Estimating the Effects of Corruption

Implications for Bangladesh[1]

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[1] This paper was prepared as a background paper for a World Bank Report "Corruption in Bangladesh: Costs and Cures". Consequently, most of the illustrations in this paper use Bangladesh as an example. For a detailed politico-economic analysis of corruption in Bangladesh please refer to the report. For helpful comments we thank Hamid Davoodi (IMF), Aymo Brunetti (University of Basle), Monali Chowdhurie-Aziz (World Bank), Stephen Knack (World Bank), Naoko Kojo (World Bank), and Tara Vishwanath (World Bank). The findings, interpretations, mistakes, and conclusions presented in this paper are entirely those of the authors. They do not necessary represent the views of the World Bank, its Executive Directors, or the countries they represent.

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I. Introduction

Corruption is an age-old problem, but only recently has it started attracting the global attention of policy makers and development practitioners[2]. A growing volume of empirical analysis, discussed in greater detail below, demonstrates that corruption hinders growth and investment, aggravates poverty and inequality, and thus hurts the overall wellbeing of people. Since there is no universally accepted indicator that measures corrupt practices, it is less clear how adequately empirical models can capture corruption.

While there is no agreement in the literature on how to define the phenomenon of corruption, one thing is clear: corruption is a governance problem. Corruption is a result of weak state management and exists when individuals or organizations have monopoly power over a good or service, discretion over making decisions, limited or no accountability, and low levels of income (Klitgaard, 1998)[3]. The frequently cited World Bank definition of corruption, used in this paper, is the abuse of public office for private gain[4]. This does not necessarily mean that corruption exists only in the public sector. Rather that corruption in the public sector is more important for the purposes of public policy in developing economies and the public sector should take the lead in establishing high standards of integrity and accountability.

The objective of this paper is to empirically scrutinize the consequences of corruption across countries. The paper builds on the pioneering work of Barro (1991) and extends the work of Mauro (1995) on corruption to the most recent period, i.e., the 1990s to see whether the relationship between corruption and growth and between corruption and investment has changed in recent years in comparison to earlier decades. We move away from Mauro's implicit assumption that the corruption index value for a relatively short period of time can be used as a proxy for the long run. We further augment Mauro's model by including significant regional dummy variables in an attempt to take account of various region specific effects (i.e., the intercept heterogeneity in the regional context). This, in turn, is expected to reduce the extent of potential omitted variable bias. The paper also analyzes the sensitivity of corruption in the presence and absence of various policy, geographic and demographic variables that are widely used in empirical growth and investment literature.

Overall, the evidence presented in this paper supports two arguments: (i) corruption is significantly and negatively associated with cross-country differences in economic growth and gross domestic investment; and (ii) corruption can reduce growth by driving away foreign direct investment, a source of capital that is especially important

[2] Greater awareness about this chronic phenomenon has emerged following the end of the Cold War with the flourishing of democracy and free press around the world that has increased the "voice" of civil society. The criminalization of bribery in the US and similar recent initiatives by OECD countries have also helped.
[3] Klitgaard (1998) defines corruption as: C= M + D - A - S, where C is corruption, M is monopoly, D is discretion, A is accountability and S is public sector salaries.
[4] Helping Countries Combat Corruption: The Role of the World Bank, PREM, World Bank, 1997.

for developing countries with limited capacity for developing technologies and know-how.

Given the possibility of endogeniety, which is usual in this type of cross-country analysis, the estimated relationships should be viewed as partial associations, not necessarily as causal linkages. However, like Levine and Renelt (1992) and Sala-i-Martin (1997) among others we leave this endogeneity issue (i.e., both identification and testing the strength of instrumental variables) beyond the scope of this paper.

The paper is organized as follows. Section I provides a brief survey of existing theories and empirical work on corruption. Section II presents reasons why the research conducted by this paper was undertaken, including the paper's methodology, data sources, and models used in empirical work. Section III discusses the regression results for economic growth and gross domestic investment and also presents results for models measuring the impact of corruption on inflows of gross foreign investment. Brief concluding remarks are given in Section IV.

II. Literature Review

II.1. The Theoretical Debate

Until recently, where there appears to be growing agreement that corruption is harmful, theories regarding the impact of corruption on efficiency have been contradictory. Some studies have advocated that corruption greases the wheels of business and commerce and thus facilitates growth and investment, while others have claimed that rather than greasing, corruption really slows down the wheels by institutionalizing itself through its chronic persistence. *Corruption with theft* (Shleifer and Vishny, 1993) or *collusive corruption* (Bardhan, 1997) occurs when investors reap the benefits of a corrupt state machinery by forging patron-client relationships with that machinery and realize windfall gains, although the state loses revenue. Such corruption is mutually beneficial for both the officials concerned and their clients, but can be harmful to the state. *Corruption without theft* occurs where the tacit collusion is absent, but officials extract extra payments from their clients, in addition to official charges, because of their discretionary powers. In this case, corruption, by increasing the hidden cost of doing business, retards both domestic and foreign investment and thus economic growth and the nations poverty reduction objectives. This type of corruption is also harmful for the state revenue, because a lower growth transfers into a lower revenue base.

In the literature, the debate on the effect of corruption has led to two opposing strands. One strand, which can be labeled as the *efficiency enhancing strand* views corruption as increasing efficiency. The opposing strand, labeled as *efficiency reducing*, views corruption as having a damaging impact on efficiency.

Motivated by Leff (1964) and Huntington (1968), the efficiency enhancing school of thought argues that corruption increases economic growth for a number of reasons. First, acting as "speed money", bribes enable entrepreneurs to avoid bureaucratic delay. Lui (1985), in an interesting equilibrium queuing model, shows that bribing strategies form a Nash equilibrium in a non-cooperative game that minimizes waiting costs thereby

reducing inefficiency in public administration. Second, while the poor pay structure does not motivate the bureaucrats to work, lack of accountability further enables them to be inert as they are not compelled to show cause to the people for their lethargy. Thus, bribe, in this circumstance would induce the bureaucracy to function efficiently. Third, from the point of view of welfare economics, in a "second best" world of pre-existing policy-induced distortions, additional distortions in the form of black-marketeering, smuggling, etc. may actually improve welfare[5].

Moving away from the rather extreme efficiency enhancing strand, some studies have taken a more moderate view and argue that corruption does not necessarily hamper allocation efficiency. For instance, allocative efficiency is maintained even if a corrupt bureaucrat ignores principles of competitive bidding and awards contracts to the highest bidder, because it is the lowest cost firm that can afford to pay the highest bribe. Allocative efficiency exists in such a competitive bidding process, even under incomplete information (Beck and Maher 1986, Lien 1986).

Those opposing the "speed money" proposition, argue that, by forming perverse patron-client relationships with the bureaucracy and state machinery and by diverting resources and talent from productive purposes to corrupt practices, corrupt investors hamper the overall prosperity of the nation by reducing economic growth by adversely affecting the quality and quantity of investment. Citing the findings of the 1964 Santhanam Committee on the Prevention of Corruption, appointed by the Government of India, Myrdal (1968) claimed that rather than speeding up the process, corrupt officials actually caused severe administrative delays in order to attract more bribes. When corruption is pervasive, the person paying the bribe is often forced to engage in more malpractice by bribing others and those in higher authority, which further increases transaction costs.

