Does Corruption Affect Economic Growth?

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ABSTRACT

Using panel data on International Country Risk Guide corruption index, institutional quality, political stability indexes and a number of state variables for developed and developing countries, this paper explores linear quadratic empirical relationship between corruption and economic growth. The empirical literature that noticed a linear relationship between corruption and economic growth failed to differentiate between growth enhancing and growth reducing levels of corruption. The analysis based on Generalized Method of Moment estimation shows that decrease in corruption raises the economic growth rate in an inverted U-shaped way and this result is robust with respect to alternative specifications of the econometric relationship.

Key words: Corruption, Economic Growth, Institutional Quality, Bureaucratic efficiency, Political Stability.

JEL Code: D73, O4, O43, P48

1. Introduction

Until the 1980s, scholarly research on corruption was largely confined to the fields of sociology, political science, history, public administration, and criminal law. Since then, economists have also turned their interest to this topic, largely on account of its increasingly evident link to economic performance. Much of the early research focused on weaknesses in public institutions and distortions in economic policies that gave rise to rent seeking by public officials and the incubation of corrupt practices.

Concern about the negative social and economic impacts of corruption has grown rapidly, and major international organizations consistently claim that corruption hinders economic growth.[2] Although these international organizations claim that corruption is detrimental to economic growth, economists have not necessarily agreed with the claim from theoretical standpoints. Theoretical studies suggest that corruption may counteract government failure and promote economic growth in the short run, given exogenously determined suboptimal bureaucratic rules and regulations. As the government failure is itself a function of corruption, however, corruption should have detrimental effects on economic growth in the long run. In practice, policymakers and economists care more about such long-term consequences of corruption than the short-term effects.

Corruption can affect resource allocation in two ways. First, it can change (mostly) private investors' assessments of the relative merits of various

[2] World Bank (2006) states, "The [World] Bank has identified corruption as the single greatest obstacle to economic and social development". Similarly, the International Monetary Fund (2006) states, "Poor governance [that offers greater incentives and more scope for corruption] clearly is detrimental to economic activity and welfare".

investments. This influence follows from corruption-induced changes in the relative prices of goods and services, and of resources and factors of production, including entrepreneurial talent. Second, corruption can result in resource misallocation when the decisions on how public funds will be invested, or which private investments will be permitted, are made by a corrupt government agency. The misallocation follows from the possibility that a corrupt decision-maker will consider potential 'corruption payments' as one of the decision criterion. Ranking of projects based on their social value may differ from ranking based on the corrupt income that the agent expects to receive.

Empirical literature in the field has consistently reported a negative correlation between economic growth and the level of corruption, and the evidence for beneficial effects has been scarce at best [Mauro (1995), Barreto (1996) and Tanzi *et al.* (1997)]. Mauro (1995) and Li *et al.* (2000) show that corruption is indeed negatively associated with investment and economic growth. The authors also suggest that the direction of causality is from corruption to development, rather than vice-versa.[3] A large number of theoretical studies point to several channels through which corruption may adversely affect income, but as of yet, these theoretical investigations, although suggestive, have an empirical basis.

While most of the theoretical literature has taken a microeconomic approach [Shleifer and Vishny (1991, 93), Cadot (1987)], we present in section 3 growth modeling of corruption to show impact of corruption and institutional

[3] Mauro's findings have been confirmed in recent work by Kaufmann et al. (1999). These findings are also consistent with those of Barreto (1996), Hall and Jones (1999) and La Porta et al. (1999).

variables on economic growth. In this model, weak institution, political instability and inefficient bureaucracy is detrimental to economic growth. Specifically, we find corruption to be growth enhancing at low levels of incidence and growth reducing at high levels of incidence; therefore implying the existence of a positive level of corruption that maximizes long-run growth is shown to have two separate effects.

The main purpose of this study is to increase the understanding of the relationship between corruption and economic growth using panel data. An attempt has, therefore, been made in the present study to understand the problem of corruption, weak institutions, inefficient bureaucracy and political instability through empirical evidence and to offer policy recommendations based on findings.

The specific objectives of the study are (a) Specification of a model of corruption based on theoretical foundation for the cross country analysis, (b) To determine growth maximizing level of corruption, and (c) To determine whether it is the combined effect of corruption and institutional quality that causes growth.

Consistent with the objectives of the study, the following hypotheses will be tested:

Hypothesis 1: In the linear specification, corruption is negatively correlated with real GDP. In case of non-linear specification, a moderate level of corruption positively affects real GDP, while a high level of corruption is detrimental to growth.

Hypothesis 2: Other things being equal, better institutional quality tends to be positively related to the economic growth.

The study proceeds by reviewing the existing literature on Institutions, corruption, and economic growth in Section 2. Growth modeling of corruption on the basis of theoretical framework described in Section 2 is presented in Section 3, while Section 4 provides detailed discussion on data, construction of variables and estimation techniques. The empirical analysis of the results is carried out in Section 5. Finally, Section 6 summarizes the main findings of the study to offer policy recommendations.

2. Defining Corruption and Literature Review

Corruption is a complex and multifaceted phenomenon with multiple causes and effects, as it takes on various forms and functions in different contexts. The phenomenon of corruption ranges from the single act of a payment contradicted by law to an endemic malfunction of a political and economic system. The problem of corruption has been seen either as a structural problem of politics or economics, or as a cultural and individual moral problem. The definition of corruption consequently ranges from the broad terms of 'misuse of public power' and 'moral decay' to strict legal definitions of corruption as an act of bribery involving a public servant and a transfer of tangible resources (Andvig *et al.,* 2000).

