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Does corruption affect income inequality and poverty?

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Abstract. This paper provides evidence that high and rising corruption increases income inequality and poverty. An increase of one standard deviation in corruption increases the Gini coefficient of income inequality by about 11 points and income growth of the poor by about 5 percentage points per year. These findings are robust to use of different instruments for corruption and other sensitivity analyses. The paper discusses several channels through which corruption may affect income inequality and poverty. An important implication of these findings is that policies that reduce corruption will most likely reduce income inequality and poverty as well.

Key words: Corruption, income inequality, poverty

JEL Classification D73, D31, I32

1. Introduction

Government officials may use their authority for private gain in designing and implementing public policies. This phenomenon-defined broadly as corruption (Tanzi, 1997a)-may result in enriching these officials as well as private individuals who obtain a larger share of public benefits or bear a lower share of public costs. In this way, corruption distorts the government's role in resource allocation. It has been argued (Tanzi, 1995) that the benefits from corruption are likely to accrue to the better-connected individuals in society, who belong mostly to high-income groups. Thus, corruption would affect not only broad macroeconomic variables, such as investment and growth, as has been shown previously, but also income distribution.

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It has been further contended that corruption increases poverty by reducing the level of social services available to the poor, creating incentives for higher investment in capital-intensive projects and lower investment in labor-intensive projects (Rose-Ackerman, 1997a, 1999). Such a bias in investment strategy deprives the poor of income-generating opportunities.

To date, no empirical evidence has been presented to corroborate the relationship between either corruption and income distribution or corruption and poverty. This paper seeks to ascertain if such relationships are supported by cross-country data.

Empirical studies of the impact of corruption have explored the efficiency implications of corruption through its impact on growth and investment (Mauro, 1995, 1998; Knack and Keefer, 1996), composition of government expenditure (Tanzi and Davoodi, 1997; Mauro, 1998), and allocation of foreign direct investment (Wei, 1997).[1] This literature generally finds that corruption reduces growth, and investment; skews expenditure towards public investment and away from operations and maintenance; and redirects foreign direct investment towards countries with lower corruption.

While underscoring the efficiency implications of corruption, the empirical literature has overlooked the distributional consequences of corruption.[2] In part, this reflects the belief that the rich or well-connected typically use bribes to be the first in line for a rationed government good or service, and the poor or individuals at the lower end of income distribution obtain the rationed good or service after waiting in line (Lui, 1985). In this way, bribes are assumed to clear the market because they reflect individuals' willingness to pay or their opportunity cost.[3] These views, similar to the early efficiency-enhancing views of corruption (Leff, 1964; Huntington, 1968), ignore that corruption may create permanent distortions from which some groups or individuals can benefit more than others. They also ignore that individuals with high willingness to pay are not necessarily the intended beneficiaries of government programs. Moreover, the distributional consequences of corruption are likely to be more severe the more persistent the corruption, and the more entrenched the vested interests. The impact of corruption on income distribution is also a function of the government's involvement in allocating and financing scarce goods and services and may increase with the extent of government intervention.[4] Finally, empirical work on the distributional consequences of corruption has been hindered by a lack of consistent and reliable cross-country data on income inequality and poverty that only lately has been rectified (Deininger and Squire, 1996; Ravallion and Chen, 1997).

[1] There are excellent reviews of the literature on the economic impact of corruption; see Rose-Ackerman (1997a, 1999), Tanzi (1998) and Wei (1999). This literature builds on earlier economic analyses of Rose-Ackerman (1978) and Klitgaard (1988).

[2] Exceptions include Tanzi (1995) and Rose-Ackerman (1997a, 1999). However, these studies are not empirical.

[3] The efficiency-enhancing theory of corruption does not seem to be supported by recent empirical evidence. For example, Kaufmann and Wei (1999) show that in a model in which government regulation and bureaucratic delays are endogenous, firms that pay more bribes are also likely to spend more, not less, time with bureaucrats negotiating regulations and face higher, not lower, cost of capital. They present evidence which corroborates this hypothesis.

[4] See Tanzi (1998) for a discussion of the political economy of corruption and the reform of the state.

This paper is organized as follows. The next section lists arguments on how corruption may affect income inequality and poverty. Section III presents two models of income inequality and poverty. Sections IV documents the direct impact of corruption on income inequality and poverty. Due to possible endogeneity of corruption, section IV contains an exhaustive set of sensitivity analyses on the choice of instruments for corruption. Section VI summarizes the results and policy implications of this paper's findings.

2. Corruption, income inequality, and poverty

Corruption can affect income inequality and poverty through various channels, including overall growth, biased tax systems, and poor targeting of social programs as well as through its impact on asset ownership, human capital formation, education inequalities, and uncertainty in factor accumulation.

Growth

High corruption can lead to high poverty for two reasons. First, evidence suggests that a higher growth rate is associated with a higher rate of poverty reduction (Ravallion and Chen, 1997), and that corruption slows the rate of poverty reduction by reducing growth. Second, income inequality has been shown to be harmful to growth (Alesina and Rodrik, 1994; Persson and Tabellini, 1994),[5] and if corruption increases income inequality, it will also reduce growth and thereby limit poverty reduction (Ravallion, 1997).[6]

Biased tax systems

Corruption can lead to tax evasion, poor tax administration, and exemptions that disproportionately favor the well-connected and wealthy population groups. This can reduce the tax base and the progressivity of the tax system, possibly leading to increased income inequality.

Poor targeting of social programs

Corruption can affect the targeting of social programs to the truly needy. The use of government-funded programs to extend benefits to relatively wealthy population groups, or the siphoning of funds from poverty-alleviation programs by well-connected individuals, will diminish the impact of social programs on income

[5] Growth is harmed because high income inequality creates pressures either for populist programs, which reduce the overall productivity of public resources, or for postponing much needed adjustment to support the growth process (e.g., Alesina and Drazen, 1991; Laban and Struzenegger, 1994; and Alesina and others, 1996).