Similarly, Andvig (1991) opposes Lui's (1985) equilibrium queuing model that suggests that bribery reduces inefficiency of public administration by minimizing waiting costs associated with the queue. He argues that Lui's assumptions regarding queues are unduly restrictive and suggests that queues are more complex and many-sided under imperfect information. Strategic considerations and different ways of organizing the queues could greatly reduce average waiting time and Lui's model is not robust enough to take these considerations into account.

In an environment characterized by a malfunctioning state, governance failure and weak institutions, there is no guarantee that the corrupt official would award the bid to the most efficient firm that is also willing to pay the highest bribe, as discussed above. As observed in many countries, including Bangladesh, nepotism and perverse client-patron relationships dominate business transactions. As a result, corrupt officials are more likely to be influenced by these relationships, than by monetary incentives alone. The existence of extensive client-patron relationships could result in contracts being diverted to friends and relatives in anticipation of future favors being granted.

[5] As pointed out by Bardhan (1997), the efficiency improving argument of corruption is an extension of this idea of second-best principle.

II.2. Empirical Evidence

Following Barro's (1991) pioneering work, there has been a remarkable expansion in the empirical literature on economic growth and investment[6]. Using Barro's framework, Mauro (1995) pioneered the econometric investigation of the impact of corruption on economic growth and investment across countries. Using Business International (BI) data for 70 countries for the period 1980-83, he found a significant negative relationship between corruption and the average annual economic growth rate over the 1960-85 period, and between corruption and the investment-GDP ratio and other kinds of investments for 1960-85 and for 1980-85 as well. Interestingly enough, Mauro did not find any empirical support for the "speed money" argument which states that in the presence of a slow bureaucracy, corruption can get bureaucrats to work faster.

Further confirming the negative relationship between corruption and investment, one of his more recent studies (Mauro, 1997) finds that corruption reduces expenditures on health and education. As the opportunities to extract rents from public expenditures on health and education are relatively less, corruption distorts public expenditures away from health and education and encourages excessive infrastructure and capital intensive investment. Tanzi and Davoodi (1997) also examine the effects of corruption on public finances and find that corruption increases public investment at the expense of private investment and skews the composition of public expenditure away from the maintenance of past investment towards new investment. In this way, the productivity of public investment and of a country's infrastructure is reduced because of corruption. In contrast to increasing public expenditure, corruption reduces tax revenue as it encourages tacit collusion between tax and custom officials and their clients, along the lines of the c*orruption with theft* model discussed above. Moreover, because of a corrupt bureaucracy, it is difficult for the government to raise tax revenue as firms go underground not necessarily to avoid tax but to avoid bureaucratic regulation (Johnson, Kaufmann and Zoido-Lobaton, 1998).

The adverse effects of corruption on foreign direct investment (FDI) are analyzed by Wei (1997a) who finds that corruption, acting like a tax, reduces foreign direct investment. Wei (1997b) further concludes that the less predictable the level of corruption (i.e., the higher is its variance), the greater is its impact on FDI as higher variance makes corruption act like an unpredictable and random tax that increases risk and uncertainty. Thus, increases in corruption and in its randomness are equivalent to increases in the tax rate on enterprises. He demonstrates, for instance, that if India's corruption level were reduced to Singapore's level, its effect on attracting foreign investment would be the same as reducing its marginal corporate tax rate by 22 percentage points (Wei, 1998).

Gupta, Davoodi, and Alonso-Terme (1998) carried out an elaborate empirical study on the effects of corruption on inequality. They found that corruption tends to increase inequality and poverty through lower economic growth; biased tax systems favoring the rich and influential; lower social spending, unequal access to education and poor

[6] Some earlier attempts in a similar spirit are Robinson (1971) and Kormendi and Meguire (1985).

targeting of social programs; interest-group lobbying that perpetuates asset inequality; and increased risk for investment decisions of the poor.

III. Basic Methodology and the Model

As mentioned earlier, this paper uses the work by Barro and Mauro as a point of departure and updates their classic framework by looking at a more recent period, a broader range of issues, and by introducing additional dependent variables into the model.

III.1. Methodology

Empirically, in order to determine the quantitative magnitude of the impact of corruption on people's life, one would normally apply traditional time series econometric analysis. However, problems of data unavailability compel us to limit ourselves to cross-country empirical investigation. We use the so-called "Barro cross-country regression" framework to investigate the impact of corruption on economic growth and domestic investment and build on more recent empirical work by Mauro (1995) and others.

Typically, the Barro framework relates the dependent variable in question to two types of variables: a) the initial level of state variables that proxy for the initial stock of physical and human capital, and b) a vector of policy variables chosen by government and/or private agents. The initial level of real GDP per capita is used as a proxy for the initial stock of physical capital (Barro & Sala-i-Martin, 1995), for which accurate data are not available.

III.2. Growth and Investment Models

We augment Mauro's (1995) base model that controls for initial level of development, initial quantity of human capital and population growth by including statistically significant regional dummies[7]. As growth theories are not explicit enough to suggest all the explanatory variables that growth empiricists should use in growth regressions (Sala-i-Martin, 1997), we then analyzed the sensitivity of corruption in the presence and absence of various policy, geographic and demographic variables that are widely used in empirical growth and investment literature[8].

We have several reasons for departing from the original model suggested by Mauro (1995). These include:

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[7] The inclusion of dummies tries to control for the combined impact of various region specific factors on the dependent variable, which might have been omitted from our model for various reasons. First, this could be due to our ignorance of the complete and complex dynamics of economic development; second, it could be a way to avoid model overfitting; and third and most importantly, to keep our model simple and preserve clarity. Moreover, inclusion of dummies in this cross-country set up enables us to control for intercept heterogeneity in the regional context. In fact, we included each of the regional dummies separately and various combinations of them in order to identify which of the regional effects are robust. In the paper we are reporting only the best fitted models. In detail results are available up on request.

[8] In fact, Mauro's (1995) base model fares very poorly in our sample and time period when we tried to use it for measuring both economic growth and domestic investment.

- update and reassess corruption's impact for the most recent period, i.e., for the 1990s;
- change the measure of corruption by switching from the Business International (BI) average corruption index for 1980-83[9] used by Mauro to the average International Country Risk Guide (ICRG) index for 1991-97, which has been used quite extensively in recent corruption literature because of unavailability of BI indices for more recent years[10]; and
- reduce the length of the period from 26 years (1960-85) as in Mauro to 8 years (1990-97). We feel that the implicit assumption made by Mauro that the BI corruption index value for 1980-83 can be a proxy for the entire 1960-85 period might be too optimistic. Rather we choose the period in such a way so that it corresponds quite closely to the dependent variable in question (i.e., growth, domestic and foreign investment).

Although Barro's framework is generally used to explain long-run determinants of economic growth, here we have to restrict ourselves to a relatively shorter period of time. We choose this period because before 1991 Bangladesh, the country of our special interest, was ruled by a military regime. We preferred to sacrifice the length of the period, rather than suffer from a problem of mixing up outcomes under the autocratic regime in contrast to those under democracy. This period is also interesting because it has witnessed enormous national and international efforts to curb corruption and to promote democracy. Thus, notwithstanding the global moves against corruption, it is interesting to see how much a country, on average, has to pay for not being able to reduce corrupt practices.

