of Krueger (1974) and others stressed that it is the existence of rents to motivate rent-seeking behavior. As a consequence, large bribes will be available on items produced by firms operating in markets where the degree of competition

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is low. Second, the illegal nature of corruption and the ensuing need for secrecy imply that corrupt officials will choose goods whose exact value is difficult to monitor. Therefore, specialized, high-technology goods will be particularly sought after (Shleifer and Vishny, 1993). Hines (1995) argues that, for example, international trade in military aircraft – high-technology goods produced by a limited number of oligopolistic firms – is particularly susceptible to corruption. By contrast, basic education only requires mature technology that can be provided by a relatively large number of suppliers. On the basis of these considerations, one might therefore expect that it will be easier to collect substantial bribes on large infrastructure projects or highly sophisticated defense equipment than on textbooks or teachers' salaries.

In other areas, such as health or transfers and welfare payments, the picture is less clear-cut. In the case of health, opportunities to collect bribes may be abundant on state-of-the-art medical equipment or advanced hospital facilities designed to boost national prestige, but may be more limited in the case of doctors' and nurses' salaries. In the case of transfers and welfare payments, many of which constitute rents, bureaucrats sometimes enjoy considerable discretion in how to allocate them, even though the rents per individual transaction may be relatively limited. For example, bureaucrats may have little room for maneuver on old-age pensions, but anecdotal evidence suggests that, in some countries, fraud is widespread on disability pensions or unemployment benefits. Education is not free from the scope for patronage, but it seems easier to hand out a disability pension to a healthy person than to give a teaching job to an unqualified person. In the case of the former, a pure rent is transferred with no further visible consequences, while in the case of the latter, it would be difficult – in egregious cases – for the unqualified teacher to face a class of students on a daily basis. Therefore, on a priori grounds, it is not always possible to make a precise guess on how corruption affects a particular spending item, but education seems to stand out as an area where it is relatively difficult to levy bribes.

The question whether corruption affects the composition of government expenditure may have important implications. First, while the empirical literature has so far yielded mixed results on the effects of government expenditure and, in particular, its composition, on economic growth,[1] most economists seem to think that the level and type of spending undertaken by governments do matter for economic performance. For example, even though cross-country regression work

[1]Concerning the overall level of government expenditure, Levine and Renelt (1992) show that it does not seem to be robustly associated with economic growth. Previous work on the composition of government expenditure has been relatively limited. Devarajan et al. (1996) find that, with the exception of current expenditure, no component of government expenditure bears a significant relationship with economic growth. Easterly and Rebelo (1993) also find few significant relationships: public investment on transport and communications is positively associated with economic growth, though not with private investment; public investment in agriculture is negatively associated with private investment; general government investment is positively correlated with both growth and private investment; and public enterprise investment is negatively correlated with private investment.

has not conclusively shown the existence of a relationship between government spending on education and economic growth, it has gathered robust evidence that school enrollment rates (Levine and Renelt, 1992) and educational attainment (Barro, 1992) play a considerable role in determining economic growth. Second, measuring the effects of corruption on the composition of government expenditure may help quantify the severity of the principal-agent problem that exists in this respect between citizens and politicians or, following the literature on the fungibility of aid resources, aid donors and recipient governments.

In order to study empirically the relatively unexplored relationship between corruption and the composition of government expenditure, this paper uses corruption indices produced by a private firm for a cross-section of countries.[2] It finds that corruption alters the composition of government expenditure, specifically by reducing government spending on education. Therefore, it confirms that more corrupt countries choose to spend less on education, since it does not provide as many lucrative opportunities for government officials as other components of spending do.[3] There is also some evidence that corruption reduces spending on health.

The paper is organized as follows. Section 2 describes the data. Section 3 presents the empirical evidence. Section 4 concludes.

2. Description of the data

This paper uses the indices of corruption and other institutional variables drawn from *Political Risk Services, Inc*., a private firm which publishes the *International Country Risk Guide*, used and described in detail by Keefer and Knack (1993).[4] The indices were compiled by the IRIS Center (University of Maryland) and are available for over 100 countries. I use the 1982–1995 average of the ''corruption'' index. Low scores on the ICRG corruption index indicate ''high government officials are likely to demand special payments'' and ''illegal payments are generally expected throughout lower levels of government'' in the form of ''bribes connected with import and export licenses, exchange controls, tax assessment,

[2]The only previous related empirical work that I am aware of is that of Rauch (1995), who uses a data set on U.S. cities to show that the wave of municipal reform that took place during the Progressive Era increased the share of total municipal expenditure allocated to road and sewer investment, thereby raising the growth in city manufacturing employment.

[3]Mauro (1996) derives a simple generalization of the Barro (1990) model that shows that if corruption acted simply as though it were a tax on income, then the amount and composition of government expenditure would be independent of corruption. As a consequence, it seems reasonable to interpret any empirical relationships between corruption indices and particular components of government spending as evidence that bribes can be collected more efficiently on some government expenditure components than on others.