The decisive role of the state is reflected in most definitions of corruption, which will define corruption as a particular and perverted state-society relation. Corruption is conventionally understood and referred to as the private wealth

seeking behaviour of someone who represents the state and public authority. It is the misuse of public resources by public officials, for private gains. The encyclopedic and working definition used by the World Bank (1997), Transparency International (1998) and others is that corruption is *the abuse of public power for private benefit (*or *profit)*. Another widely used description is that corruption is a transaction between private and public sector actors through which collective goods are illegally converted into private (Heidenheimer *et al.,* 1989:6). This point is also emphasized by Rose-Ackerman, who says corruption exists at the interface of public and private sectors (Rose-Ackerman 1978).

Nye (1967:416) defines corruption as "*behaviour that deviates from the formal duties of a public role (elective or appointive) because of private-regarding (personal, close family, private clique) wealth or status gains*". An updated version with the same elements is the definition by Khan (1996:12): corruption is "*behaviour that deviates from the formal rules of conduct governing the actions of someone in a position of public authority because of private-regarding motives such as wealth, power, or status*".

2.1 Theoretical and Empirical Background

A natural starting point for the economic analysis of corruption is to treat it as any other crime and to apply to it the standard economic model of crime developed originally in Becker (1968) and extended subsequently by many authors such as Polinsky and Shavell (1979, 1984). In this basic model the persons contemplating corruption take account of the expected benefits in the form of

bribes, favours or payment in kind and compare the monetary equivalent of these gains with the expected costs in the form of probability that they will be detected and the monetary sum (or equivalent) of the punishment should they be convicted. Such a formulation has close parallels with the application of Becker's model to the economics of tax evasion by Allingham and Sandmo (1972). Corruption is predicted to occur if the net expected gain is positive.

The theoretical and empirical literature on corruption has generated a rich debate for the last thirty years. On one hand, researchers like Krueger (1974), Myrdal (1989), Shleifer and Vishny (1993), Tanzi (1997), and Mauro (1995, 1998) have argued that corruption is detrimental to economic growth. They point out that corruption modifies the goals of the government and creates a diversion of resources from public purposes to private ones, thereby, resulting in a deadweight loss to society.[4] Furthermore, governmental corruption may also discourage private investment by raising the cost of public administration (since it is likely to take the form of a bribe for a public service) or by generating social discontent and political unrest, which in turn, may slow down economic growth (Alesina 1992). On the other hand, Leff (1964), Huntington (1968), and Friedrich (1972) have suggested that it is also possible for corruption to be beneficial for economic growth. They argue that if the government has produced a package of pervasive and inefficient regulations then corruption may help circumvent these regulations

[4] In a related argument Krueger (1974) explains how unproductive, rent-seeking activities can be expected to arise in a corrupt environment.

at a low cost. Under this scenario, it is plausible that corruption may improve the efficiency of the system and actually help economic growth.[5]

Another argument in favour of corruption has viewed bribery as 'speed money', that is, as payments that speed up the bureaucratic process, or payments that are intended to 'mediate' between political parties that would not reach an agreement otherwise. Then, as long as the time consumed by administrative procedures is reduced by the bribe, the bribers could be made better-off. Lui (1985), for example, presents a model in which the costs of 'standing in line' are minimized by the use of bribes. Kaufmann and Wei (1998), however, contest the empirical validity of this hypothesis.

Ehlrich *et al.* (1999) stated that corruption and per capita income are expected to be negatively correlated across different stages of economic development. The difference between corruption and crime is that corruption depends on investment in political capital as a ticket for entry to the bureaucratic rank, unlike entry to many criminal activities, which requires little skill. The author argued that such an investment has repercussions on the incentive of productive agents to invest in human capital. The relationship between corruption and the economy is thus explained as an endogenous outcome of competition between growth-enhancing and socially unproductive investments and its reaction to exogenous factors, especially government's intervention in private economic activity.

[5] In a famous passage Huntington (p.69) states it simply: "In terms of economic growth, the only thing worse than society with a rigid, over centralized, dishonest bureaucracy is one with a rigid, over centralized, honest bureaucracy".

Cartier-Bresson (1995) suggests five economic conditions which encourage the flourishing of corruption within a society. The first of these conditions is the existence of an exploitable natural resource (e.g. oil) providing the opportunity for state authorities, both administrative and political, to obtain payments. Secondly, the general scarcity of public assets relative to demand accompanied by policies of fixed official prices creates opportunities for informal rationing through bribery. Thirdly, low wages in the public sector are also likely to be associated with extensive low-level corrupt payments. Fourthly, high levels of state intervention/planning (i.e. protectionism, state-owned enterprises, price controls, exchange controls, import licenses, etc.), which has characterized many developing countries, creates opportunities of corruption. Finally, economies in transition are likely to have particular problems causing corruption as they undertake privatization and establish the relevant legal framework of company and contract law, etc.

Empirical literature in the field has consistently reported a negative correlation between economic growth and the level of corruption, and the evidence for beneficial effects on growth has been scarce at best.[6] Using a cross section of countries, Mauro (1995) demonstrates that after controlling for a number of economic and sociopolitical factors, the relationship between corruption and economic growth is negative. Knack and Keefer (1995) also report a negative correlation between corruption and GDP growth. Others like Hall and Jones (1999) and Sachs and Warner (1997) have obtained similar results.

[6] A good review of all cases can be found in Klitgaard (1988).

Tanzi and Davoodi (1997) find evidence of bureaucratic malpractice manifesting in the diversion of public funds to the areas where bribes are easiest to collect, implying a bias in the composition of public spending towards low-productivity projects (e.g. large-scale construction) at the expense of value-enhancing investments (e.g., maintenance or improvements in the quality of social infrastructure). Thus abuse of public office may not only reduce the volume of public funds available to the government (through corrupt practices in tax collection), but may also lead to misallocation of those funds.