For example, a reasonably consistent data series on corruption for Bangladesh starts only from 1991. As this paper was produced as a background paper for a World Bank report of corruption in Bangladesh, we had to ensure that Bangladesh was in the sample. Other researchers such as Brunetti, Kisunko and Weder (1998), however, have also used Barro's framework for a shorter period of time to asses an impact of institutional credibility on growth and investment.

Another reason for departing from Mauro (1995) is to demonstrate the sensitivity of the effect of corruption in the presence of various other policy, geographic and demographic variables that have been widely used in empirical growth literature

Thus the structure of our growth and investment models is as follows:

*Growth Model***:**

$$g = \alpha + \beta_1(\text{initial level of real GDP per capita}) + \beta_2(\text{initial quantity of human capital}) + \beta_3(\text{initial quality of human capital}) + \beta_4(\text{corruption}) + w\,\mathbf{X}' + q\,(Z;\, Z\,\varepsilon\, Z') + e \qquad (1)$$

[9] Mauro (1995) also regressed the investment-GDP ratio for 1980-85 on BI's corruption index in Table-IV of his paper. However, his key analysis seems to be based on the growth and investment ratio for 1960-85.
[10] For example, the index is used in Knack and Keefer (1995), Tanzi and Davoodi (1997), Gupta, Davoodi, and Alonso-Terme (1998), Kaufmann, Kraay, and Zoido-Lobaton (1999), and Wei (1998) among others.

Investment Model:

$I = \delta + \upsilon_1$(initial level of real GDP per capita) + υ_2(initial quantity of human capital) + υ_3 (initial quality of human capital) + υ_4(corruption) + $\mu \mathbf{X}' + \rho (Z; Z \varepsilon Z') + e$ (2)

where, g and I imply average annual growth rates and the investment-to-GDP ratio, respectively. $\mathbf{X}'$, is a vector of regional dummies, Z' is a pool of policy, geographic and demographic variables that are widely used in the literature[11], and e is the error term. The quantity of human capital is measured by secondary school enrollment, while the quality of human capital is measured by the pupil-teacher ratio in secondary schools.

Brunetti, Kisunko, and Weder (1998) argue that the credibility of rules established by government can influence both economic growth and investment by affecting the accumulation and allocation of resources. We use the same approach and separate these two effects by separately estimating growth and investment regressions. The investment regression in our paper measures the effect of corruption on the accumulation of resources while the growth regression tries to capture the effect of corruption on allocation.

III.3. Data Sources

Although various organizations produce quantifiable measures that are widely used by researchers to link economic performance with the efficiency of institutions, the main limitation of the majority of these measures is their heavy bias towards the perception of foreign investors and experts, their poll-based nature and limited coverage. Survey-based indices, which are of better overall quality, unfortunately have limited country coverage and compatibility. Recognizing that there is no ideal index that measures corruption, this paper measures corruption using a perception index called the International Country Risk Guide (ICRG)[12] corruption index which, as mentioned above, has been used quite extensively in recent corruption literature.

There are several other indices that measure different aspects of corruption, such as the Business International Index (BI), the Transparency International index (TI), and the World Economic Forum index (GCR). There are also indices that were prepared for the World Bank's 1997 World Development Report including a Private Sector Survey and work done by Kauffman, Kraay, and Zoido-Lobaton (1999). Despite very different sources of data, the correlation among the indices is quite high. The simple correlation coefficients between the BI and TI indices and between the BI and GCR indices are 0.88 and 0.77, respectively. Thus, conclusions reached on the basis of a particular index can be considered robust as they are not very sensitive to the choice of index.

[11] The list of this pool of variables is appended to the end of the paper.

[12] International Country Risk Guide (ICRG) is a subsidiary of Political Risk Services (PRS) Group. ICRG provides a detailed country-by-country breakdown of the comparative risks of operating in, investing in, or lending to particular countries.

ICRG uses a three-dimensional evaluation system that weighs the composite risk and identifies desegregated political, financial and economic risks by indicator through a predetermined number of risk sub-indicators, which are grouped into three main categories - political, financial and economic. Each sub-indicator is assigned a point rating, up to a specified maximum, on the basis of information and data analyzed and assessed by ICRG staff. For the chosen period, the ICRG corruption index ranges from 1 to 6 for all countries in our sample. The higher values of the index imply lower corruption levels. The data is collected and published on a monthly basis for more than 130 countries.

For this paper, monthly data is averaged to obtain annual values for the corruption index for the 1991-97 period. The sample of countries ranges from 63 to 79 countries for the growth and domestic investment models and from 47 to 61 countries for the model on foreign investment, representing a broad range of development experience and encompassing both developing and developed economies.

Data for the explanatory variables, namely schooling, area and distance (average distance to the capitals of the world's 20 major exporters, weighted by the values of bilateral imports) are from Barro and Lee (1994). Data for other variables are taken from the World Bank's SIMA database (except otherwise mentioned).

IV. Regression Results

In this section we present the main empirical results of the impact of corruption on economic growth, and on gross domestic and foreign direct investment. In all cases higher levels of corruption are shown to have a negative effect on the dependent variables.

IV.1. Corruption and Economic Growth

We first test the relationship between the corruption indicator and average per capita growth rates for 1990-97. The ICRG index assigns higher values to less corrupt countries; therefore, we expect a positive relationship. The sample scatter plot is shown in Figure 1.

Table 1 displays the multivariate regression results. Our "base" model (Model 1) shows that the sign of the coefficient for the corruption variable is positive and marginally significant at 5 percent confidence level, controlling for a country's initial level of development, its initial quality and quantity of human capital, and for various region specific effects[13]. Quantitatively, one standard deviation improvement in the corruption index (1.2 points on the scale between 1 and 6), would increase the dependent variable, in this case growth, by 0.79 points.

[13] Following the usual approach of growth empirics, we use the log of GNP per capita in 1985 as a proxy for the initial level of development, gross secondary school enrollment rate, 1985 (most commonly defined as ratio of children of all ages enrolled in secondary schools to the country's population of secondary school age children) as a proxy for initial quantity of human capital; pupil/teacher ratio in secondary school, 1980 as a proxy for initial quality of human capital of a country and regional dummies to capture region specific effects.