[6] It is possible for income inequality to be high enough that it results in rising poverty, despite high growth (Ravallion, 1997).

distribution and poverty. Taxpayers and corrupt public officials can also divide the savings from taxes and duties, with the costs borne by poorer taxpayers with low ability to pay bribes, and reflected in lower provision of social services that are vital to the poor (Rose-Ackerman, 1999).

Asset ownership

High concentration of asset ownership can influence public policy and increase income inequality. In a society where asset ownership is concentrated in a small elite, asset owners can use their wealth to lobby the government for favorable trade policies, including exchange rate, spending programs, and preferential tax treatment of their assets. These policies will result in higher returns to the assets owned by the wealthy and lower returns to the assets owned by the less well-to-do, thereby increasing income inequality. Furthermore, assets can be used as collateral to borrow and invest; therefore, inequality in ownership of assets will limit the ability of the poor to borrow and increase their lifetime income and will perpetuate poverty and income inequality (Li, Squire, and Zou 1998; Birdsall and Londoño, 1997).

Human capital formation, education inequalities, and social spending

Corruption can affect income distribution and poverty via its impact on human capital formation and the distribution of human capital. First, corruption weakens tax administration and can lead to tax evasion and improper tax exemptions, as discussed above. Therefore, for a given tax system, the higher the level of corruption, the lower the tax revenue and the lower the resources available for funding public provision of certain services, including education.

Second, corruption increases the operating cost of government, and, therefore, reduces the resources available for other uses, including the financing of social spending that is crucial to the formation of human capital. In fact, higher corruption is found to be associated with lower education and health spending (Mauro, 1998).

Third, wealthy urban elites can lobby the government to bias social expenditure toward higher education and tertiary health, which tend to benefit high-income groups. Corruption can also increase expenditure on tertiary health because bribes can be more easily extracted from the building of hospitals and purchasing of state-of-the-art medical equipment than from expenditure on vaccinations.

Finally, corruption can increase the share of recurrent expenditure devoted to wages as opposed to operations and maintenance (Tanzi and Davoodi, 1997). This lowers the quality of education and health services and affects the ability of the state to improve educational attainment levels.

Uncertainty and factor accumulation

If the “rules of the game” in a corrupt country are unclear and biased toward the well-connected, the poor and the less-well-connected face an added risk premium

in their investment decisions. This unequally distributed risk increases expected returns to any investment for the well-connected relative to the less-well-connected. Therefore, low income and poor groups-the less-well-connected-will be discouraged from investing in any resource-human, physical capital, or land-and income inequality and poverty will be perpetuated or accentuated.

3. Models

A. Corruption and income inequality

The empirical model of inequality used in this paper is in the spirit of Atkinson (1997).[7] It specifies the personal distribution of income in terms of factor endowments, distribution of factors of production, and government spending on social programs.[8] Specifically, the Gini coefficient is assumed to depend on the following variables:

- Initial distribution of assets (the initial Gini coefficient for land ownership);
- Education inequality (percent of adult population with no schooling expressed as a fraction of percent of adult population with completed secondary and higher education);[9]
- Education stock or educational attainment (average years of secondary education in population aged 15 and over);
- Capital stock-to-GDP ratio;
- Natural resource endowment (share of natural resources in total exports);
- Corruption;
- Social spending (various spending measures relative to GDP);
- Expenditure dummy-equals one when the Gini coefficient is expenditure-based and zero when it is income-based;
- Recipient dummy-equals one when the recipient of income or the spending unit is a person and zero when it is a household; and
- Net income dummy-equals one when the Gini coefficient is based on net income and zero when it is based on gross income.

Distribution of income-generating assets has an impact on income distribution. Distribution of land is used as a proxy for asset distribution because data on the distribution of other income-generating assets, such as bonds and equity, are available for only a limited number of countries. Inequality in the distribution of land is expected to be positively correlated with income inequality for two reasons. First, the distribution of land has a direct impact on the distribution of income in a given time period, particularly in countries where income from land constitutes a large share of total income. Second, land can be used as collateral for borrowing and

[7] At present, there is no consensus about a proper model of income inequality.

[8] The models of Bourguignon and Morrisson (1990), Londoño and Székely (1997), and Spilimbergo, Londoño, and Székely (1999) are also based on the same underlying principle.

[9] Adult population is defined as population aged 15 years and over.

investing; therefore, inequitable land distribution limits the ability of the poor to borrow and increase their lifetime income.

Education inequality is expected to be positively correlated with income inequality (Tinbergen, 1975). A more egalitarian distribution of human capital will improve income distribution both by boosting the earning potential of the poor (Londoño and Székely, 1997) and by limiting the ability of the wealthy to lobby policymakers in their favor. In a similar vein, a higher educational endowment is expected to decrease inequality (Tinbergen, 1975).

A higher capital-output ratio or lower average productivity of capital is expected to be associated with higher income inequality. This may happen in developing economies where the most economic activity is concentrated in a traditional, low-productivity, unskilled labor sector, but also have islands of high-productivity and high-skilled labor. Similarly, a high natural resource endowment is expected to be associated with higher income inequality because of the high concentration of ownership and rent in this type of wealth as well as the high capital intensity and low complementarily between capital and labor in the natural resource sector.[10] As discussed, corruption is expected to increase income inequality.

Government transfers and spending on social services can constitute a major source of income in poor households. Well-targeted social programs (proxied here by different measures of social spending) are expected to lower income inequality.

Survey-type dummies are included as explanatory variables because differences in measured inequality can be due to differences in the type of survey data used. These dummies and the Gini coefficient data are taken from Deininger and Squire (1996). The dummies represent types of cash flow (income versus expenditure), choice of recipient unit (household versus personal), and type of income (gross versus net of taxes). An income-based measure of inequality is expected to show higher inequality than an expenditure-based measure. This is consistent with aggregate consumption theories in which individuals can smooth their consumption via borrowing and lending while their income fluctuates. Furthermore, measurement errors for income may be higher than for consumption, particularly in developing countries, which tends to inflate measured income inequality. Individual-based Gini coefficients are expected to be higher than household-based ones. This is because poor households tend to be larger than rich ones, and because households are better able to make interpersonal and intertemporal adjustments in expenditure patterns than individuals. The Gini coefficient based on net income should be lower than one based on gross income if tax systems are progressive and redistribute income in favor of the poor.