According to Lambsdorff (1999) empirical research on the causes of corruption focuses on political institutions, government regulations, legal systems, GDP-levels, salaries of public employees, gender, religion and other cultural dimensions, poverty, and the history of colonialism. Lambsdorff states that it is often difficult to assess whether corruption causes other variables or is itself the consequence of certain characteristics. Empirical research based on various corruption indexes reports correlation between certain forms of government regulations, poor public institutions, poverty and income inequality. But conclusions with respect to causality are vague. A major obstacle for cross-national comparative empirical research is the difficulty in measuring the levels of relative corruption in different countries. However, in recent years economists and political scientists have started to analyse the indexes of perceived corruption prepared by Political Risk Services and various business risk analysts and polling organisations. A number of econometric studies using these indexes as explanatory variables examine historical, cultural, political and economic

determinants of a variety of indicators of government quality, including corruption (e.g., La Porta et al., 1999; Paldam, 1999 and Treisman, 2000).

Thus, most of the empirical evidence seems to be consistent with the theories that hold corruption as purely detrimental. However, all these empirical studies assume that corruption has only a monotonic impact upon economic growth, and therefore, provide an incomplete test of the hypothesis that have treated this impact as a differentiated phenomenon depending on the size of corruption.

3. Growth Modeling of Corruption

The common view among economists is that corruption affects output by distorting the allocation of resources. This view contrasts with the hypothesis prevalent among economic historians and political scientists that in an economy that has a rigid bureaucracy, corruption may be beneficial as a way of 'oiling the wheels of bureaucracy'. The decomposition of output into its components, capital (physical and human) and total factor productivity (TFP) offers a glimpse into this controversy. This study follow Hall and Jones (1999) in taking the view that TFP mainly reflects market efficiency.

Following the empirics of Mauro (1995), we develop and modify the growth model of corruption. Since the author does not test whether there is growth enhancing or growth reducing level of corruption, one wonders whether corruption still affect economic growth adversely if more policy controls are added. It is apparent from the linear specification used by Mauro's study that linear framework can only provide a partial test of the theory: only linear effect

can be captured, and the growth maximizing level of corruption is forced to lie in a corner.

The analysis starts from standard production function, which extends Solow's (1956) original approach to growth accounting process. We can model the aggregate production function to be of the following form.

$$\mathbf{Y}_{\mathbf{it}} = \mathbf{A}_{\mathbf{it}}\,\mathbf{F}\,(\mathbf{K}_{\mathbf{it}}\ ,\mathbf{L}_{\mathbf{it}}\ ) \qquad 3.1$$

or

$$\mathbf{Y}_{\mathbf{it}} = \mathbf{A}_{\mathbf{it}}\,\mathbf{K}_{\mathbf{it}}^{\alpha}\,\mathbf{L}_{\mathbf{it}}^{1-\alpha} \qquad 3.2$$

Where Y_{it} is the aggregate output, A_{it} is the total factor productivity (TFP), K_{it} is the capital stock, and L_{it} is the quantity of labor in country *i* at time period *t*. The parameter *α* measures the share of capital and 1-α the share of labor in total output. Divide equation (3.2) by L then taking natural logarithms, we obtain:

$$\mathbf{y}_{\mathbf{it}} = \mathbf{a}_{\mathbf{it}} + \alpha\mathbf{k}_{\mathbf{it}} \qquad 3.3$$

Where

$$\mathbf{y}_{\mathbf{it}} = \mathbf{ln}\left[\frac{\mathbf{Y}_{\mathbf{it}}}{\mathbf{L}_{\mathbf{it}}}\right]$$

$$\mathbf{a}_{\mathbf{it}} = \mathbf{ln}\mathbf{A}_{it}$$

$$\mathbf{k}_{\mathbf{it}} = \mathbf{ln}\left[\frac{\mathbf{K}_{\mathbf{it}}}{\mathbf{L}_{\mathbf{it}}}\right]$$

As we have to empirically analyze the effects of institutional quality indicators, corruption indicator and other policy indicators on economic growth, we empirically analyze these effects on economic growth through total factor productivity growth and determine corruption and institutional quality within the

model. The dynamic feature of the model arises from the inclusion of lagged dependent variable. For convenience in empirical analysis we specify the following relationships.

$$\mathbf{a_{it}} = \boldsymbol{\beta_0} + \sum \boldsymbol{\beta_j} \mathbf{X_{itj}} + \sum \boldsymbol{\delta_k} \mathbf{X_{itk}} + \gamma y_{i(t-1)} + \boldsymbol{\mu_{it}} \qquad 3.4$$

Where:

a_{it} = total factor productivity.

X_j = set of *j* conditioning variables. It includes:

X_1 = Government expenditure (% of GDP).

X_2 = Indicator of external competitiveness, measured as trade to GDP ratio.

X_3 = Population growth rate.

X_4 = Primary school enrollment rate (log form).

X_5 = Secondary school enrollment rate (log form).

X_6 = Foreign direct investment (gross).

X_7 = Risk to investment index.

X_k = set of k variables measuring level of corruption and institutional quality. It includes:

X_8 = Corruption index.

X_9 = Square of corruption index.

X_{10} = Bureaucratic efficiency index.

X_{11} = Political stability index.

X_{12} = Institutional efficiency index.

$\beta_{j's}$ are the coefficients of the first seven conditioning variables, δ_K are the coefficients of eight variables measuring corruption and institutional quality, γ is the coefficient of lag of GDP per worker and finally, μ is the random error term. The set of conditioning variables X_4 and X_5 measure the quality of human capital.