[4]Mauro (1996) obtains broadly similar results using also data from another firm, *Business International*.

police protection, or loans.'' All indices are on a scale from 0 (worst, most corrupt) to 6 (best, least corrupt). There are 106 observations in the Barro (1991) sample for which the corruption index is available. The sample statistics are as follows: mean = 3.37, standard deviation = 1.45, minimum = 0.10, maximum = 6.00.

In estimating the relationship between corruption indices and the components of government expenditure, the fact that the indices are subjective is unlikely to constitute a source of endogeneity bias. In fact, it does not seem plausible that the consultants that produce the indices be influenced in their judgement by the composition of government expenditure. However, the issue of causality is relevant when one wonders whether the composition of government expenditure causes corruption (by creating opportunities for it) or corruption alters the composition of government expenditure. Therefore, in some estimates in this paper, a number of instrumental variables are used to address potential endogeneity bias. The first three have been used and described in further detail in Mauro (1995).

The first instrument is an index of ethnolinguistic fractionalization drawn from Taylor and Hudson (1972), which measures the probability that two randomly selected persons from a given country will not belong to the same ethnolinguistic group. This variable is a good instrument because, in accordance with Shleifer and Vishny (1993) arguments, more fractionalized countries tend to have more dishonest bureaucracies. The index of ethnolinguistic fractionalization has a correlation coefficient of 0.36 (significant at the conventional levels) with the corruption index. The second and third are two dummy variables (compiled by consulting the Encyclopaedia Britannica) related to whether (following Taylor and Hudson, 1972) the country ever was a colony (after 1776), and whether the country achieved independence after 1945. The colonial dummies are highly correlated with a country's corruption index, perhaps because countries that have been colonized have found it difficult to develop efficient institutions. The simple correlation coefficients are 0.58 and 0.41 respectively, both significant at the conventional levels.

As additional instruments, I use the black market premium from Levine and Renelt (1992), the ratio of the sum of imports plus exports to GDP from the World Bank's STARS database and the ''oil'' dummy from Barro (1991). The first two variables are proxies for the extent to which a country is protected by restrictions to trade with the rest of the world, which the original rent-seeking literature emphasized as a potential source of rents. Ades and Di Tella (1994) show that the second variable is a significant determinant of corruption. In this paper's sample of countries, the simple correlation coefficients with the corruption index are 0.31 and 0.21 respectively. The ''oil'' dummy, which indicates whether oil production represents a large fraction of a country's GDP, is used following the arguments by Sachs and Warner (1995) that natural resources constitute an important source of rents. The simple correlation coefficient is 0.23 in this case. All correlation coefficients are significant at the conventional levels. All these variables are likely

to be valid instruments, since a priori they should be unrelated to the composition of government expenditure, other than through their effects on corruption.

This paper uses two standard sources of data on the composition of government expenditure:[5]

(1) The Barro (1991) data set, which provided the basis for much recent empirical work on the determinants of economic growth. It contains the 1970–85 averages of government spending on defense, education, transfers, social security and welfare, and total government consumption expenditure for over 100 countries. The primary sources are Unesco and the International Monetary Fund's Government Finance Statistics (GFS). The basic sample of countries in this study is also the same as Barro (1991), subject to data availability.

(2) The Devarajan et al. (1996) data set of developing countries, to which I added the industrial countries, so as to obtain data for around 90 countries. The data are drawn from the GFS and refer to the 1985 observation. The sub-components of education (school, university and other education) and health (hospitals, clinics and other health) expenditure are available for thirty to sixty countries.

The data on population by age group refer to 1985 and are drawn from United Nations (1990). I use the share of population aged 5–20 in total population.

3. Empirical results

This section analyzes empirically the relationship between corruption and various components of government expenditure. It finds that corruption lowers expenditure on education, and perhaps on health.

Table 1 analyzes the relationship between each component of public expenditure (as a ratio to GDP) reported in the Barro (1991) data set, and the corruption index.[6] Government spending on education as a ratio to GDP is negatively and significantly correlated with corruption. The magnitude of the coefficient is considerable: a one-standard-deviation improvement in the corruption index is associated with an increase in government spending on education by 0.6% of GDP. Taken at face value, this result implies that if a given country were to improve its ''grade'' on corruption from, say, a ''4 out of 6'' to a ''$5\frac{1}{2}$ out of 6'', on average its government would increase its spending on education by about 0.6% of GDP.

[5]Mauro (1996) also reports estimates obtained using the Easterly and Rebelo (1993) data set on the composition of public investment. The results are mostly insignificant.

[6]The reason why the various components of government spending are analyzed *as a share of* GDP is that the simple generalization of the Barro (1991) that is derived in Mauro (1996) implies that if bribes could be levied just as easily on all income (rather than more easily on some government expenditure components than others), then each component of government expenditure *as a share of* GDP should be unrelated to corruption.