Figure 1. Corruption and Growth, 1991-1997

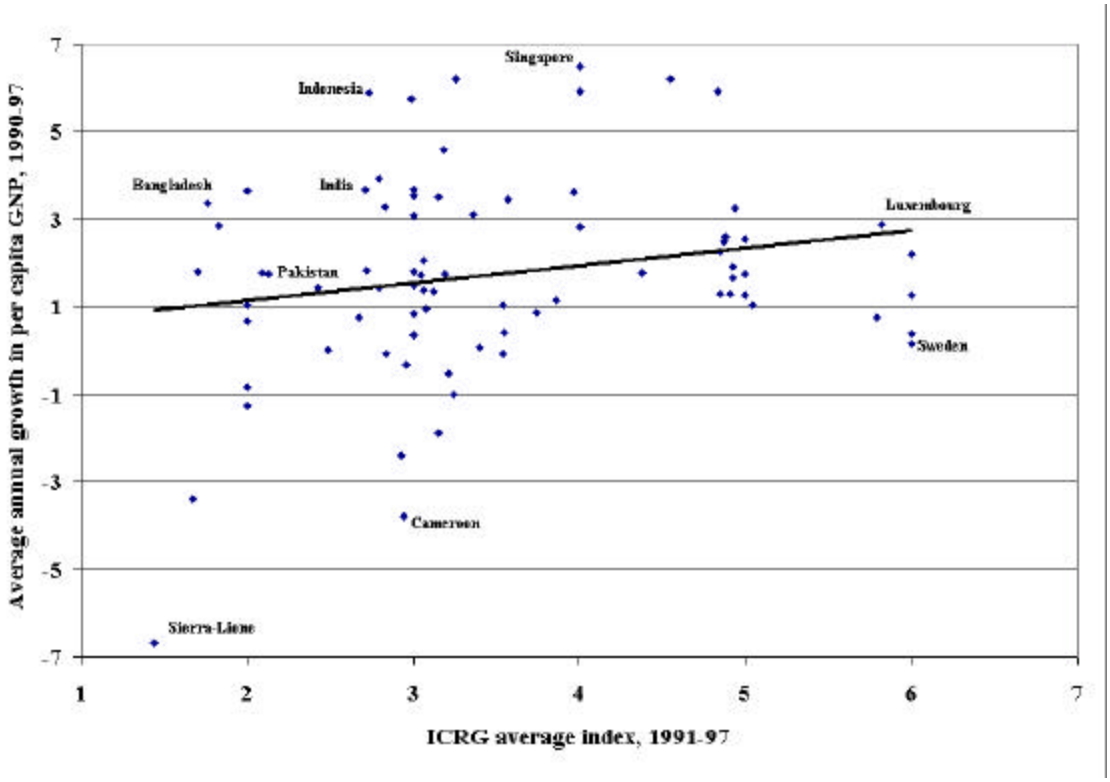


Table 1: Impact of corruption on growth in per capita GNP, 1990-97

Dependent variable: average annual growth rate, 1990-97

Independent Variables	Base model	Model 1	Model 2	Model 3	Model 4	Model 5
Log of GNP per capita, 1985	-0.48	-1.31**	-1.14**	-1.08**	-0.88*	-1.11**
	(-0.96)	(2.73)	(2.23)	(2.17)	(1.76)	(2.26)
Gross secondary school enrollment	5.33**	3.58**	2.76	2.76	2.38	2.39
rate, 1985	(2.29)	(2.12)	(1.56)	(1.58)	(1.41)	(1.44)
Pupil/teacher ratio in secondary	-0.03	-0.08**	-0.07*	-0.07**	-0.07*	-0.06*
school, 1985	(-1.36)	(2.67)	(1.90)	(1.88)	(1.85)	(1.78)
Gross domestic investment-GDP ratio,			0.14**	0.15**	0.16**	0.15**
average for 1990-97			(2.71)	(2.83)	(3.02)	(2.89)
ICRG corruption index value,		**0.66**[a]**	**0.63****	**0.56****	**0.61****	**0.51***
average for 1991-97		**(1.93)**	**(2.19)**	**(2.07)**	**(2.25)**	**(1.82)**
Government consumption as % of					-0.08**	
GDP, average for 1990-97					(2.04)	
Average annual population growth						-0.31
rate, 1990-97						(1.27)
South East Asia	3.23**	4.25**	2.35**	2.12**	1.62**	2.04**
	(3.96)	(5.94)	(2.73)	(2.48)	(1.99)	(2.41)
Latin America	0.90*	1.78**	1.51**	1.35**	0.94	1.27**
	(1.67)	(2.84)	(2.66)	(2.43)	(1.56)	(2.29)
Middle East & North Africa	0.63	1.14*	0.43			
	(0.98)	(1.67)	(0.67)			
South Asia	2.10**	2.02**	2.02**	1.91**	1.59**	1.69**
	(3.10)	(2.30)	(2.78)	(2.68)	(2.37)	(2.35)
Constant	3.67	8.65**	4.76	4.44	4.09	5.55
	(0.98)	(2.32)	(1.09)	(1.03)	(0.95)	(1.23)
Adjusted R^2	0.23	0.31	0.42	0.42	0.44	0.43
# of observations	90	79	78	78	78	78

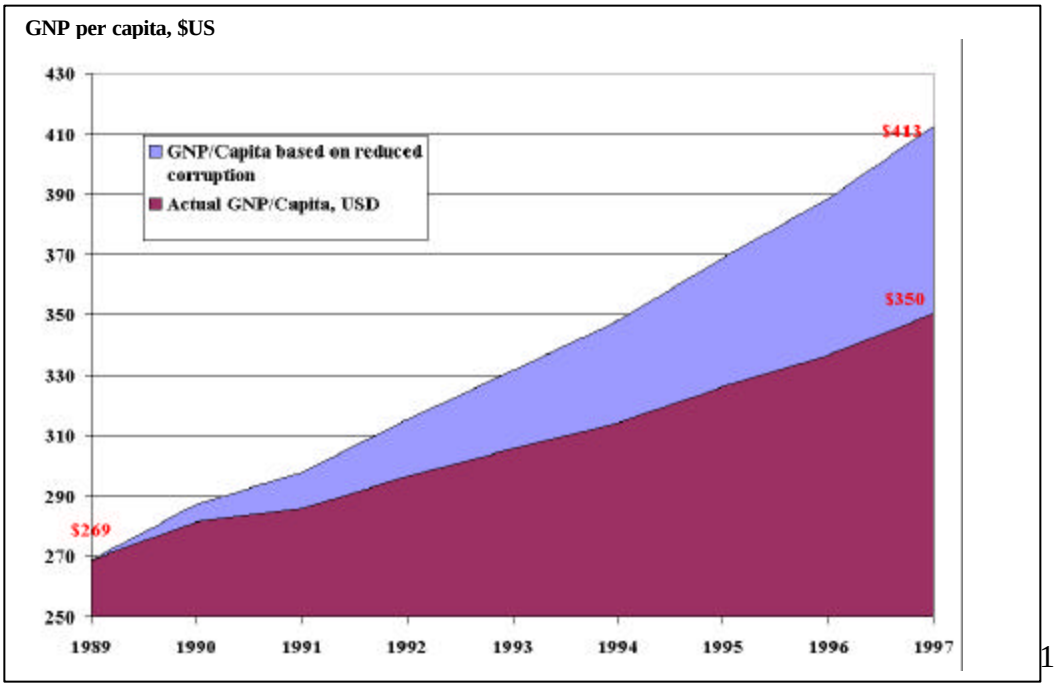
Note: Numbers in parentheses are White's heteroskedasticity consistent standard error based t-ratio. **Significant at 5% level; *Significant at 10% level. [a] More precisely, the index is significant at 5.8% level.