B. Corruption and poverty

The model of poverty used in this paper is a variation of models that determine overall income growth in the economy.[11] The model expresses the income growth

[10] See Leamer, Maul, Rodriguez, and Schott (1999) for additional arguments and evidence.

[11] See Sala-I-Martin (1997) and Sachs and Warner (1997).

of the bottom 20 percent of the population, a measure of change in poverty,[12] as a function of the following variables:

- Natural resource endowment (share of natural resources in total exports);
- Initial income of the poor (real income of the bottom 20 percent of the population in 1980 measured in purchasing power parity U.S. dollars);
- Initial secondary schooling (years of secondary education in population aged 15 and over in 1980);
- Education inequality (percent of adult population with no schooling, expressed as a fraction of percent of adult population with completed secondary and higher education);
- Initial distribution of assets (the initial Gini coefficient for land);
- Social spending (various measures relative to GDP); and Growth in corruption.

The rate of change of the income of the bottom 20 percent is chosen as the dependent variable because it is less prone to measurement errors than levels of poverty.[13] Another advantage of this formulation is that it is unaffected by country-specific factors that influence the level of poverty.

It has been argued that resource-rich countries grow less rapidly than resource-scarce countries (Sachs 1995, Sachs and Warner, 1997). Therefore, natural resource endowment is included in the model to examine if it affects income growth of the poor directly as well as indirectly through aggregate growth.

Initial income of the poor is included to account for diversity in initial conditions among countries. It is also intended to capture the extent to which the poor in one country are catching up with the poor in other countries. If there is a catch-up or convergence effect, the lower the initial income of the poor, the higher their income growth will be. Therefore, the coefficient on the initial income of the poor is expected to be negative.

Initial secondary schooling is included to measure the impact of human capital on the income growth of the poor. A positive coefficient is expected if human capital contributes positively to income growth of the poor. Two measures of distribution of factors of production are included: education inequality and the initial Gini coefficient for land. Each factor-distribution measure is expected to be negatively associated with the income growth of the poor.

Well-targeted social programs are believed to transfer relatively more income to the poor and reduce the incidence of poverty. In reality, it is quite conceivable that much of the benefits of social programs accrue to the middle- and higher-income groups.[14] To assess the impact of social spending on the income growth of

[12] This measure has been previously used by Deininger and Squire (1996) and Birdsall and Londoño (1997). Income growth of the bottom 20 percent of the population is defined as the average yearly growth rate in real per capita GDP of the bottom quintile of the population, measured in purchasing power parity-adjusted US dollars.

[13] Use of international poverty lines, such as the proportion of the population living on less than US$1 a day, will solve some but not all of the measurement problems. For example, sample size falls substantially as corruption data and less-than-a-dollar definition of poverty or other measures are not available for the same set of countries.

[14] For evidence on benefit incidence of social spending, see Tanzi (1974) and Alesina (1998).

the poor, three broad proxies for social spending are tried, all in relation to GDP; these are government spending on (1) social security and welfare, (2) education and health, and (3) the sum of spending items (1) and (2) plus housing and community amenities. Finally, in line with the model of income inequality, various indices of corruption are used to examine whether a higher growth rate of corruption reduces the income growth of the poor.

4. Empirical results

A. Impact of corruption on the Gini coefficient

The models of income inequality and poverty are estimated using OLS and instrumental variable (IV) techniques on cross-section of countries over the 1980–97 period. The IV technique would address endogeneity of the corruption variable. The income inequality regression is estimated using three specifications. In the first one, the Gini coefficient is regressed on a constant, three survey-type dummies, natural resource abundance, ratio of physical capital stock to GDP, education inequality, initial Gini coefficient for land, and a corruption index. In the second specification, education inequality is replaced with mean years of secondary schooling. The third specification includes both education variables to test for their relative impact on income inequality.

Table 1 reports the results for all three specifications for the OLS technique. The explanatory variables account for about 73 percent of cross-country variation in income inequality. In all three specifications, the survey-type dummies have the expected signs. Inequality is lower when the Gini coefficient is based on consumption rather than income, higher when the recipient unit is a person rather than a household, and lower when the coefficient is based on after-tax income than before-tax income.

The results also suggest that countries with high income inequality tend to have abundant natural resources, low capital productivity, high education inequality, low average secondary schooling, and unequal distribution of land. Distribution of education seems to matter more than its mean. Of the aforementioned five variables, abundance of natural resources and capital productivity are statistically more significant than others.

As regards the impact of corruption on income inequality, higher corruption is associated with higher income inequality using either one or two-tail tests at the one percent level. The magnitude of the effect of corruption on income inequality is considerable. A worsening in the corruption index of a country by one standard deviation (2.52 points on a scale of 0 to 10) is associated with an increase in the Gini coefficient of about 4.4 points (Table 1, column 1), the same increase in income inequality as a reduction in average secondary schooling of almost 2 years.[15]

[15] This estimate is based on Table 1, Column 2: (1.62 x 2.52) ÷ -2.12 = -1.9.

Table 1. Corruption and income inequality: OLS estimates (dependent variable: the Gini coefficient)