Table 1
Corruption and the composition of government expenditure, Barro (1991) data

Dependent variable (average 1970–85, in percent of GDP)	N	R^2	Constant	Per capita GDP (1980)	Corruption index OLS	Corruption index ROBUST	Corruption index MEDIAN
Government expenditure on education	103	0.14	0.029		0.0039	0.0039	0.0040
			(7.95)		(4.00)	(3.75)	(2.93)
Government consumption expenditure	106	0.03	0.212		−0.0080	−0.0083	−0.0077
			(12.47)		(−1.75)	(−1.79)	(−1.23)
Government consumption expenditure excluding education and defense	93	0.10	0.144		−0.0114	−0.0114	−0.0126
			(10.99)		(−3.29)	(−3.04)	(−1.97)
Government expenditure on defense	93	0.00	0.033		0.0004	0.0003	0.0003
			(4.18)		(0.19)	(0.31)	(0.18)
Government transfer payments	73	0.45	−0.036		0.0348	0.0347	0.0371
			(−2.01)		(7.41)	(7.20)	(5.12)
Social insurance and welfare payments	75	0.47	−0.041		0.0258	0.0248	0.0205
			(−4.04)		(7.83)	(7.41)	(6.22)
Government expenditure on education	103	0.14	0.030	0.0003	0.0034	0.0036	0.0039
			(7.56)	(0.50)	(2.41)	(2.54)	(2.02)
Government consumption expenditure	106	0.15	0.194	−0.0089	0.0069	0.0070	0.0085
			(11.56)	(−0.57)	(1.28)	(1.24)	(1.03)
Government consumption expenditure excluding education and defense	93	0.25	0.117	−0.011	0.0080	0.0089	0.0107
			(8.30)	(−4.73)	(1.43)	(1.53)	(1.16)
Government expenditure on defense	93	0.00	0.032	0.0002	0.0007	0.0023	0.0032
			(2.91)	(−0.07)	(0.14)	(1.19)	(1.03)
Government transfer payments	73	0.64	0.013	0.0185	0.0004	−0.0038	−0.0052
			(0.84)	(5.62)	(0.06)	(−0.57)	(−0.80)
Social insurance and welfare payments	75	0.58	−0.011	0.0110	0.0052	0.0027	0.0018
			(−1.25)	(4.56)	(1.22)	(0.54)	(0.45)

Data sources: Barro (1991) and Political Risk Services/IRIS.

The corruption index is the simple average of the corruption indices produced by Political Risk Services (compiled by IRIS) for 1982–95. One standard deviation of the corruption index equals 1.45. A high value of the corruption index means that the country has good institutions in that respect. The number of observations, N, the R^2, the constant, and the coefficients on per capita GDP in 1980 and the corruption index (OLS) refer to the OLS estimates, with White-corrected t-statistics in parentheses. The ROBUST coefficients on the corruption index refer to robust regressions (with an identical specification to the OLS regression in the same row) that perform an initial OLS regression, calculate Cook's distance, eliminate the gross outliers for which Cook's distance exceeds 1, and then perform iterations based on Huber weights followed by iterations based on a biweight function. The MEDIAN coefficients refer to quantile (median) regressions that minimize the sum of the absolute residuals. Both routines are programmed in the STATA econometric software. The remainder of these regressions is omitted for the sake of brevity.

The coefficient is broadly unchanged and the relationship remains significant when estimated through widely-used robust regression techniques (see notes to the tables). Fig. 1 provides direct visual evidence that this result is not driven by a small group of countries.

Other components of government expenditure are also significantly associated with the corruption index at the conventional levels, most notably in the case of transfer payments, and social insurance and welfare payments. However, it is important to take into account the well-known empirical observation that government expenditure as a ratio to GDP tends to rise as a country becomes richer – a relationship known as Wagner's law.[7] When the level of per capita income in 1980 is used as an additional explanatory variable, education turns out to be the only component of public spending whose association with the corruption index remains significant at the 1% level. The magnitude of the coefficient remains broadly the same as in the univariate regression.

Table 2 reports the results obtained by using the *Government Finance Statistics*, which include more finely disaggregated data, though at the cost of a reduction in the number of countries for which data are available and possibly of lower cross-country comparability at the level of the more detailed items. Total government expenditure is again unrelated to corruption, and the results obtained when public expenditure is split by function are in line with those obtained using the Barro data set. In particular, controlling for per capita GDP, government expenditure on education is negatively and significantly associated with corruption, the magnitude of the coefficient being larger by about a third in this sample. In addition, government expenditure on health is found to be negatively and significantly associated with corruption in univariate regressions (see Fig. 2) and when controlling for GDP per capita. In the latter case, the link between corruption and health expenditure is significant at the conventional levels in the estimates presented in Table 2, but it was only significant at the 10% level in a previous version of this paper, which used a slightly different proxy for corruption (which included corruption indices from another private firm, *Business International*).[8] Therefore, the results on the relationship between corruption and health expenditure should only be considered tentative. Finally, neither defense, nor transportation display any significant relationship with corruption. Of course, this does not necessarily mean that corruption is unrelated to spending on these items. On the contrary, it is highly likely that the relationship between corruption and defense spending in particular is being blurred by the presence of a large number of other factors that cannot easily be controlled for.

While the relationship between corruption and government expenditure on

[8]By contrast, the relationship between corruption and government spending on education has proved robust to changes in the source of the proxies for corruption.

[7]Easterly and Rebelo (1993) provide a literature review on Wagner's law and show that, in a panel of countries, several components of public spending rise (as a ratio to GDP) as income per capita rises.