By substituting equation 3.4 into equation 3.3, we will get the final version of growth model of corruption, $y_{i,t-1}$ is the logarithm of GDP per worker at the start of that period.

$$\mathbf{y_{it}} = \boldsymbol{\beta_0} + \sum \boldsymbol{\beta_j} \mathbf{X_{itj}} + \sum \boldsymbol{\delta_k} \mathbf{X_{itk}} + \boldsymbol{\gamma} \mathbf{y_{i,t-1}} + \boldsymbol{\alpha} \frac{\mathbf{K_{it}}}{\mathbf{L_{it}}} + \boldsymbol{\varepsilon_{1it}} \qquad 3.5$$

We attempt to capture both the growth enhancing and growth reducing effects of corruption on growth by estimating long run growth as a linear-quadratic function of corruption, as well as set of controls in the Barro (1991 and 1997) and Barro et al. (2004), Mankiw, Romer and Wei (1992), Mauro (1995), where the conditioning variables include measures of human capital, indictors of external competitiveness, government spending as share of GDP, the rate of population growth, as well as risk to investment index. It is worth noting that most of the previous work on growth accounting and corruption adopts a linear specification.

We compare both specifications and show that linear-quadratic is preferred on the basis of standard statistical tests. Traditional (Linear) setting does not allow for the growth-maximizing level of corruption to differ from zero or infinity.

Population growth, education, openness, and institutional variables (government expenditure and corruption) contribute to determining steady-state

per capita growth levels. These variables and lag of GDP per worker affect the speed with which economy converges toward its steady state, thereby affecting the growth rate.

3.1 Definition and Source of Data

The study is based on a panel data set over the period 1984-2009 for 71 developed and developing countries. High income countries are categorized as developed countries and the countries that fall into the categories 'low income', 'lower middle income', and 'upper middle income' are developing countries according to the *World Development Report 2004*. An important advantage of using panel data is that these capture both time-series and cross-section variations in variables. The data are sourced from the publication of Political Risk Services "International Country Risk Guide" (ICRG),[7] IMF's International Financial Statistics yearbook (2009).

3.2 Description of the Data

In order to analyze panel data, the study employs two data sets. The smaller one, Data set given in Appendix I, contains 60 countries, both developed and underdeveloped. Data set given in Appendix Ia contains 71 countries. Country choice is constrained by the limited availability of data on policy variable.

[7] In assigning a "grade" to the country in which they are based, Political Risk Services (PRS) correspondents follow general criteria which are outlined in the questionnaires they fill in. For example, for the bureaucratic quality index, a grade of 12 is given in the case of "smoothly functioning, efficient bureaucracy," while a grade of 5 means "constant need for government approvals and frequent delays." These indices were assembled by hand from hard copy.

In order to minimize the measurement error in each individual index, we made simple averages of closely related variables. It may yield a better estimate of the determinants of economic growth. It seems that corruption, bureaucratic quality and law & order indices represent closely related variables on the basis of the definitions of variables, and that their simple average may be reasonable proxies for what we will label bureaucratic efficiency. Similarly, the simple average of the democratic accountability, military in politics, external conflicts, internal conflicts and government stability indices may be a reasonable proxy for political stability. In addition to being closely related on a priori grounds, the indices that we choose to group together are more strongly correlated with each other. In some estimates we aggregate all eight indices into an average index of institutional efficiency, which we define as including bureaucratic efficiency, as well as political stability. Possibility of multicollinearity makes it difficult to tell which of the several institutional factors examined is crucial for economic growth.[8] It may be desirable to combine groups of variables into composite indices. ICRC indices value was maximum 4, 6 and 12, due to averaging of the indices we convert all the indices into maximum of 12. Descriptive statistics for all regression variables are provided in Appendix II. There is not much variation in the mean of the ICRG indices.

All ICRG indices are positively correlated to each other. The simple correlation coefficient between corruption and bureaucratic quality indices is 0.72 while correlation coefficient between democratic accountability and government stability indices is 0.30. Appendix III reports the correlation matrix for the ICRG

[8] This is a common finding. Putnam (1993) reports that all his indicators of bureaucratic efficiency for the Italian regions tend to move together to a remarkable extent, too.

indices. A number of mechanisms may contribute to explaining the positive correlation among all categories of institutional efficiency. Corruption may be expected to be more wide spread in countries where red tape slows down bureaucratic procedures. In addition, the report of *Asian Development Bank* (2003) argues that corruption may even lead to more bureaucratic delay.[9] In fact, when individuals offer speed money (which may actually avoid delay for an individual), it may increase red tape for the economy as a whole. The fact that all categories of country risk tend to move together is an interesting result. Correlation coefficients of Barro type variables are given in Appendix IV, which shows negative (-0.65) correlation between log of capital per worker and population growth.

In the given sample of seventy one countries, the country reported to have the best bureaucracy is Sweden, which in 1984-2009 obtained grades of 12 out of 12 for all the bureaucratic efficiency indices we use. It also had the highest real GDP per worker over the period 1984-2009. At the opposite extreme in 1984-2009, ICRG considered Nigeria as having the worst in institutions among the countries in the sample. During the same period Russia has lowest growth rate of GDP per worker (-2.2). A casual glance at these appendices shows that richer countries tend to have better institutions than poorer countries, and that fast-growers also tend to be among the countries with a higher bureaucratic efficiency

[9] Krueger (1993) and De Soto (1989) also argue that corrupt bureaucrats will intentionally introduce new regulations and red tape in order to be able to extract more bribes by threatening to deny permits.

index. One of the most striking features of the data set is the strong association between bureaucratic efficiency and political stability.[10]

A potential endogeneity problem arises as economic growth may affect the level of corruption. The direction of this effect is however unclear. Higher economic growth may increase the availability of rents, making corruption more profitable, but it also increases the amount of resources that can be devoted to control it. In either case, corruption would be correlated with the error term in the Random Effect Model (henceforth, REM) and the estimates would be biased. If economic growth increases (decreases) corruption, regression coefficients on the linear and quadratic terms for corruption would be biased upward (downward). In order to overcome this difficulty, several authors in the past included an instrumental variable and conducted a two stage least squares regression. In theory, this is a perfectly valid procedure. In practice however, it is very difficult to find a valid instrument.