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Constant	27.56***	34.76***	30.11***	30.29***	34.53***	30.33***
	(4.30)	(6.55)	(4.72)	(4.93)	(5.95)	(4.86)
Expenditure dummy	-2.79	-1.37	-2.32	-3.99	-3.94	-3.97
	(-1.03)	(-0.57)	(-0.80)	(-1.44)	(-1.05)	(-1.11)
Recipient dummy	1.84	1.66	1.26	0.04	0.40	0.04
	(0.58)	(0.45)	(0.36)	(0.01)	(0.10)	(0.01)
Net income dummy	-6.91***	-7.10***	-6.85***	-6.79***	-6.86***	-6.80***
	(-3.25)	(-3.03)	(-3.16)	(-3.65)	(-3.49)	(-3.54)
Natural resource abundance	38.91**	34.77**	36.69**	27.32	23.92	27.37
	(2.38)	(2.18)	(2.36)	(1.61)	(1.29)	(1.50)
Capital stock-GDP ratio	0.05**	0.03	0.03*	0.04**	0.04	0.04*
	(2.28)	(1.40)	(1.81)	(2.41)	(1.56)	(1.85)
Education inequality	2.32*		1.79	1.49		1.49
	(1.97)		(1.46)	(1.24)		(1.19)
Secondary schooling		-2.12	-1.28		-0.45	-0.03
		(-1.45)	(-0.94)		(-0.21)	(-0.01)
Initial gini coefficient for land	0.10	0.12	0.12	0.11	0.11	0.11
	(1.49)	(1.52)	(1.57)	(1.53)	(1.20)	(1.26)
Real per capita GDP ($x10^2$)				-0.05*	-0.06	-0.05
				(-1.93)	(1.63)	(-1.43)
Corruption	1.74***	1.62**	1.46**	0.94	1.01	0.94
	(3.01)	(2.61)	(2.54)	(1.46)	(1.44)	(1.40)
Adjusted R^2	0.73	0.72	0.73	0.75	0.73	0.74
Number of observations	38	38	38	37	37	37
F-statistic	13.80***	13.13***	12.32***	12.83***	12.06***	11.12***

Note: Estimation is by OLS. Numbers in parentheses are t-statistics based on White heteroscedasticity-consistent standard errors. A high value of the corruption index indicates a high level of corruption.

***Significant at 1 percent level; **significant at 5 percent level; and * significant at 10 percent level.

B. Sensitivity analysis of the income inequality regression

Results reported in Table 1 (columns 1, 2 and 3) are robust to (i) use of other indices of corruption[16]; (ii) addition of social spending which may affect income inequality; [17] (iii) a measure of agricultural dualism, a statistically significant determinant of

[16] Six other indicators are used. Four are compiled by Goettingen University and *Transparency International* (1997); the fifth one is taken from Tanzi and Davoodi (1997); and the sixth indicator is the so-called graft index that is constructed by Kaufmann, Kraay, and Zoido-Lobaton, (1999a, 1999b). For example, using the graft index and rerunning regression in Table 1, column 1 produces a coefficient on the index that has the expected sign which is statistically significant at the 1 percent level. The resulting adjusted R-squared is even higher (0.77) than Table 1, column 1.

[17] Three measures of social spending are used as indicated in the previous section Tanzi (1974) and Alesina (1998) have also found that social spending has no impact on income inequality.

income inequality in models of Bourguignon and Morrisson (1998)[18]; (iv) addition of growth in real per capita GDP; and (v) presence of outliers. However, once real per capita GDP is added to the regression (Table 1, columns 4, 5, and 6) corruption ceases to be significant at the conventional statistical levels although its sign remains the same.

Real per capita GDP is often regarded as a proxy for the stage of economic development and many studies of income distribution often include this variable. However, real per capita GDP has also been regarded as a strong determinant of corruption (Treisman, 2000) which therefore reduces the explanatory power of corruption once it is included in the regression.[19] In addition, we found no evidence of a Kuznets curve, as the square of real per capita GDP is not statistically significant in regression which already includes the level of real per capita GDP. In the latter regressions, corruption has the expected sign but is not significant at the conventional statistical levels.

C. The IV estimation of the income inequality regression

The above regression results establish the existence of a statistically significant positive association between corruption and income inequality when real per capita GDP is not included in the regression. However, this association could stem from "reverse" causation, that is, high income inequality can lead to higher corruption and/or the observed association could be due to other factors affecting both. The Instrumental Variables (IV) technique can help address these problems. In this regard, choice of the instrument is important. A valid instrument for the corruption index has to be highly correlated with it, but not correlated with the error term in the income inequality regression or the income inequality itself (the Gini coefficient) other than its impact on the Gini coefficient through the corruption index. One such instrument is the extent of democracy in a country. Countries with a democratic tradition have established checks and balances and the rule of law, among other things, for effective monitoring of corruption and punishment of corrupt officials, particularly in the public sector. In fact, a variable measuring length of exposure to democracy has been found to be a robust determinant of corruption (Treisman, 2000). Governments in democratic societies use tax and expenditure/transfer policies to affect post-tax, post transfer income distribution, but these policies are confined mainly to OECD countries (Atkinson, 2000; Chu, Davoodi and Gupta, 2000) and to the extent that a democratic tradition has any impacts through this channel on income inequality, the dummy variable in the regression representing before-and after-tax Gini coefficient can account for this. In addition, democracy is not associated with income inequality, as demonstrated by Barro (1999). Therefore democracy seems to be a good instrument for corruption. The simple correlation coefficient between the democracy variable used in this paper (i.e., length of exposure to democracy

[18] We thank a referee for pointing out this study.

[19] Countries with low levels of per capita GDP have, on average, higher levels of corruption. The simple correlation coefficient between real per capita GDP and the corruption index has a t-statistic of -12.

Table 2. Corruption and income inequality: instrumental variable estimates (dependent variable: the Gini coefficient)

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Constant	38.51***	39.34***	36.92***	39.03***	40.75***	38.26***
	(6.19)	(6.98)	(6.25)	(5.28)	(5.76)	(5.21)
Expenditure dummy	-5.35**	-5.28*	-5.77*	-5.18*	-5.74	-5.83
	(-1.96)	(-1.72)	(-1.89)	(-1.66)	(-1.49)	(-1.55)
Recipient dummy	-0.01	0.62	0.36	0.76	1.15	0.94
	(-0.00)	(0.17)	(0.10)	(0.22)	(0.32)	(0.26)
Net income dummy	-5.85**	-6.05**	-5.87**	-5.69*	-5.72*	-5.63*
	(-2.39)	(-2.39)	(-2.32)	(-1.83)	(-1.94)	(-1.87)
Natural resource abundance	41.02***	41.43**	42.75**	47.57*	43.44	46.47*
	(2.65)	(2.45)	(2.55)	(1.83)	(1.58)	(1.68)
Capital stock-GDP ratio	0.06**	0.06*	0.06**	0.05**	0.06*	0.06*
	(2.52)	(1.90)	(2.11)	(2.22)	(1.69)	(1.80)
Education inequality	0.66		1.00	0.82		0.97
	(0.45)		(0.76)	(0.57)		(0.71)
Secondary schooling		0.40	0.96		0.51	0.82
		(0.21)	(0.58)		(0.21)	(0.37)
Initial gini coefficient for land	0.06	0.05	0.05	0.05	0.04	0.04
	(1.01)	(0.63)	(0.59)	(0.65)	(0.41)	(0.38)
Real per capita GDP (x10 ^{2})				0.03	0.01	0.02
				(0.50)	(0.17)	(0.29)
Corruption	3.48***	3.74***	3.73***	4.21**	4.16**	4.25**
	(3.81)	(3.20)	(3.02)	(2.09)	(2.07)	(2.02)
Adjusted generalized R^2	0.76	0.74	0.76	0.77	0.75	0.76
Number of observations	38	38	38	37	37	37
P-value for Sargan's misspecification test	n.a	n.a	n.a	n.a	n.a	n.a