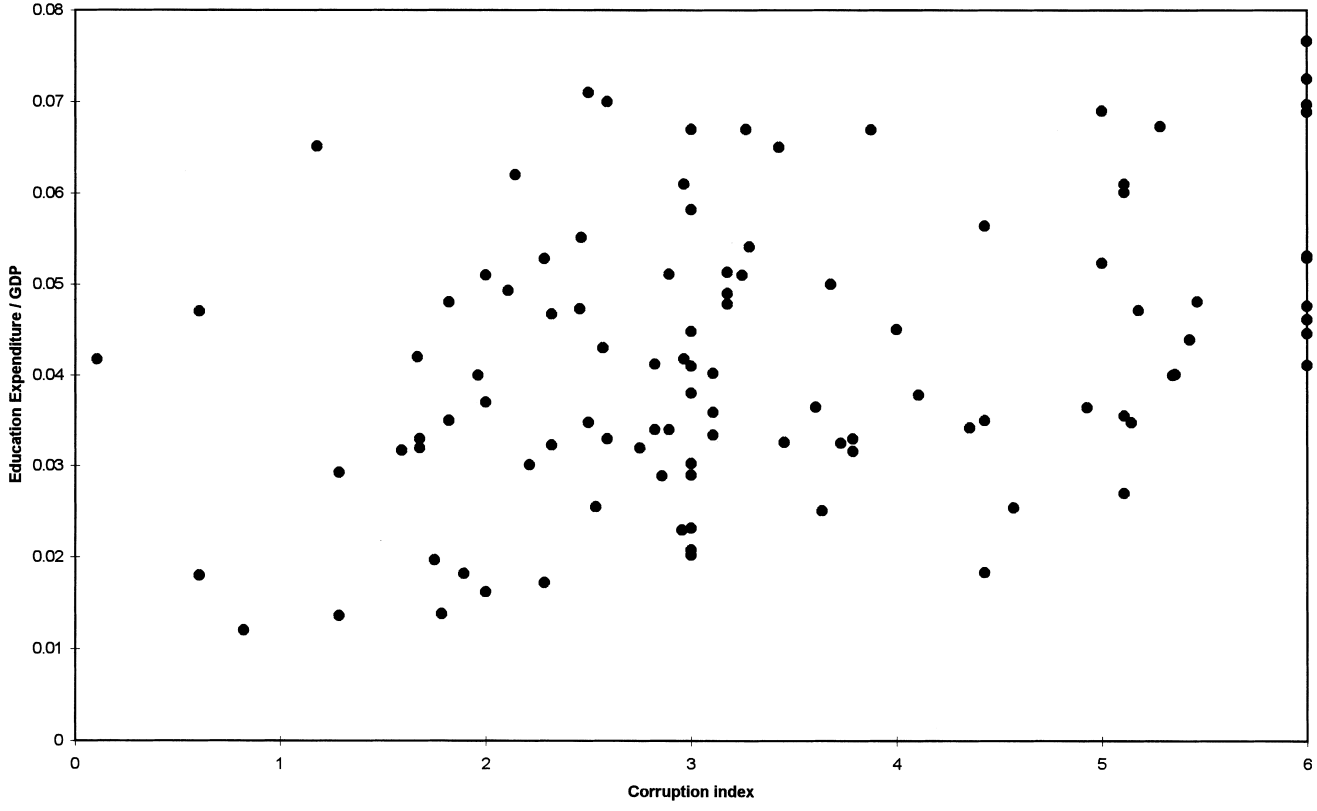

Fig. 1. Corruption and government expenditure on education.

Table 2
Corruption and the composition of government expenditure, *Government Finance Statistics* data

Dependent variable 1985, observation, as ratio of GDP	N	R^2	Constant	Per capita GDP (1980)	Corruption index OLS	Corruption index ROBUST	Corruption index MEDIAN
Total government expenditure	88	0.12	0.229	0.0105	0.0094	0.0215	0.0215
			(4.56)	(1.55)	(0.51)	(1.53)	(1.04)
Current government expenditure	85	0.24	0.140	0.0086	0.0227	0.0296	0.0357
			(3.55)	(1.56)	(1.54)	(2.41)	(2.26)
Capital government expenditure	86	0.12	0.082	0.0014	−0.0114	0.0023	−0.0019
			(4.80)	(0.56)	(−1.78)	(0.70)	(−0.64)
Government expenditure on education	85	0.06	0.023	−0.0018	0.0046	0.0048	0.0054
			(4.60)	(−1.86)	(2.23)	(2.27)	(3.09)
Government expenditure on schools	57	0.05	0.016	−0.0017	0.0035	0.0022	−0.0003
			(2.80)	(−1.50)	(1.37)	(0.95)	(−0.09)
Government expenditure on universities	56	0.06	0.005	−0.0006	0.0012	0.0012	0.0022
			(2.84)	(−2.17)	(1.85)	(1.90)	(3.09)
Other government expenditure on education	54	0.01	0.008	−0.0001	−0.0003	0.0004	0.0001
			(2.17)	(−0.11)	(−0.19)	(0.83)	(0.17)
Government expenditure on health	86	0.29	0.002	0.0013	0.0040	0.0039	0.0036
			(0.45)	(1.38)	(2.05)	(2.55)	(2.37)
Government expenditure on hospitals	54	0.06	0.009	0.0010	−0.0003	−0.0003	−0.0002
			(2.13)	(1.41)	(−0.16)	(−0.23)	(−0.08)
Government expenditure on clinics	28	0.14	−0.006	−0.0005	0.0039	0.0007	0.0010
			(−1.15)	(−0.52)	(1.74)	(0.70)	(0.68)
Other government expenditure on health	44	0.03	0.002	−0.0008	0.0014	0.0003	0.0002
			(0.71)	(−1.17)	(0.78)	(0.92)	(0.63)
Government expenditure on defense	82	0.01	0.037	0.0015	−0.0027	0.0023	0.0014
			(3.01)	(0.65)	(−0.51)	(1.31)	(0.48)
Government expenditure on transportation	85	0.01	0.014	−0.0000	0.0008	0.0016	0.0011
			(4.52)	(−0.03)	(0.49)	(1.33)	(0.62)