The two dimensionality of the panel data create two types of errors, which affect the performance of estimates. One is related to the cross sectional observation and the other to time series observations (e.g. country specific error can overstate the estimates in our sample). Apart from these errors the inclusion of the lag dependent variable also worsens the problem of serial correlation; to overcome the problem of biasness and endogeneity this study uses the Generalized Method of Moment (GMM), apart from REM.

[10] Shleifer and Vishny (1993) argue that countries with weak (and, therefore, unstable) governments will experience a very deleterious type of corruption, in which an entrepreneur may have to bribe several public officials and still face the possibility that none of them really have the power to allow the project to proceed.

4. Results and Discussion

The main results from GMM technique are summarized in Table 1.[11] It is clear from column 1 of Table 1 that the coefficient of corruption is significantly different from zero. Note also that the coefficient on Corruption Squared in the linear-quadratic model is different from zero at the 10% significance level. The overall explanatory power is improved, if we include control variables (Columns 5).

Mauro (1995), using specifications with linear corruption and a limited set of controls, finds significant coefficients for corruption in the order of 0.002. In his study, after controlling for other important determinants of economic growth, the coefficient on corruption becomes more significant. In their study of economic growth and convergence, Knack and Keefer (1995) reported that the coefficient on corruption becomes insignificant after other variables are included in the regressions.

The sign of the coefficients, as expected, suggests the existence of a positive growth maximizing level of corruption. Specifically, corruption is found to become detrimental to economic growth for ICRG values lower than 10 in the baseline model (column 1). [12] What happens when the square of the corruption index is dropped? In linear specification, corruption in the GMM (column 2) specification is quite similar and significant also with negative affect on real GDP per worker. A one standard–deviation increase (an improvement) in corruption

[11] The magnitude of coefficients for various variables differs substantially, due to different unit of measurement for the variables.

[12] It is important to remember that a lower ICRG value denotes a higher incidence of corruption.

index raises the log of GDP per worker by 0.78 percent (Obtained by multiplying 0.0021, the slope coefficient, by 3.73, the standard deviation of the index).[13]

When we include the conditioning variables in our model, we got more significant results (column 6). The size of the coefficient corruption squared (0.0003) is not changed but the significance level improves (significant at 1%). The level of Corruption that maximizes economic growth is still interior: 8.3 for column 6. The significance levels for Corruption index proved to be sensitive to the inclusion of risk to investment and political stability indexes.

A sense of the economic importance of the coefficients can be obtained by predicting the change in long run economic growth resulting from a decrease (worsening) in the corruption index. For countries with low levels of corruption, such as The Netherlands, Norway and Sweden (Corruption index of near 12), such decrease up to growth maximizing level of corruption imply an increase in long run growth of 0.40 percentage points per year. For countries with corruption level, such as Nigeria (Corruption index of 3.1) and Pakistan (4.4), improvement (increase) in the corruption index would raise the long run economic growth by 1.66 and 0.85 percentage points per year respectively.

In case of Random Effects estimation, we obtain significant coefficients of 0.064 for Corruption and -0.004 for Corruption Squared, which imply a growth maximizing level of corruption at 7.5, very similar to that of Table 1 but the results of corruption squared term in Column 5 and 6 of Table 2 are highly insignificant.

As shown in the appendix countries like Cost a' Rica, Hong Kong, Poland, Spain and Greece have indexes of corruption that are remarkably close to the

[13] Given in Column 2, Table 1.

estimated optimal level of corruption. Figure 1 plots the average real GDP per worker against the average corruption index and its square term for the 60 countries. The figure provides growth maximizing level of corruption, which is 8.3 according to our GMM estimates (Table 1, column 6).

4.1 Institutional Efficiency and Economic Growth

Table 1 also shows the simple relationship between economic growth and institutional variables in further detail. Column 3 of the Table 1 shows that one standard deviation increase (an improvement) in the bureaucratic efficiency index is associated with an increase in the log of GDP per worker by 1.2 percent (obtained by multiplying 0.004, the slope coefficient, by 3.04, the standard deviation of the index). The estimated magnitude of the effects of bureaucratic efficiency on economic growth is even higher (and remains significant) when we add conditioning variables. The coefficient is still significant at the conventional levels, column 7 and 8. Therefore, these results do not provide any support for the claim that, in the presence of a slow bureaucracy, corruption would become beneficial, as suggested by Leff (1964) and Huntington (1968). The corruption and the bureaucratic inefficiency both adversely and significantly affect the real GDP per worker.

Having provided some evidence in favor of the claim that corruption lowers economic growth, we now turn to analyzing the channels through which this takes place. In the context of an endogenous growth model, bureaucratic inefficiency could affect economic growth indirectly (by lowering the investment

rate) or directly (for example, by leading to misallocation of investment among sectors), [Easterly (1993) and Mauro (1995)].

In case of political stability index, one standard deviation decrease (worsening) in the index is associated with a decrease in the log of GDP per worker by 0.86 percent[14] and if we include conditioning variables then its affect is even greater, i.e. 1.29 percent.[15] Random Effects estimation (Table 2) also gives the highly significant results with even greater impact on economic growth. Controlling for all the variables in the all techniques, the political stability index and the bureaucratic efficiency index are always positively and significantly associated with the GDP per worker, although the level of significance of political stability index is only 10 percent or even greater when indicators of human capital are included in the list of independent variables (Tables 1 and 2, columns 7, 8). The magnitude of the coefficient on bureaucratic efficiency is in this case twice as large as in Column 3 of Table 1.