Note: Estimation is by instrumental variable techniques using democracy as the instrument for corruption. Other variables in the regression act as their own instruments. Numbers in parentheses are t-statistics based on White heteroscedasticity-consistent standard errors. The adjusted generalized R^2 is the measure of adjusted R^2 for regressions estimated by instrumental variable technique; see Pesaran and Smith (1994). Sargan's misspecification test is a test of validity of instruments. A high value of the corruption index indicates a high level of corruption.

***Significant at 1 percent level; **significant at 5 percent level; and * significant at 10 percent level.

taken from Treisman, 2000) and the corruption index is -0.75 with a t-ratio of -7, i.e., countries with long periods of democracy are perceived to be less corrupt.

The results of the IV technique using democracy as the instrument are shown in Table 2 for the same specification as in the OLS regression. Results are much stronger than the OLS version: significance and magnitude of the estimated coefficient on corruption increase even when real per capita GDP is included in the regression. In particular, the estimated coefficient when real per capita GDP is included in the regression is now significant at the 5 percent level, whereas it was not significant at the conventional statistical levels using the OLS techniques. The point estimate suggest that a worsening in the corruption index of a country by one standard deviation (2.52 points on a scale of 0 to 10) increases income inequality by 9 points (Table 2, column 1) or 11 points (Table 2, column 6). This is a significant

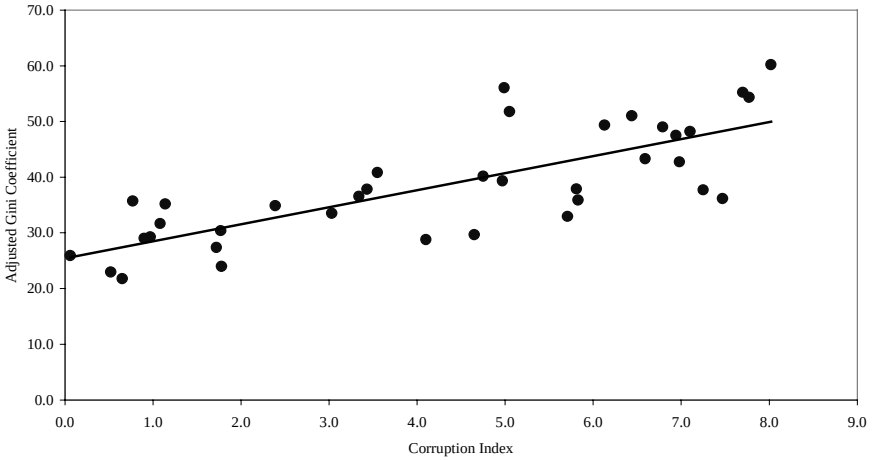

Fig. 1. Corruption and income inequality. The Gini coefficient is adjusted using the regression in Table 2, column 6. A high value of the corruption index means the country has a high level of corruption

increase given that the average value of the Gini coefficient in the sample is 39. An important reason for the increased significance of corruption in the IV regression is the fact that use of democracy as an instrument renders real per capita GDP insignificant in the regression.[20] Figure 1 shows the relationship between corruption and income inequality based on the IV regression result (Table 2, column 6). The fitted relationship shows that the results are not driven by any outliers.

We next test the sensitivity of the results in Table 2 to alternative choices of instrument. The set of instruments consist of the same democracy variable and one or two of the following six variables: initial real per capita income, country's latitude, ethnicity, initial corruption, ratio of public employment to labor force and ratio of government spending to GDP. The first three variables have been used as instruments for corruption in previous studies of corruption (La Porta et al, 1998; Mauro, 1995, 1998; Hall and Jones, 1999; Treisman, 2000). Ratio of public employment to labor force and government spending to GDP are used as proxies for government intervention in the economy which may affect the extent of corruption.[21] Lastly initial corruption (in 1980) was used: it is predetermined relative to the future values of corruption, as the corruption variable is the average of the corruption data over the 1980–1997 period. The attraction of using more than one instrument is that it generates overidentifying restrictions which allows us to test for the validity of such instruments. We use Sargan's test for this purpose which

[20] Barro (1999) provides evidence that real per capita GDP is a robust determinant of democracy. In our sample, the simple correlation coefficient between the democracy variable and real per capita GDP is 0.7 with a t-statistic of 6.4.

[21] We thank the editor of the journal for this suggestion. We also added the interaction between each measure of government size and corruption, another suggestion of the editor, on the assumption that impact of corruption may increase with the scale of government intervention in the economy. The interaction variable turned out to be insignificant. By contrast, the interaction variable was found to be significant in the poverty regression.