Data sources: *Government Finance Statistics*, International Monetary Fund; and Political Risk Services/IRIS.

The corruption index is the simple average of the corruption indices produced by Political Risk Services (compiled by IRIS) for 1982–95. One standard deviation of the corruption index equals 1.45. A *high* value of the corruption index means that the country has good institutions in that respect. The number of observations, N, the R^2, the constant, and the coefficients on per capita GDP in 1980 and the corruption index (OLS) refer to the OLS estimates, with White-corrected t-statistics in parentheses. The ROBUST coefficients on the corruption index refer to robust regressions (with an identical specification to the OLS regression in the same row) that perform an initial OLS regression, calculate Cook's distance, eliminate the gross outliers for which Cook's distance exceeds 1, and then perform iterations based on Huber weights followed by iterations based on a biweight function. The MEDIAN coefficients refer to quantile (median) regressions that minimize the sum of the absolute residuals. Both routines are programmed in the STATA econometric software. The remainder of these regressions is omitted for the sake of brevity.

Table 3
Corruption and government expenditure on education, health, robustness tests

Dependent variable (average 1970–85)	N	R^2	P-value	Constant	Per capita GDP (1980)	Cons. ex./ GDP	Pop. 5-20/ tot. pop.	Polit. stabil.	Coruption index OLS	Coruption index ROBUST	Coruption index MEDIAN
Exp. on educ./GDP	103	0.14		0.029					0.0039	0.0039	0.0040
				(7.95)					(4.00)	(3.75)	(2.93)
Exp. on educ./GDP	103	0.14		0.030	0.0003				0.0034	0.0036	0.0039
				(7.56)	(0.49)				(2.41)	(2.54)	(2.02)
Exp. on educ./GDP	103	0.29		0.011		0.0871			0.0046	0.0046	0.0045
				(2.34)		(4.72)			(5.54)	(4.87)	(4.05)
Exp. on educ./GDP	102	0.16		0.005			0.0553		0.0058	0.0062	0.0067
				(0.31)			(1.75)		(3.71)	(3.82)	(3.48)
Exp. on educ./GDP	102	0.35		−0.015	0.0017	0.0988	0.0600		0.0039	0.0039	0.0040
				(−0.98)	(1.96)	(4.49)	(1.65)		(2.60)	(2.83)	(1.90)
Exp. on educ./GDP	102	0.18		−0.008	0.0010		0.0884		0.0052	0.0055	0.0064
				(−0.49)	(1.30)		(2.30)		(3.16)	(3.35)	(3.52)
Exp. on educ./GDP	67	0.24		−0.020	0.0010		0.0958	0.0012	0.0053	0.0055	0.0067
				(−0.74)	(1.14)		(1.85)	(0.75)	(2.50)	(2.75)	(2.69)
Exp. on educ./ Cons. exp.	103	0.27		0.109					0.0428	0.0371	0.0344
				(4.43)					(5.33)	(5.34)	(4.56)
Exp. on educ./ Cons. Exp.	102	0.44		0.042	0.0198		0.2366		0.0178	0.0154	0.0045
				(0.41)	(4.46)		(0.97)		(1.93)	(1.57)	(0.33)
Exp. on educ./GDP instr: fraction.,col. hist.	100	*	0.75	0.033					0.0025		
				(5.79)					(1.55)		
Exp. on ed./cons. ex. instr: fraction.,col. hist.	100	*	0.01	0.082					0.0509		
				(1.89)					(3.86)		

Exp. on educ./GDP	88	*	0.90	0.029		0.0038		
instruments: all				(5.82)		(2.81)		
Exp. on ed./cons. ex.	88	*	0.95	0.098		0.0472		
instruments: all				(2.38)		(3.92)		
Exp. on health /GDP	86	0.28		−0.001		0.0064	0.0047	0.0057
				(−0.32)		(4.57)	(5.35)	(7.67)
Exp. on health /GDP	84	*	0.25	−0.014		0.0099		
instr: fraction., col. hist.				(−1.82)		(4.26)		
Exp. on health /GDP	77	*	0.25	−0.009		0.0085		
instruments: all				(−1.64)		(4.56)		

Data sources: Barro (1991), Business International, Political Risk Services/IRIS, United Nations (1990).