Table 1 (columns 9 and 10) shows the simple relationship between economic growth and institutional efficiency index. A one standard-deviation increase (improvement) in the institutional efficiency index is associated with an increase in the log of GDP per worker by 1.74% and 2.98% respectively (obtained by multiplying 0.007 and 0.012, the slope coefficients, by 2.49, the standard deviation of the index).

[14] Obtained by multiplying 0.004, the slope coefficient, by 2.15, the standard deviation of the index, Table 1, column 4.
[15] This value is calculated by multiplying 0.006, the slope coefficient, by 2.15, the standard deviation of the index, given in Table 1, column 5.

The corruption, bureaucratic efficiency index, political stability and institutional efficiency indices are significantly associated with GDP per worker. Again, we analyze the robustness of these simple relationships to alternative control variables, using the two different methodologies. The null hypothesis of no relationship between GDP per worker and corruption can be rejected at a level of significance lower than the one at which the null hypothesis of no relationship between investment and corruption can be rejected. This finding is consistent with the results reported by Levine and Renelt (1992), Mauro (1995), and Barro (1997). The finding that corruption is negatively and significantly associated with the economic growth is consistent with the view that corruption lowers the marginal product of capital (for example, by acting as a tax on the proceeds of investment).

4.2 Conditioning Variables and Economic Growth

In the growth model of corruption we consider, the control variables are a measure of international openness, the ratio of government spending to GDP, a subjective indicator of risk to investment index, gross foreign direct investment, indicators of human capital, population growth and lag of GDP per worker.

The results show that the coefficient of log of capital per worker in the growth equation is positive and statistically significant indicating that capital growth is the key variable affecting economic growth. As in much of the cross-country literature, the regression results show that greater human capital – as measured by the gross secondary school enrollment– is associated with faster economic growth. Moreover, since our GMM panel estimator controls for

endogeneity, this finding suggests that the exogenous component of schooling exerts a positive impact on economic growth.

The results in Tables 1 and 2 indicate a significantly negative association between government spending and GDP per worker. The argument is that although government consumption had no direct effect on private productivity (or private property rights), but it lowers saving and growth through distortionary effects from taxation or government expenditure programs, [Barro (1991)]. Big government spawns corruption via bureaucrats manipulating spending in order to collect more bribes, (Li *et al*., 2000). Thus results suggest that macroeconomic policy is also important. Large government tends to hurt economic growth. According to the GMM results, the direct effects of a one standard-deviation increase in risk to investment (improvement) on the log of GDP per worker is an increase of 0.62 percentage point (Table 1 column 5).

5. Concluding Remarks

In this section we will discuss the main findings of the study. On the basis of theoretical underpinnings, we derive the growth model of corruption. The main result obtained here: that the growth maximizing level of corruption is not necessarily equal to zero, confirms the predictions of the theory of political economics developed in the last three decades.

The evidence from this study demonstrates the statistical importance of corruption in the development of a robust model that explains real GDP per worker. The empirical literature that noticed a linear relationship between corruption and economic development failed to differentiate between growth

enhancing and growth reducing levels of corruption. In this study we present evidence that suggests the existence of a hump-shaped relationship between corruption and long-run economic growth. This finding remains unchanged under several specifications.

Drawing longitudinal implications from cross-sectional data is hazardous, but for what it is worth the estimates of this study suggest that if for example, Bangladesh were to improve the integrity and efficiency of its bureaucracy to the level of that of China (corresponding to a one-standard-deviation increase in the bureaucratic efficiency index), its real GDP per worker would rise by almost one and a half percentage points.

The catch, of course, is that high levels of corruption and bureaucratic inefficiency are themselves likely to impede investment and growth (Mauro 1995). But corruption does not necessarily prevent economic growth when other factors are conducive. Indeed, the three 'most corrupt' countries in the International Country Risk Guide data for the mid 1980s — Indonesia, Paraguay and Ghana — had average economic growth of 1 percent during the 1980s, substantially below the worldwide average of 3.2 percent.

The analysis for the panel data of countries lends significant support to the proposition that the quality of public institutions plays a crucial role in the growth performances of any country. This is evident not only in the high statistical significance of the estimated parameters for the institutional variables but also in their robustness to changes in model specifications.

There are several channels, not all analyzed in this study, through which corruption hinders economic development. They include reduced domestic investment, reduced foreign direct investment, overblown government expenditure, distorted composition of government expenditure away from education, health, and the maintenance of infrastructure, towards less efficient public projects that have more scope for manipulation and bribe-taking opportunities. Hong Kong, Portugal, and Singapore have demonstrated that corruption can be reduced significantly. Encouraging research and the dissemination of its findings can provide valuable direction to policy makers.

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TABLE 1: THE GMM ESTIMATES OF THE RELATIONSHIP BETWEEN ECONOMIC GROWTH AND CORRUPTION (DEPENDENT VARIABLE IS LOG OF GDP PER WORKER)

Independent Variable	(1)	(2)	(3)	(4)	(5)
Corruption index	0.006***	0.0021*			0.0003
	(0.001)	(0.001)			(0.001)
Corruption Square	-0.0003*				-0.001***
	(0.0001)				(0.0002)
Bureaucratic efficiency index			0.004***		
			(0.001)		
Political stability index				0.004***	0.006***
				(0.001)	(0.001)
Institutional efficiency index					
Risk to investment index					0.003***
					(0.0009)
Log of capital per worker					0.874***
					(0.182)
Gross foreign direct investment					0.0005*
					(0.0003)
Openness					-0.033**
					(0.014)
Gross primary school enrollment rate (log)					0.050*
					(0.031)
Gross secondary school enrollment rate (log)					0.020*
					(0.012)
Population growth					-0.007***
					(0.002)
Government expenditure					-0.002***
					(0.0007)
Log of GDP per worker (-1)	1.006***	0.999***	0.992***	0.993***	0.830*
	(0.004)	(0.003)	(0.004)	(0.003)	(0.443)
Constant	-0.075**	-0.0003	0.043	0.037	-0.300*
	(0.034)	(0.027)	(0.027)	(0.023)	(0.181)
N	969	969	969	969	969
Adj. R square	0.9994	0.9994	0.9994	0.9994	0.9995

Note: Standard errors are in parentheses.
*Significant at 10%, **significant at 5%, ***significant at 1%.