Table 3. Corruption and income inequality: impact of alternative instruments (dependent variable: the Gini coefficient)

Instruments	Coefficient	P-value	First Stage Adjusted R-squared
Democracy, initial income	3.12* (1.67)	0.02	0.73
Democracy, ethnicity	2.41 (1.52)	0.17	0.75
Democracy, ethnicity, initial corruption	1.34 (1.14)	0.15	0.77
Democracy, latitude, initial corruption	1.71 (1.56)	0.14	0.78
Democracy, latitude	2.95** (2.32)	0.40	0.76
Democracy, latitude, ethnicity	2.28** (1.99)	0.40	0.77
Ratio of government spending to GDP, Democracy	3.95** (1.95)	0.58	0.73
Ratio of public employment to labor force, Democracy	2.07 (1.39)	0.34	0.76

Notes: Entries in the second column show the estimated coefficient on the corruption index and its t-ratio (in parentheses) in specification (6) of Table 1. P-value is the probability value associated with test of validity of the chosen instruments. Adjusted first stage R-squared is the adjusted R-squared obtained from the first stage regression of the corruption on the instruments. A high value of the corruption index indicates a high level of corruption.

***Significant at 1 percent level; **significant at 5 percent level; and * significant at 10 percent level.

admittedly has low power in samples of the size we use in this paper. Therefore, results should be treated with caution in this respect.

The results are shown in Table 3 for eight sets of instruments. Of the eight regressions, the estimated coefficient on corruption is significant in three regressions at the 5 percent level and in one regression at the 10 percent level. The chosen instruments are valid at the conventional statistical levels in seven regressions as judged by Sargan's test. In all regressions, the first stage R-squared is quite high, which suggest that the chosen instruments are highly correlated with corruption. The regression with the highest p-value for Sargan's test uses ratio of government spending to GDP and democracy as instruments which produces an estimated coefficient on corruption which is as high as the estimated coefficient when democracy was the only instrument.

D. Impact of corruption on poverty

The poverty regression is estimated using the OLS and the IV techniques and the specification given in section III.B. Table 4 shows the results of the OLS regression. All regressions contain the following variables: a constant, natural resource abundance, initial income of the poor, initial secondary schooling, and growth in

Table 4. Corruption and poverty: OLS estimates (dependent variable: income growth of the bottom 20 percent)

Independent variables	(1)	(2)	(3)	(4)	(5)
Constant	0.01 (0.91)	0.00 (0.27)	0.05 (1.51)	-0.00 (-0.01)	0.00 (0.00)
Natural resource abundance	-0.09 (-0.94)	-0.08 (-0.79)	-0.09 (-0.99)	-0.15 (-1.49)	-0.12 (-1.33)
Initial income of the bottom 20 percent ($x10^3$)	-0.04 (-1.26)	-0.04 (-1.14)	-0.05 (-1.56)	-0.09** (-2.36)	-0.09** (-2.34)
Initial secondary schooling	0.01 (1.13)	0.01 (1.13)	0.01 (1.25)	0.01 (1.33)	0.02 (1.52)
Education inequality (x10)		0.05 (0.51)			0.14 (1.36)
Initial gini coefficient for land ($x10^2$)			-0.06 (-1.12)		-0.03 (-0.73)
Social spending (x10)				0.03** (2.43)	0.03** (2.38)
Corruption	-0.02** (-2.17)	-0.02** (-2.19)	-0.01 (-1.24)	-0.02*** (-2.57)	-0.02* (2.05)
Adjusted R^2	0.13	0.10	0.14	0.29	0.28
Number of observations	31	31	31	31	31
F-statistic	2.19*	1.71	1.96	3.56**	2.69**

Note: Estimation is by OLS. Numbers in parentheses are t-statistics based on White heteroscedasticity-consistent standard errors. Social spending is sum of spending on education, health, social security, welfare, housing and community amenities. The corruption index is multiplied by -1 so that a high value of growth in the index indicates a high growth rate of corruption.

***Significant at 1 percent level; **significant at 5 percent level; and * significant at 10 percent level.

corruption.[22] The three remaining variables (education inequality, initial Gini coefficient for land, and social spending) are entered one at a time and then all at once to see if the sign and significance of these variables – as well as that of corruption – change. In all these regressions, higher growth in corruption is associated with lower income growth of the poor, with the coefficient significant in four regressions at the conventional statistical levels. The estimated coefficient on the corruption index is most significant (at the 1 percent level) when the regression includes social spending (column 4). The results also show that the impact of corruption on poverty is quantitatively important. An increase of one standard deviation in the growth rate of corruption (a deterioration of 0.78 percentage points) is associated with a de-

[22] Most of the variables included in the regression affect aggregate growth. Hence, aggregate growth is excluded in Table 4. Including it increases collinearity among the variables, which makes it difficult to distinguish the effect of each independent variable on the dependent variable. Nevertheless, adding aggregate growth produces results which are similar to Table 4, particularly with respect to the impact of corruption. Aggregate growth is significant only at the 10 percent level. These results are available from authors.

cline in income growth of the bottom 20 percent of the population of 1.6 percentage points per year (Table 4, column 4).

The results also show that income growth of the poor is high in countries with poor natural resources, low levels of initial income, higher initial schooling, low land inequality and high level of social spending. Surprisingly, income growth of the poor is high when education inequality is high although the latter is not statistically significant.

E. Sensitivity analysis and the IV estimation of the poverty regression

The OLS regression is robust to addition of aggregate growth, allowing for the sample size to vary across various specifications in Table 4 and presence of outliers.[23] Sample size varies depending on data availability for each specification.[24] The OLS regression results establish association at best and not causality. The association could be due to high poverty causing high corruption or due to other variables. As in the analysis of corruption and income inequality, instrumental variable estimation is used to address these concerns, using initial corruption as the instrument. Initial corruption is predetermined with respect to growth in corruption over the 1980-95 period. Initial corruption turns out to be a powerful predictor for growth in corruption in the subsequent periods. The simple correlation coefficient between the two variables is -0.55 with a t-statistic of -3.84, suggesting that countries which were perceived to be highly corrupt at the start of the 1980s were perceived to have become less corrupt over the subsequent 15 years.

The results are shown in Table 5. Statistical significance and magnitude of the corruption index increases in the IV regression relative to the OLS regression. Corruption is now statistically significant at the 1 percent level in two specifications (Columns 4 and 5) and at 5 and 10 percent level as before in the remaining specifications.