The corruption index is the simple average of the 1982–95 indices produced by Political Risk Services (compiled by IRIS). One standard deviation of the corruption index equals 1.45. A *high* value of the corruption index means that the country has good institutions in that respect. The number of observations, *N*, the R^2, the constant, and the coefficients on per capita GDP in 1980, government consumption expenditure as a share of GDP, the share of population aged between 5 and 20 (from United Nations, 1990), the Business International 'political stability' index for 1980–83 (see Mauro, 1995), and the corruption index (OLS) refer to the OLS estimates, with White-corrected *t*-statistics in parentheses. The ROBUST coefficients on the corruption index refer to robust regressions (with an identical specification to the OLS regression in the same row) that perform an initial OLS regression, calculate Cook's distance, eliminate the gross outliers for which Cook's distance exceeds 1, and then perform iterations based on Huber weights followed by iterations based on a biweight function. The MEDIAN coefficients refer to quantile (median) regressions that minimize the sum of the absolute residuals. Both routines are programmed in the STATA econometric software. The remainder of these regressions is omitted for the sake of brevity. 'Fractionalization' is the index of ethnolinguistic fractionalization in 1960, from Taylor and Hudson (1972). 'Colonial history' indicates dummies for whether the country was ever a colony (after 1776) and for whether the country was still a colony in 1945. 'All' adds to this instrument list the ratio of imports plus exports to GDP from the World Bank STARS database, the 'oil' dummy from Barro (1991) and the black market premium from Levine and Renelt (1992).

(*) The R^2 is not an appropriate measure of goodness of fit with instrumental variables (Two-Stage Least Squares). The *P*-value refers to the test of the overidentifying restrictions.

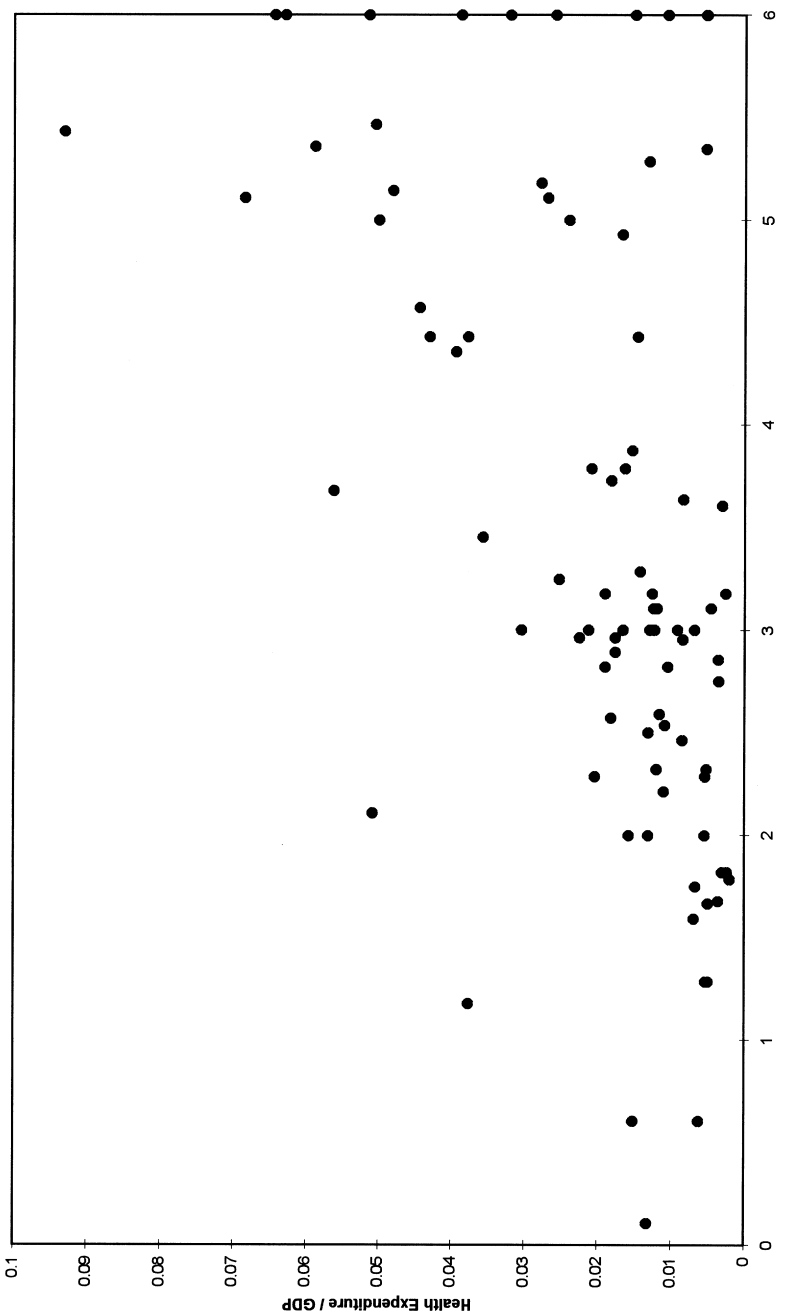

Fig. 2. Corrution and government expenditure on health.

education is strongly significant, the link between corruption and the sub-components of education expenditure (schools, universities, and other) is less clear, and it is significant (though just at the 10% level) only for spending on universities.