(…Table 1 contd.)

Independent Variable	(6)	(7)	(8)	(9)	(10)
Corruption index	0.005***				
	(0.001)				
Corruption Square	-0.0003***				
	(0.0001)				
Bureaucratic efficiency		0.010***	0.009***		
index		(0.002)	(0.002)		
Political stability index		0.003	0.003*		
		(0.002)	(0.0016)		
Institutional efficiency index				0.007***	0.012***
				(0.002)	(0.002)
Risk to investment index	0.001**	0.002***	0.002***		0.002**
	(0.0008)	(0.001)	(0.0009)		(0.0009)
Log of capital per worker		0.738***	0.836***		0.790***
		(0.193)	(0.229)		(0.189)
Gross foreign direct	0.0005*	0.0006*	0.0005		0.0006**
investment	(0.0003)	(0.0003)	(0.0003)		(0.0003)
Openness	-0.040***	-0.042***	-0.044***		-0.041***
	(0.014)	(0.015)	(0.014)		(0.014)
Primary school enrollment	-0.019		0.041		0.024
rate (log)	(0.025)		(0.029)		(0.026)
Secondary school	0.024**		0.006		0.003
enrollment rate (log)	(0.007)		(0.009)		(0.008)
Population growth	0.003	-0.007***	-0.007***		-0.007***
	(0.005)	(0.002)	(0.002)		(0.002)
Government expenditure	-0.004***	-0.003***	-0.003***		-0.003***
	(0.001)	(0.0008)	(0.0008)		(0.0007)
Log of GDP per worker (-1)	1.025***	-0.500	-0.710	0.991***	-0.641
	(0.006)	(0.465)	(0.198)	(0.004)	(0.451)
Constant	0.012	-0.034	-0.252	0.032	-0.154
	(0.115)	(0.101)	(0.168)	(0.027)	(0.146)
N	969	969	969	969	969
Adj. R square	0.9991	0.9981	0.9974	0.9994	0.9982

Note: Standard errors are in parentheses.

*Significant at 10%, **significant at 5%, ***significant at 1%.

TABLE 2: THE RANDOM EFFECTS ESTIMATES OF THE RELATIONSHIP BETWEEN ECONOMIC GROWTH AND CORRUPTION (DEPENDENT VARIABLE IS LOG OF GDP PER WORKER)

Independent Variable	(1)	(2)	(3)	(4)	(5)
Corruption index	0.064*** (0.008)	0.020*** (0.002)			0.050** (0.023)
Corruption Square	-0.004*** (0.0005)				-0.001 (0.001)
Bureaucratic efficiency index			0.025*** (0.003)		
Political stability index				0.039*** (0.003)	0.061*** (0.012)
Institutional efficiency index					
Risk to investment index					0.094*** (0.013)
Log of capital per worker					0.930*** (0.013)
Gross foreign direct investment					0.019*** (0.004)
Openness					-0.238*** (0.028)
Primary school enrollment rate (log)					-0.029 (0.087)
Secondary school enrollment rate (log)					-0.006 (0.032)
Population growth					-0.053*** (0.007)
Government expenditure					-0.004** (0.002)
Constant	9.071*** (0.124)	9.211*** (0.122)	8.868*** (0.113)	8.713*** (0.123)	-0.089 (0.360)
Number of countries	71	71	71	71	67

Note: Standard errors are in parentheses.
*Significant at 10%, **significant at 5%, ***significant at 1%

(…Table 2 contd.)

Independent Variable	(6)	(7)	(8)	(9)	(10)
Corruption index	0.204*** (0.069)				
Corruption Square	-0.001 (0.004)				
Bureaucratic efficiency index		0.002*** (0.0008)	0.006*** (0.0004)		
Political stability index		0.001* (0.001)	0.008*** (0.0006)		
Institutional efficiency index				0.041*** (0.003)	0.002*** (0.0005)
Risk to investment index	0.367*** (0.039)	0.001*** (0.0006)	0.005*** (0.0006)		0.004*** (0.0007)
Log of capital per worker		0.412*** (0.003)	0.401*** (0.001)		0.400*** (0.001)
Gross foreign direct investment	-0.014 (0.013)	0.0001 (0.0002)	-0.0004 (0.0004_		-6.6E-05 (0.0002)
Openness	-0.339*** (0.077)	-0.0002 (0.003)	0.001 (0.001)		-0.002* (0.001)
Primary school enrollment rate (log)	-0.476* (0.261)		0.015*** (0.004)		-0.011*** (0.004)
Secondary school enrollment rate (log)	1.370*** (0.089)		0.0002 (0.001)		0.008*** (0.001)
Population growth	-0.011 (0.037)	0.001 (0.001)	-0.001* (0.0007)		-0.001* (0.0006)
Government expenditure	0.022*** (0.006)	-0.001*** (0.0002)	-0.001*** (0.0001)		-7.9E-05 (0.0001)
Constant	1.680 (1.086)	0.007 (0.012)	-0.014 (0.019)	8.723*** (0.113)	0.043** (0.020)
Number of countries	67	68	67	71	67

Note: Standard errors are in parentheses.
*Significant at 10%, **significant at 5%, ***significant at 1%.