The effect of corruption on poverty is quantitatively important. A one-standard deviation increase in the growth rate of corruption (a deterioration of 0.78 percentage points) reduces income growth of the bottom 20 percent of the population by 4.7 percentage points per year (Table 5, column 4) which is considerable given the average income growth of 0.6 percent a year.[25] Figure 2 shows the relationship between growth in corruption and income growth of the poor based on the IV regression result (Table 5, column 5). The fitted relationship shows that the results are not driven by any outliers. This is also confirmed by deleting from the sample ob-

[23] Sample size would vary depending on data availability. These results, not reported, produce identical results to Table 4. Additional sensitivity analyses are not conducted since the specification follows the baseline specification in the growth literature.

[24] We could not experiment with different measures of corruption since there are not enough time series data on corruption for the available sample except for the corruption measure reported in Tanzi and Davoodi (1997).

[25] In the sample, there are countries in which income growth of the poor has increased dramatically (e.g, Thailand, 10 percent a year) and countries in which income growth had decreased substantially (Dominican Republic with 4 percent per year) and those with almost zero growth (e.g., United States, Sweden) over the 1980B97 period.

Table 5. Corruption and poverty: instrumental variable estimates (dependent variable: income growth of the bottom 20 percent)

Independent variables	(1)	(2)	(3)	(4)	(5)
Constant	-0.00 (-0.08)	-0.01 (-0.38)	-0.00 (-0.12)	-0.02 (-1.02)	-0.08 (-1.28)
Natural resource abundance	-0.07 (-0.76)	-0.06 (-0.57)	-0.07 (-0.80)	-0.14* (-1.65)	-0.12 (-1.39)
Initial income of the bottom 20 percent ($x10^3$)	-0.03 (-1.01)	-0.02 (-0.78)	-0.03 (-0.90)	-0.09** (-2.52)	-0.07** (-2.25)
Initial secondary schooling	0.01 (1.50)	0.02 (1.51)	0.01 (1.54)	0.02* (1.77)	0.02* (1.87)
Education inequality (x10)		0.07 (0.77)			0.01 (1.60)
Initial gini coefficient for land ($x10^2$)			0.01 (0.13)		0.05 (0.79)
Social spending (x10)				0.04*** (2.71)	0.04*** (2.85)
Corruption	-0.04** (-2.01)	-0.04* (-1.94)	-0.04** (-2.31)	-0.06*** (-2.87)	-0.06*** (3.31)
Adjusted generalized R^2	0.13	0.09	0.22	0.29	0.38
Number of observations	31	31	31	31	31
P-value for Sargan's misspecification test	n.a.	n.a.	n.a.	n.a.	n.a.

Note: Estimation is by IV. Numbers in parentheses are t-statistics based on White heteroscedasticity-consistent standard errors. The adjusted generalized R^2 is the measure of adjusted R^2 for regressions estimated by instrumental variable technique; see Pesaran and Smith (1994). Sargan's misspecification test is a test of validity of instruments. The instrument is initial corruption. Other variables in the regression act as their own instrument. Social spending is sum of spending on education, health, social security, welfare, housing and community amenities. The corruption index is multiplied by -1 so that a high value of growth in the index indicates a high growth rate of corruption.

***Significant at 1 percent level; **significant at 5 percent level; and * significant at 10 percent level.

servations with extreme values (e.g., countries with largest reduction in corruption and largest improvement in income growth of the poor).

Additional sensitivity analysis are conducted using eight set of instruments, similar to the set used in the income inequality regression.[26] The results are shown in Table 6. In all cases, Sargan's test does not reject the hypothesis that the chosen instruments are valid. Corruption has the same sign as before and is statistically significant at the 1 percent level in all but three regressions. Therefore, one may conclude that higher corruption leads to higher poverty.

5. Conclusions and policy implications

Corruption interferes with the traditional core functions of government: allocation of resources, stabilization of the economy, and redistribution of income. These func-

[26] The rationale for the choice of these instruments are the same.

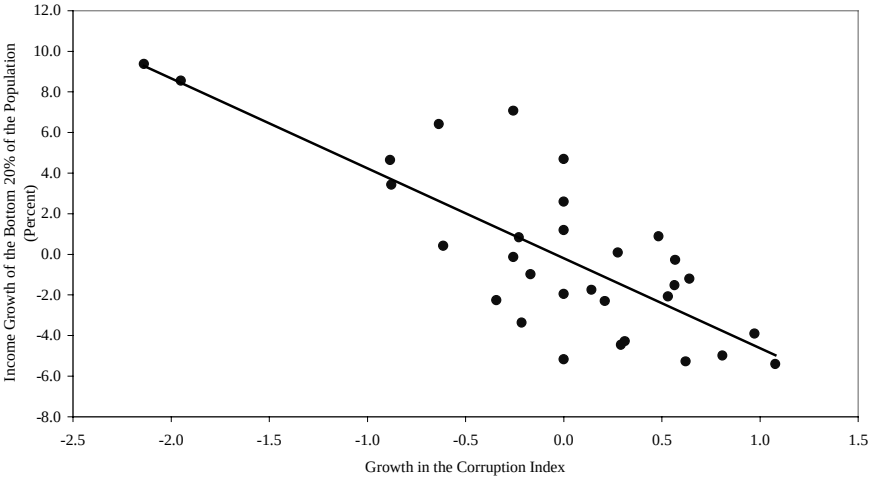

Fig. 2. Corruption and income growth of the poor. The figure is based on the regression in Table 5, column 5. A higher growth in the corruption index means the country has a higher growth rate of corruption

Table 6. Corruption and poverty: impact of alternative instruments (dependent variable: income growth of the bottom 20 percent)

Instruments	Coefficient	P-value	First Stage Adjusted R-squared
Initial corruption, initial income	-0.05*** (-3.42)	0.65	0.46
Initial corruption, latitude	-0.06*** (-3.34)	0.97	0.44
Democracy, ethnicity, initial corruption	-0.06*** (-3.18)	0.16	0.41
Democracy, latitude, initial corruption	-0.06*** (-3.12)	0.95	0.42
Democracy, latitude	-0.06* (-1.81)	0.84	0.30
Democracy, latitude, ethnicity	-0.07* (-1.86)	0.24	0.26
Ratio of public employment to population, initial corruption	-0.04*** (-2.60)	0.75	0.15
Ratio of public employment to labor force, initial corruption	-0.04** (-2.47)	0.40	0.48

Notes: Entries in the second column show the estimated coefficient on the corruption index and its t-ratio (in parentheses) in specification (5) of Table 4. P-value is the probability value associated with test of validity of the chosen instruments. Adjusted first stage R-squared is the adjusted R-squared obtained from the first stage regression of the corruption on the instruments. The corruption index is multiplied by -1 so that a high value of growth in the index indicates a high growth rate of corruption.