Table 2 also shows the results of the test of a hypothesis that is often heard in popular debate, namely that corruption is likely to lead to high capital expenditure by the government, perhaps on ''white elephant'' projects (prestigious projects that do not serve useful economic or social objectives). The data are somewhat in line with this hypothesis, with improvements in the corruption index coinciding with declines in capital expenditure and increases in current expenditure, but neither relationship is significant at the conventional levels. Therefore, these results are interesting, but not too much should be made of them.

Table 3 analyzes the relationship between corruption and government expenditure on education in further detail. It shows that the relationship is robust to controlling for additional determinants of education expenditure. Most notably, the inclusion of the share of population aged between 5 and 20 over total population (an obvious determinant of the need for expenditure on schooling) raises the magnitude of the coefficient on corruption by around one third, and the relationship retains its strong significance. The association between corruption and government expenditure on education remains strongly significant when total government consumption expenditure as a ratio to GDP is included among the explanatory variables. The association is also largely unaffected by controlling for the degree of political stability, which turns out to be insignificant in this multivariate regression. In all of these cases, the coefficient on the corruption index remains broadly unchanged when using robust regression techniques. It is also interesting to note that the coefficient does not change much when dropping one observation at a time – a more rudimentary approach to robustness: in the case of the regression reported in row 6, the largest value for the corruption coefficient amounts to 0.0060 (when dropping Nicaragua, *t*-statistic 3.89) and the smallest amounts to 0.0043 (obtained by dropping Kuwait, *t*-statistic 2.73). The same coefficient amounts to 0.0058 (*t*-statistic 3.07) when dropping the 15 poorest countries, 0.0044 (*t*-statistic 2.51) when dropping the 15 richest countries, 0.0063 (*t*-statistic 3.66) when dropping the (5) countries with corruption indices more than $1\frac{1}{2}$ standard deviations worse than the mean, and 0.0047 (*t*-statistic 2.69) when dropping the (ten) countries with corruption indices more than $1\frac{1}{2}$ standard deviations better than the mean. Finally, it is worth noting that the association between corruption and expenditure on education is broadly the same when estimated in sub-samples of developed or developing countries. For example, the following text table reports the results obtained by splitting the sample into countries with above-average and below-average per capita GDP in 1980. A log-likelihood ratio test is far from rejecting the null of equality of the coefficients in the regressions for the high-income and low-income countries (Table 4).

Table 3 also conducts a number of simple robustness tests of the relationship between corruption and government expenditure on education by, first, relaxing

Table 4
Corruption and government expenditure on education, developed and developing countries

Sample	Constant	Corruption index	Per capita GDP in 1980	Share of the population aged 5–20	N	R^2
Above-average	0.027	0.0041			40	0.11
GDP per capita	(2.84)	(2.08)				
Below-average	0.028	0.0044			63	0.09
GDP per capita	(5.10)	(2.30)				
Above-average	−0.016	0.0064	0.0011	0.0933	40	0.20
GDP per capita	(−0.69)	(2.49)	(1.15)	(1.68)		
Below-average	−0.016	0.0044	0.0013	0.1157	62	0.12
GDP per capita	(−0.67)	(2.03)	(0.67)	(1.91)		

Data sources: Barro (1991) and Political Risk Services/IRIS.
The *corruption* index is the simple average of the *corruption* indices produced by Political Risk Services (compiled by IRIS) for 1982–95. One standard deviation of the *corruption* index equals 1.45. A *high* value of the *corruption* index means that the country has *good* institutions in that respect. White-corrected *t*-statistics in parentheses.

some of the assumptions on functional form that have been made in the previous estimates and, second, controlling for possible endogeneity problems by using instrumental variables. To explore the effects of changing the functional form of the relationship, government expenditure on education as a share of total government consumption expenditure is used as the dependent variable, and turns out also to be significantly associated with the corruption index. The magnitude of the coefficient is considerable: a one standard-deviation improvement in the corruption index leads education expenditure to rise by over six percentage points of total government consumption expenditure. The relationship expressed in this form becomes weaker only when using robust estimation techniques and controlling for GDP per capita and the share of schooling age population. Overall, the relationship between corruption and government expenditure on education seems to be robust to a number of changes in specification.[9]

To address issues of endogeneity and ensure that the direction of causality being captured is that from corruption to government spending on education, it is interesting to use instrumental variable estimation (Table 3). I use two sets of instrumental variables. The first is the same as in Mauro (1995) and includes the index of ethnolinguistic fractionalization and the two colonial history dummies. In this first case, the use of instrumental variables lowers the coefficient on corruption by about a third in the regression of government expenditure on education as a ratio to GDP (row 10 compared to row 1), but raises it slightly in the regression of government expenditure as a share of total government consumption expenditure

[9]I also experimented with adding various combinations of per capita GDP squared, the log of GDP, and the square of the log of GDP to the list of explanatory variables, and did not find notable changes in the main relationship of interest, which remained significant.