Literally speaking, following Wei (1998) this would mean that for Bangladesh, a reduction in corruption from its current level (average ICRG index value for 1991-97 equals 1.76 - see Annex 1 for ICRG data) to a level of, say, Poland and Hungary (average ICRG index value for 1991-97 equals 5.0) would increase Bangladesh's annual average growth rate during 1990-97 by 2.14 percentage points (.66 * (5-1.76) = 2.14). Thus, in other words, if corruption in Bangladesh could be reduced to levels existing in transition economies like Poland, then during the 1990-97 period Bangladesh could have increased its annual average per capita growth rate by more than 2 percent (from 3.4 percent to about 5.5 percent per annum). Figure 2 shows that if Bangladesh would experience this rate of growth, which is comparable to growth rates experienced by Argentina and Thailand during the same period, than Bangladesh per capita GNP would have crossed the $400 mark in 1997. In other words the difference even over a short period of time (8 years) would be $63, or 18% increase compare to the actual 1997 per capita GNP of $350.

There are at least two reasons why we used two most advanced transitional economies as comparators. First, among LDCs – these countries have the highest values of ICRG index – 5.0 (the only other LDC countries which are enjoying the same high ratings are Costa Rica and South Africa). Second, regardless of their transitional status and unlike many other transitional economies at a similar stage of development, Poland and Hungary have managed to build sustainable institutional systems. This, in turn, supports the argument that a lower level of development, by itself, is not an excuse for a corrupt and dysfunctional institutional structure.

Models 2 through 5 in Table 1 test whether the results are sensitive to the inclusion of additional explanatory variables. Controlling for the level of gross domestic investment, government consumption and population growth, the corruption index has the expected positive sign and remains significant. In all five models in Table 1 the controlling variables also have expected signs.

Figure 2. GNP per Capita Growth ($US, 1989-1997): Two Scenarios



The starting level of per capita GNP is used to control for the neoclassical convergence effect and, as expected, has a negative sign due to decreasing returns to capital. According to this argument, countries with lower initial levels of GNP should grow faster and gradually converge to levels of development prevailing in more advanced countries. Mankiw, Romer, and Weil (1992) argue that the neoclassical growth model does not predict an absolute convergence. According to them, each country converges to a conditional steady state, which depends mostly on the quantity (and quality) of the countries' human capital. As Table 1 summarizes, the quantity of human capital has the expected positive sign indicating that education has a positive effect on growth, while the quality of human capital has the intuitively expected negative sign and is significant at the 10 percent level.

The level of statistical significance of the impact of corruption increases to the 5 percent level (Model 2), if we control for the average gross domestic investment to GDP ratio for the 1990-97 period. Although investment is a classic determinant of economic growth, its use as an explanatory variable in growth models is subject to criticism on account of problems of endogeneity. The point we would like to make is that the focal variable, corruption, is both economically and statistically significant, irrespective of controlling for the investment ratio. In fact, given the endoneity problem associated with investment in empirical growth models, most, if not all, researchers tend to estimate the growth equation both with and without investment as an explanatory variable (see for instance, Barro 1991, Sala-i-Martin 1997, Levine and Renelt 1992).

After controlling for investment, a one standard deviation improvement in the corruption index (1.2 points on the scale between 1 and 6), would increase the dependent variable (economic growth) by 0.76 points. The regional effect of Middle East and North Africa (MENA) becomes insignificant, once we control for the domestic investment to GDP ratio. Dropping MENA results in a 0.67 percentage increase in growth due to a one standard deviation improvement in the corruption index (Model 3).

Among the different policy, geographic and demographic variables, only government consumption (as a percentage of GDP for the 1990-97 period) seems to affect growth negatively and significantly (Model 4). Controlling for government consumption results in a 0.73 percent increase in growth due to a one standard deviation improvement in the corruption index. Following Mauro (1995), we also use population growth as a regressor in our model (Model 5). However, this variable does not appear to be robust,[14] although corruption remains statistically significant.

Thus, literally speaking, our results indicate that if Bangladesh were able to reduce corruption levels to those found in the more advanced East European countries (i.e., Poland or Hungary) holding other things constant, its corresponding annual average growth rate during 1990-97 could have been increased by between 1.65-2.14 percentage

[14] The negative association between population growth and economic growth is statistically significant if instead of controlling for both the quality and quantity of human capital, we only control for initial quality of human capital.

points[15]. Achieving these rates of growth over the post-independence period would have resulted in per capita GNP of between US$524-587 (in 1995 constant $US) in 1997, compared to its actual per capita GNP of US$350. Even more dramatically, the results indicate that if Bangladesh were able to reduce corruption levels to those prevailing in advanced countries like Switzerland, Denmark, Norway and Canada, annual average rates of growth could increase by 2.12 – 2.88 percentage points annually, implying per capita GNP levels of between US$592 and US$690 in 1997.

Analysis undertaken during the preparation of the Bangladesh 2020 report[16] shows that an extra 2-3 percent increase in economic growth per annum could cut the incidence of extreme poverty from the current 36 percent to about 11 percent by the year 2020. This in turns shows how corruption, by reducing economic growth, is adversely affecting the pace of poverty reduction in Bangladesh.

IV.2. Corruption and Gross Domestic Investment

The effect of corruption on gross domestic investment is highly significant, both from an economic and statistical point of view (Table 2). Together with highly significant regional dummies, our base model explains 54 percent of the cross-country variation in investment rates. Models 2 and 3 in Table 2 are used to illustrate the robustness of the corruption indicator.

Quantitatively, as per the base model (Model 1), a one standard deviation improvement in the corruption index (1.2 points on the scale between 1 and 6) would increase the investment-GDP ratio by 2.36 percentage points. In order to examine whether our base model is overfitted, the paper examines the sensitivity of corruption's impact by controlling for the initial quantity (Model 2) and quality of human capital (Model 3), along with other base controls. Thus literally speaking, our results illustrate that if Bangladesh could reduce its corruption level to that of, for example, the least corrupt East European countries, its gross domestic investment-GDP ratio would have been increased by 5.3 to 6.4 percentage points[17] (see Figure 3). Similarly, if it could reduce corruption to levels existing in the more advanced economies such as Sweden and Norway, investment levels could increase by 7 to 8 percentage points per annum.

Assuming an incremental capital output ratio of 3-4, this implies that additional GDP growth of between 1.3 and 2.1 percentage points could have been realized by reducing corruption. This quantitative magnitude of increase in growth further conforms the findings of the econometric model of corruption and economic growth discussed in the earlier section.

[15] The corresponding increase in growth rate would be 2.14% in model 1, 2.04% in model 2, 1.81% in model 3, 1.98% in model 4, and 1.65% in model 5.

[16] See Bangladesh 2020: A Long Term Perspective Study; The World Bank and Bangladesh Center for Advanced Studies; Dhaka: University Press Limited, 1998.

[17] More precisely, the increase in investment-GDP ratio would be 6.4% in model 1 and 6.2% in model 2, and 5.3% in model 3.