***Significant at 1 percent level; **significant at 5 percent level; and * significant at 10 percent level.

tions influence income distribution and poverty in varying degrees, both directly and indirectly.

The budget is the principal vehicle through which any government conducts its core functions. Previous studies have demonstrated that corruption affects the revenue and expenditure side of the budget (Mauro, 1998, Tanzi and Davoodi, 2001) and impairs efficiency and growth (Mauro, 1995, 1998). The empirical evidence presented in this paper shows that corruption has significant distributional consequences as well and interferes with redistribution function of the government.

The paper finds that the impact of corruption on income inequality and poverty is considerable. A worsening in the corruption index of a country by one standard deviation (2.52 points on a scale of 0 to 10) increases the Gini coefficient by 11 points which is significant, given the average Gini value of 39. A one-standard deviation increase in the growth rate of corruption (a deterioration of 0.78 percentage points) reduces income growth of the poor by 4.7 percentage points per year which is considerable given the average income growth of 0.6 percent a year.

The paper's findings suggest that the adverse distributional consequences of corruption can, however, be mitigated by: (1) sound management of natural resources; (2) broad-based, labor-intensive growth; (3) efficient spending on education and health; (4) effective targeting of social programs; and (5) a low level of inequality in the access to education.

A central message of this paper is that corruption increases inequality and, given its negative efficiency implications established already in the literature, should be considered harmful to both growth and equity. Policies that reduce corruption will most likely reduce income inequality and poverty. The evidence gives support to political economy considerations that benefits of corruption and bribing public officials are captured primarily by the rich and better-connected individuals. There are many other mechanisms through which corruption can affect poverty and inequality, some of which were presented in the paper. Future research can focus on these channels and provide rigorous theoretical models of corruption, income inequality, poverty while working with a larger sample size that one used in this paper.

Data appendix

The Gini coefficient and quintile income shares

Data on the Gini coefficient and quintile income shares are taken from Deininger and Squire's (1996) "high quality" data set. This data set includes observations on the Gini coefficient that fulfill three key requirements for reliability: they must be based on household survey data, the survey coverage must be national, and the surveys must include all income sources.

Natural resource endowment

The proxy for natural resource endowment is the share of natural resource exports in total exports in 1970 (Sachs and Warner, 1997).

Physical capital endowment

The physical capital endowment is the average ratio of the stock of physical capital to GDP, both measured in constant 1987 prices in local currency, between 1980 and 1990 (Nehru and Dhareshwar, 1993).

Human capital endowment

The proxy for human capital endowment is the average years of secondary education in the population aged 15 and over between 1980 and 1995 (Barro and Lee, 1996).

Land distribution

The proxy for the distribution of land is the Gini coefficient for land (circa 1980). It is based on the land rental market and was used by Deininger and Squire (1996).[27]

Education inequality

Education inequality is proxied by the 1980–95 average ratio of the percent of population, aged 15 and over, with no schooling expressed as a fraction of percent of population, aged 15 and over, with completed secondary and higher education (Barro and Lee, 1996).

Corruption

Six indices of corruption are used. One measure taken from Tanzi and Davoodi (1997) is from the *International Country Risk Guide (ICRG)* and the Business International (*BI*). (The latter is reported in Mauro (1995) and is averaged between 1980 and 1995. The ICRG index reflects the assessment of foreign investors on the degree of corruption in an economy. Investors are asked whether high government officials are likely to demand special payments and whether illegal payments are generally expected throughout lower levels of government as bribes connected with import and export licenses, exchange controls, tax assessment, police protection, or loans. The ICRG index has been rescaled and spliced with the BI index so that the combined index ranges from 0 (most corrupt) to 10 (least corrupt).

Other five indexes are from the*Transparency International* corruption perception indices for 1995, 1996, 1997, an expanded 1997 index (Lambsdorff), and a historical corruption index averaged over the 1988–92 period. The expanded 1997 corruption index was constructed by Johann Lambsdorff (forthcoming) by applying the same technique as *Transparency International*, but includes countries for which a minimum of two survey sources were available. The rationale for their exclusion from the *Transparency International* indexes was the requirement of a minimum

[27] Klaus Deininger kindly provided the data.

of four survey sources on every country to enhance the reliability of the data. By enlarging the number of observations available (from 52 to 101), however, the expanded 1997 corruption perception index compensates for the increased margin of error incurred by using data based on fewer surveys. Results from this measure are reported in the income inequality regression.

Real per capita GDP

The data on nominal purchasing power parity per capita GDP denominated in U.S. dollars have been converted to real data using the U.S. GDP deflator (International Monetary Fund, *World Economic Outlook*, 1997).

Social spending

Three measures of social spending are used; these are government spending on: (1) social security and welfare, (2) education and health, and (3) the sum of spending items (1) and (2) plus housing and community amenities. These data have been expressed as fractions of GDP, both in local currency, and are from the same source (International Monetary Fund, *Government Finance Statistics*, 1997).

Democracy

This variable measures whether has been democratic for the past 46 years (Treisman, 2000).

Latitude

Latitude is a country's distance from the equator (Hall and Jones, 1999). This variable is measured as the absolute value of latitude in degrees divided by 90 to place it on a 0-to-1 scale.

Ethnicity

The proxy for ethnicity is an index of ethnolinguistic fractionalization for 1960 (Taylor and Hudson, 1972). It measures the probability that two randomly selected persons from a given country will not belong to the same ethnolinguistic group.

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