(row 11 compared to row 8). The second set of instruments adds the black market premium, imports plus exports as a ratio of GDP, and the oil dummy to the previous set. In this second case, the use of instrumental variables yields a coefficient on corruption almost identical to that in the ordinary least squares regression both in the regression of government expenditure on education as a ratio to GDP (row 12 compared to row 1) and in the regression of government expenditure as a share of total government consumption expenditure (row 13 compared to row 8). The null of appropriate specification of the system is not rejected by tests of the overidentifying instruments when using the first set of instruments and is rejected when using the second set of instruments. Overall, there is tentative support for the hypothesis that corruption causes a decline in government expenditure on education. The last rows in Table 3 report some evidence that corruption may also cause a decline in government spending on health.

To sum up, there is significant evidence that corruption is negatively associated with government expenditure on education, and the relationship is robust to a number of changes in the specification. There is also some evidence of an association between corruption and government expenditure on health. The fact that significant relationships have been found is even more interesting when one recalls that the quality of the available data on spending may be relatively low, both because not all countries may apply the same criteria in allocating projects among the various categories of government expenditure and because each public expenditure component presumably contains both productive and unproductive projects.[10] The results are consistent with the hypothesis that education provides more limited opportunities for rent-seeking than other items do, largely because for the most part it requires widely available, mature technology. There is also tentative evidence that the direction of the causal link is at least in part from corruption to the composition of spending. That is, it seems that the existence of corruption causes a less-than-optimal composition of government expenditure, rather than merely high government expenditure on unmonitorable items causing corruption.

4. Concluding remarks

This paper has presented evidence of a negative, significant, and robust relationship between corruption and government expenditure on education, which is a reason for concern, since previous literature has shown that educational attainment is an important determinant of economic growth. A possible interpreta-

[10]The noisy quality of the data might explain why in previous literature it has proved difficult to find significant and robust effects of the composition of government expenditure on economic growth (see footnote 2).

tion of the observed correlation between corruption and government expenditure composition is that corrupt governments find it easier to collect bribes on some expenditure items than on others. Education stands out as a particularly unattractive target for rent-seekers, presumably in large part because its provision typically does not require high-technology inputs to be provided by oligopolistic suppliers. A potential policy implication might be that it would be desirable to encourage governments to improve the composition of their expenditure by increasing the share of those spending categories that are less susceptible to corruption. However, an important issue remains whether, as a practical matter, that composition could be specified in such a way that corrupt officials would not be able to substitute publicly unproductive but privately lucrative projects for publicly productive but privately non-lucrative ones *within* the various expenditure categories.

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References

Ades, A., Di Tella, R., 1994. Competition and Corruption. Institute of Economics and Statistics Discussion Papers 169, University of Oxford.

Barro, R., 1992. Human capital and economic growth. In: Federal Reserve Bank of Kansas City, Policies for Long-Run Economic Growth, pp. 199–216.

Barro, R., 1991. Economic growth in a cross-section of countries. Quarterly Journal of Economics CVI, 407–443.

Barro, R., 1990. Government spending in a simple model of endogenous growth. Journal of Political Economy 98 (5), S103–S125.

Devarajan, S., Swaroop, V., Zou, H., 1996. What do governments buy? The composition of public spending and economic performance. Journal of Monetary Economics 37, 313–344.

Easterly, W., Rebelo, S., 1993. Fiscal policy and economic growth: an empirical investigation. Journal of Monetary Economics 32 (2), 417–458.

Hines, J., 1995. Forbidden Payment: Foreign Bribery and American Business. NBER Working Paper 5266.

Keefer, P., Knack, S., 1993. Why Don't Poor Countries Catch Up? A Cross-National Test of an Institutional Explanation. Center for Institutional Reform and the Informal Sector Working Paper 60.

Krueger, A., 1974. The Political Economy of the Rent-Seeking Society. American Economic Review 64 (3), 291–303.

Levine, R., Renelt, D., 1992. A sensitivity analysis of cross-country growth regressions. American Economic Review 82 (4), 942–963.

Mauro, P., 1996. The effects of corruption on investment, growth, and government expenditure. International Monetary Fund Working paper 96/98.

Mauro, P., 1995. Corruption and growth. Quarterly Journal of Economics CX (3), 681–712.

Rauch, J., 1995. Bureaucracy, infrastructure and economic growth: evidence from U.S. cities during the progressive era. American Economic Review 85 (4), 968–979.

Sachs, J., Warner, A., 1995. Natural Resource Abundance and Economic Growth. NBER Working Paper 5398.

Scleifer, A., Schleifer, R., 1995. Corruption. Quarterly Journal of Economics CIX, 599–617.

Taylor, C.L., Hudson, M.C., 1972. World Handbook of Political and Social Indicators. ICPSR, Ann Arbor MI.

United Nations, 1990. Sex and Age. Computer disk. United Nations, New York.