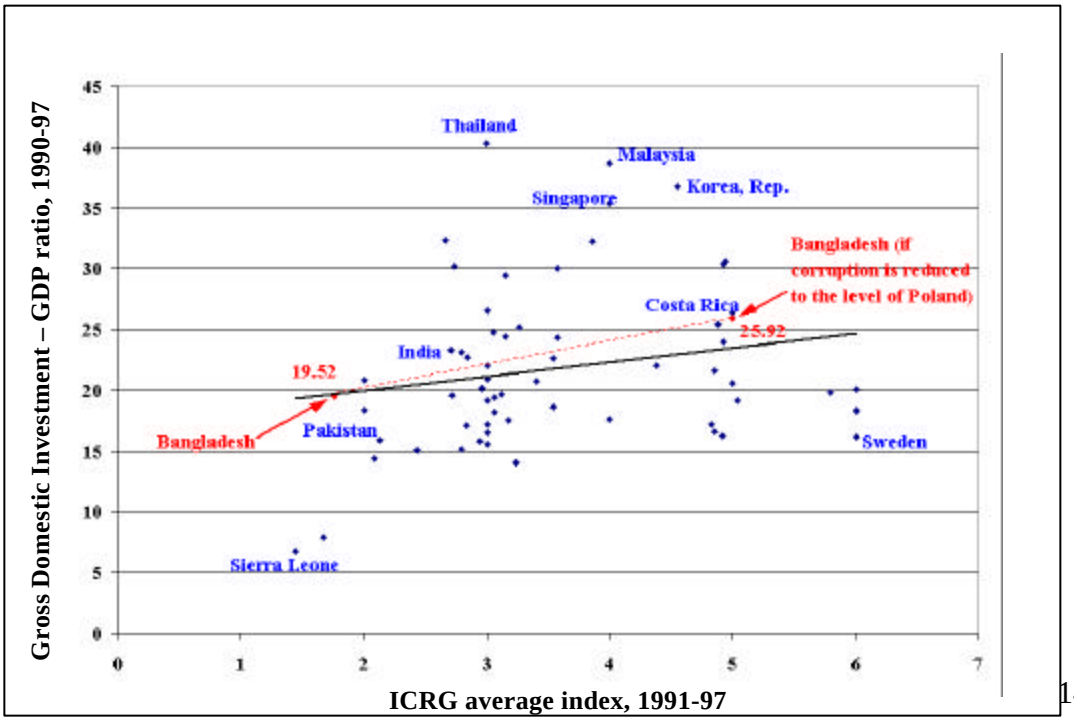
Table 2: Impact of corruption on gross domestic investment/GNP, 1990-97

Dependent variable: gross domestic investment-GDP ratio, average for 1990-97

Independent Variables	Base model	Model 1	Model 2	Model 3
Log of GNP per capita, 1985	0.50 (0.35)	-0.35 (0.31)	-0.60 (0.49)	0.70 (0.65)
Gross secondary school enrollment rate, 1985	6.03 (1.34)	3.09 (0.70)	2.66 (0.55)	
Pupil/teacher ratio in secondary school, 1985	0.02 (0.24)	0.06 (0.56)		0.17 (1.11)
Distance	0.39 (1.22)	0.28 (0.87)	0.26 (0.84)	0.26 (0.78)
ICRG corruption index value, average for 1993-97		**1.97** **(2.30)**	**1.92** **(2.51)**	**1.63*** **(1.86)**
South East Asia	13.51** (5.38)	14.20** (5.86)	14.69** (6.33)	12.87** (4.59)
Latin America	1.27 (0.70)	3.39** (2.03)	3.36**[a] (1.93)	2.94 (1.53)
Middle East & North Africa	7.03** (3.90)	8.78** (4.89)	8.81** (5.08)	7.88** (4.06)
South Asia	4.08** (2.38)	5.03** (2.44)	5.04** (2.74)	4.67** (2.07)
Constant	8.28 (0.76)	8.71 (0.90)	12.29 (1.30)	1.89 (0.19)
Adjusted R^2	0.49	0.54	0.52	0.44
# of observations		63	69	65

Note: Numbers in parentheses are White's heteroskedasticity consistent standard error based t-statistics. **Significant at 5% level ; *Significant at 10% level. [a] More precisely, the index is significant at 5.8% level.

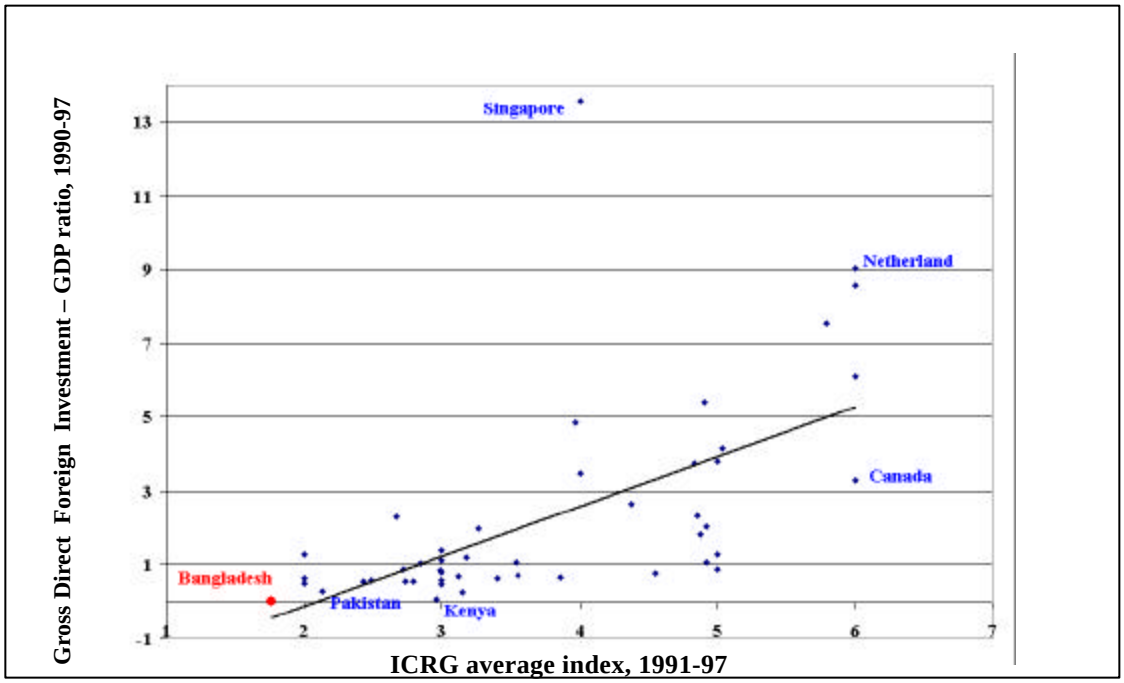
Figure 3. Corruption and Gross Domestic Investment



IV.3. Gross Direct Foreign Investment

Corruption is also shown to exert a strong negative influence on levels of gross foreign investment (see Chart 4 below). Foreign investment is different from domestic investment from at least two perspectives. First, foreign investors are usually more sensitive to the institutional setting in the host countries. Second, since these investors are outsiders to the countries' political processes, they are less familiar with the bureaucracy, and in many instances are less than welcome by local businesspeople and general population[18]. As a result they are more likely to take their business elsewhere if the institutional environment is perceived as unfriendly and bureaucratic discretion is too high. Chart 4 and empirical results in Table 3 support this conclusion.

Figure 4. Scatter plot of Gross FDI and Freedom from Corruption



The four simple models, summarized in Table 3, demonstrate that the extent of corrupt practices in a country significantly affect gross foreign direct investment, both statistically and economically. Every standard deviation (1.2 points on the scale between 1 and 6) of reduction in corruption increases the level of gross foreign direct investment, measured as a percentage of GDP, by about 1.2 percentage points. For illustrative purpose, these results for Bangladesh can be interpreted in a way that even a slight reduction of corrupt practices, say from the current level as mentioned above to that in India (ICRG 1991-97 average equals 2.71) would bring enormous benefits, equivalent to about US$300 million of foreign direct investment per year.

[18] This information is revealed in a survey of 117 senior managers of western manufacturing companies (Lankes, Hans-Peter and Anthony Venables, 1996):

Model 3 in Table 3 also shows that by controlling for the usual initial level of state variables that proxy for the initial stock of physical and human capital and for the openness of the economy, 64 percent of the cross-country variation in foreign direct investment levels can be explained.

Table 3: Impact of corruption on gross foreign direct investment/GNP, 1990-97

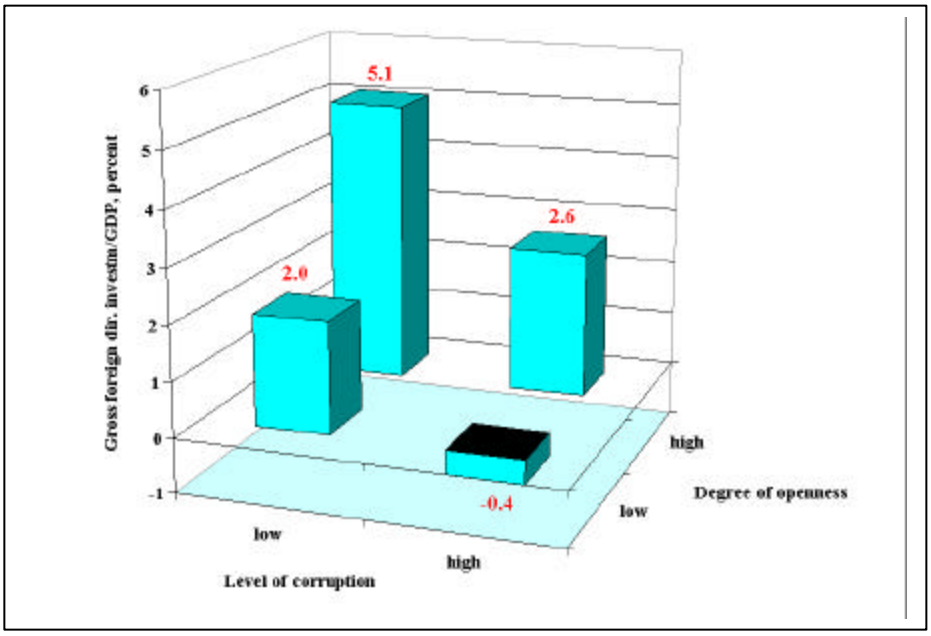
Dependent variable: gross foreign direct investment-GDP ratio, average for 1990-97

Independent Variables	**Base model**	**Model 1**	**Model 2**	**Model 3**
Log of GNP per capita, 1985	1.18 (1.39)	0.80 (0.85)	0.85 (0.90)	0.65 (1.20)
Gross secondary school enrollment rate, 1985	1.77 (0.84)	-0.59 (-0.31)	-0.54 (-0.28)	-0.67 (-0.36)
Pupil/teacher ratio in secondary school, 1985	0.028 (0.49)	0.03 (0.58)	0.02 (0.34)	0.00 (0.11)
ICRG corruption index value, average for 1993-97		**1.04** **(2.40)**	**1.02** **(2.41)**	**1.01** **(2.49)**
Size of the country			-0.00* (-2.00)	
Openness of the economy				0.03** (4.22)
Constant	-9.11 (-1.38)	-8.51 (-1.24)	-8.40 (-1.24)	-8.69* (-1.92)
Adjusted R^2	0.25	0.32	0.34	0.64
# of observations	50	48	48	47

Note: Numbers in parentheses are White's heteroskedasticity consistent standard error based t-statistics.
**Significant at 5% level ; *Significant at 10% level.

Figure 5 shows that if a country's economy is closed and its institutions are corrupt than it tends to loose foreign investment. The latter tendency is represented by a negative value on the chart. For given levels of openness, countries with lower levels of corruption have higher inflows of foreign investment. Figure 4 also shows that given the degree of openness, foreign investment will be lower if corrupt practices persist.

Figure 5. Level of Gross Foreign Investment



V. Concluding Remarks

This paper extends the pioneering work of Mauro (1995) to include the most recent years for which data are available, i.e. the 1990s, to see whether the relationship between corruption and growth and between corruption and investment has changed in recent years in comparison to earlier decades. The paper then extends the analysis beyond growth and investment and, although data limitations imply a need to interpret the results with necessary caution, empirical results show that corruption has significant negative effects on the amount of foreign direct investment. The paper also checks the robustness and sensitivity of the impact of corruption on growth and investment as well as on other dependent variables, i.e., gross foreign investment, by controlling for policy, geographic and demographic effects, as well as various omitted region specific effects.

The paper findings suggest that countries serious about improving governance and reducing corruption should redefine the role of government, overhaul the system of incentives and strengthen domestic institutions in order to make sure that the necessary checks and balances are in place. Such a holistic approach to reform would help to attract more investment, both domestic and foreign, and accelerate the pace of economic growth and poverty reduction.

Annex 1.
ICRG corruption index, 1991-1997 average[19]

Country Name	Average ICRG corruption index, 1991-1997[1/]	Ranking[2/]
Albania	3.43	69
Algeria	3.15	59-60
Angola	2.91	34
Argentina	3.18	61
Australia	5.00	107-112
Austria	4.92	104-105
Bahrain	3.74	78
Bangladesh	1.76	6
Belgium	4.63	96
Bolivia	2.56	24
Botswana	3.36	67
Brazil	3.40	68
Brunei	4.44	94
Bulgaria	4.14	89
Burkina Faso	3.08	57
Cameroon	2.94	37
Canada	6.00	118-123
Chile	3.26	66
China	3.57	73-75
Colombia	2.72	27
Congo, Rep.	3.01	52
Costa Rica	5.00	107-112
Cote d'Ivoire	3.55	72
Cuba	2.96	38-39
Cyprus	4.73	97
Czech Republic	4.38	91-92
Denmark	6.00	118-123
Dominican Republic	3.19	62
Ecuador	3.12	58
Egypt, Arab Rep.	3.00	41-51
El Salvador	2.83	32

[19] Only countries where data was available for all the underlining years are presented in this annex. During 1991-1997, the magnitude of the ICRG index for all countries in this sample was between 1 and 6.

Country Name	Average ICRG corruption index, 1991-1997[1/]	Ranking[2/]
Ethiopia	2.09	17
Finland	6.00	118-123
France	5.04	113
Gabon	1.05	2
Gambia, The	3.21	63
Ghana	3.06	54-55
Greece	5.00	107-112
Guatemala	2.43	22
Guinea	3.92	82
Guinea-Bissau	2.00	9-15
Guyana	2.11	18
Haiti	1.67	5
Honduras	2.00	9-15
Hong Kong, China	4.94	106
Hungary	5.00	107-112
Iceland	6.00	118-123
India	2.71	26
Indonesia	2.73	28
Iran, Islamic Rep.	3.57	73-75
Iraq	1.03	1
Ireland	4.83	98
Israel	4.87	101
Italy	3.54	70-71
Jamaica	2.67	25
Japan	4.92	104-105
Jordan	3.86	79-81
Kenya	2.96	38-39
Korea, Rep.	4.55	95
Kuwait	2.80	31
Lebanon	2.39	21
Libya	3.86	79-81
Luxembourg	5.82	117
Madagascar	4.00	84-88
Malawi	3.06	54-55
Malaysia	4.00	84-88
Mali	2.49	23
Malta	3.97	83

Mexico	2.84	33
Country Name	Average ICRG corruption index, 1991-1997[1/]	Ranking[2/]
Mongolia	4.00	84-88
Morocco	3.00	41-51
Mozambique	4.00	84-88
Myanmar	1.83	7-8
Namibia	4.41	93
Netherlands	6.00	118-123
New Zealand	5.79	114-116
Nicaragua	4.85	99-100
Niger	2.93	36
Nigeria	2.00	9-15
Norway	5.79	114-116
Oman	3.00	41-51
Pakistan	2.13	19
Panama	2.00	9-15
Papua New Guinea	3.05	53
Paraguay	2.02	16
Peru	3.00	41-51
Philippines	2.79	29-30
Poland	5.00	107-112
Portugal	4.88	102
Qatar	2.00	9-15
Romania	3.73	77
Russian Federation	3.07	56
Saudi Arabia	2.00	9-15
Senegal	3.00	41-51
Sierra Leone	1.44	3
Singapore	4.00	84-88
Slovak Republic	4.18	90
Somalia	1.51	4
South Africa	5.00	107-112
Spain	4.38	91-92
Sri Lanka	3.23	64
Sudan	1.83	7-8
Suriname	3.00	41-51
Sweden	6.00	118-123
Switzerland	5.79	114-116

Country Name	Average ICRG corruption index, 1991-1997[1/]	Ranking[2/]
Syrian Arab Republic	3.57	73-75
Taiwan, China	3.86	79-81
Tanzania	3.70	76
Thailand	2.99	40
Togo	2.00	9-15
Trinidad and Tobago	3.00	41-51
Tunisia	3.00	41-51
Turkey	3.15	59-60
Uganda	2.79	29-30
United Arab Emirates	2.14	20
United Kingdom	4.91	103
United States	4.85	99-100
Uruguay	3.00	41-51
Venezuela	3.00	41-51
Vietnam	2.92	35
Yemen, Rep.	3.00	41-51
Zambia	3.24	65
Zimbabwe	3.54	70-71

1/ Annual average was calculated in two steps: (i) monthly values were averaged for each of the years; (ii) annual values were averaged to obtain annual average ICRG corruption index.
2/ If values of average ICRG corruption index were equal for several countries then these countries were assigned to the same interval, i.e. Uruguay and Venezuela both belong to 41-51 ranking interval. Higher ranking means that corruption is a lesser issue.

Annex 2.
Correlation matrix for the variables used in the econometric analysis

	AFRICA	AREA	AVGM9097	CORR9197	DIST	GDI9097	GFI9097	GOV9097	GR9097	LAC	MENA	OPEN9097	POP90	POPG9097	S85	SA	SEASIA
AFRICA	**1**																
AREA	-0.077	**1**															
AVGM9097	-0.088	-0.278	**1**														
CORR9197	**-0.274**	**0.106**	**0.116**	**1**													
DIST	0.346	0.100	-0.032	**-0.388**	**1**												
GDI9097	-0.304	-0.081	0.421	**0.093**	0.044	**1**											
GFI9097	-0.206	-0.051	0.514	**0.566**	-0.167	0.034	**1**										
GOV9097	-0.002	0.074	0.137	**0.278**	-0.229	-0.029	0.248	**1**									
GR9097	-0.321	-0.063	0.207	**0.073**	0.074	0.398	0.158	-0.295	**1**								
LAC	-0.280	0.011	-0.125	**-0.249**	0.168	-0.075	-0.211	-0.277	0.107	**1**							
MENA	-0.243	-0.034	0.100	**-0.181**	-0.154	0.121	-0.164	0.298	0.067	-0.210	**1**						
OPEN9097	-0.119	-0.246	0.964	**0.174**	-0.063	0.407	0.568	0.132	0.185	-0.116	0.043	**1**					
POP90	-0.105	0.045	-0.106	**-0.067**	0.103	0.066	-0.106	-0.077	0.119	0.126	-0.020	-0.093	**1**				
POPG9097	0.402	-0.057	0.086	**-0.449**	0.387	-0.102	-0.246	-0.044	-0.121	-0.037	0.367	0.025	-0.009	**1**			
S85	-0.654	0.124	0.159	**0.695**	-0.391	0.186	0.508	0.305	0.248	-0.066	0.031	0.240	0.014	-0.613	**1**		
SA	-0.104	0.026	-0.109	**-0.162**	0.113	-0.028	-0.173	-0.172	0.113	-0.090	-0.078	-0.108	-0.033	-0.005	-0.121	**1**	
SEASIA	-0.204	-0.078	0.265	**0.010**	0.186	0.444	0.113	-0.167	0.361	-0.176	-0.153	0.298	0.144	-0.017	0.062	-0.066	**1**
TEASEC80	0.325	-0.265	0.073	**-0.269**	0.253	0.021	-0.191	-0.292	-0.129	0.034	-0.117	0.051	-0.055	0.323	-0.306	-0.065	0.201

Notice: Correlation based on a sample of 123 country observations.

Annex 3.
Descriptive Statistics.

	Number of observations	Max	Mean	Median	Min	St. deviation	Coef.of variation	Bangladesh	Pakistan	India	Sri Lanka
ICRG corruption index, 1991-97	123	6.00	3.51	3.19	1.03	1.20	0.34	1.76	2.13	2.71	3.23
GNP per capita, 1985 (PPP Dollars)	107	19,930	4,957	3,165	290	4,736	0.96	550	773	721	1,176
GNP per capita growth, 1990-97	111	10.07	1.53	1.49	-7.76	2.84	1.86	3.36	1.74	3.69	3.94
Gross domestic investment/GNP, 1990-97	117	40.34	21.74	20.81	6.71	6.32	0.29	19.52	15.88	23.34	24.54
Gross FDI/GNP, 1990-97	60	13.57	2.16	1.07	0.02	2.58	1.20	0.02	0.28	NA	0.40
Pupil/teacher ratio, 1980	90	42.90	20.65	20.40	5.90	7.38	0.36	21.10	16.20	16.90	NA
Gross secondary school enrollment, 1985	101	1.00	0.52	0.51	0.03	0.30	0.59	0.18	0.16	0.39	0.63
Government consumption/GDP, 1990-97	115	44.41	15.62	14.46	3.48	6.79	0.43	4.33	12.91	10.69	10.05
Population growth, 1990-97	123	6.69	1.84	1.93	-1.55	1.24	0.68	1.67	2.49	1.81	1.24
Size of the country (sq. km)	103	9976	847	300	1	1756	2.07	144	796	3288	66
Openness of the economy	116	350.38	73.18	64.44	3.63	49.13	0.67	24.13	NA	22.00	75.88
Average import/GDP, 1990-97	116	169.38	39.33	34.88	2.25	24.10	0.61	15.00	NA	12.13	42.63

NA - not available.

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