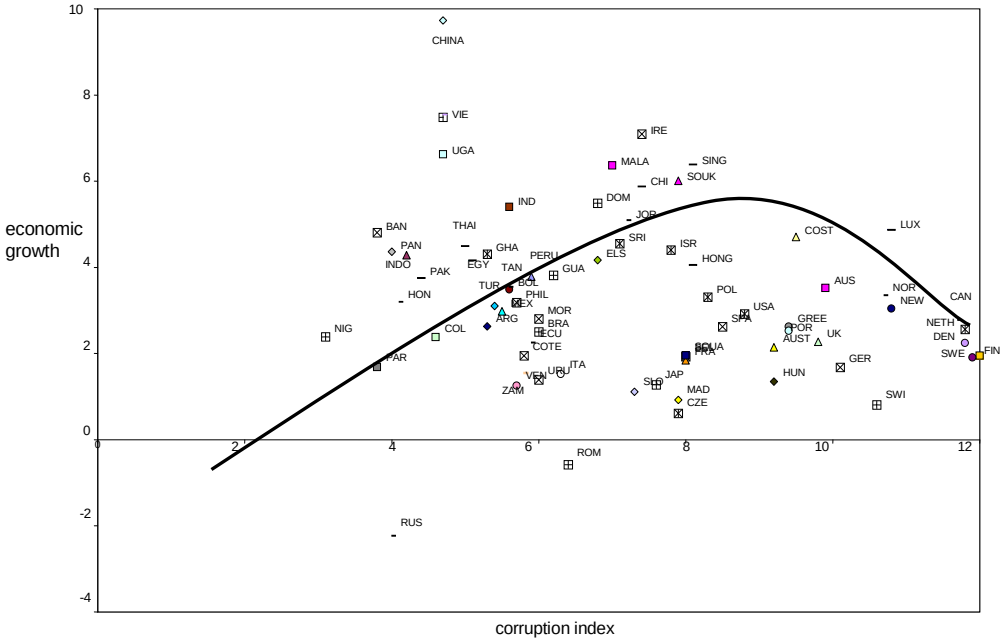

Figure 1: Relationship between Corruption and Economic Growth

APPENDIX I:

DATA SET FOR GENERALIZED METHOD OF MOMENT

1. Argentina
2. Australia
3. Austria
4. Bangladesh
5. Belgium
6. Bolivia
7. Brazil
8. Canada
9. Chile
10. China
11. Colombia
12. Costa Rica
13. Cote d' Ivory
14. Czech Republic
15. Denmark
16. Dominican Republic
17. Ecuador
18. Egypt
19. Elsalvador
20. Finland
21. France
22. Germany
23. Ghana
24. Guatemala
25. Honduras
26. Hungary
27. India
28. Indonesia
29. Italy
30. Japan
31. Jordan
32. Malaysia
33. Mexico
34. Morocco
35. Netherlands
36. New Zealand
37. Nigeria
38. Norway
39. Pakistan
40. Panama
41. Paraguay
42. Peru
43. Philippines
44. Poland
45. Romania
46. Russia
47. Slovakia
48. South Africa
49. South Korea
50. Spain
51. Sri Lanka
52. Sweden
53. Switzerland
54. Tanzania
55. Thailand
56. Uganda
57. United Kingdom
58. United States Of America
59. Uruguay
60. Venezuela

APPENDIX I a:

DATA SET FOR RANDOM EFFECTS MODEL

1. Argentina
2. Australia
3. Austria
4. Bangladesh
5. Belgium
6. Bolivia
7. Brazil
8. Canada
9. Chile
10. China
11. Colombia
12. Costa Rica
13. Cote d' Ivory
14. Czech Republic
15. Denmark
16. Dominican Republic
17. Ecuador
18. Egypt
19. Elsalvador
20. Finland
21. France
22. Germany
23. Ghana
24. Greece
25. Guatemala
26. Honduras
27. Hong Kong
28. Hungary
29. India
30. Indonesia
31. Ireland
32. Israel
33. Italy
34. Japan
35. Jordan
36. Luxemburg
37. Madagascar
38. Malaysia
39. Mexico
40. Morocco
41. Netherlands
42. New Zealand
43. Nigeria
44. Norway
45. Pakistan
46. Panama
47. Paraguay
48. Peru
49. Philippine
50. Poland
51. Portugal
52. Romania
53. Russia
54. Singapore
55. Slovenia
56. South Africa
57. South Korea
58. Spain
59. Sri Lanka
60. Sweden
61. Switzerland
62. Tanzania
63. Thailand
64. Turkey
65. Uganda
66. United Kingdom
67. Uruguay
68. United States of America
69. Venezuela
70. Vietnam
71. Zambia

APPENDIX II:

DESCRIPTIVE STATISTICS OF REGRESSION VARIABLES

Series	Mean	Standard Deviation	Minimum	Maximum
Institutional efficiency index	8.07	2.49	2.33	11.9
Bureaucratic efficiency index	7.51	3.04	0.67	12.0
Bureaucratic quality	7.54	3.73	0.0	12.0
Corruption	7.29	3.73	0.0	12.0
Law and order	7.98	3.19	0.0	12.0
Political stability index	8.63	2.15	2.81	11.8
Democratic accountability	8.4	2.95	0.0	12.0
Military in politics	8.19	3.58	0.0	12.0
External conflicts	10.17	2.08	2.0	12.0
Internal conflicts	9.12	2.70	0.0	12.0
Government stability	7.44	2.20	1.0	12.0
Risk to investment	6.91	2.09	1.16	12.0
Gross foreign domestic investment	3.85	4.32	0.0	40.51
Openness	0.80	0.56	0.12	4.72
Primary school enrollment rate (log)	4.59	0.15	3.76	5.04
Secondary school enrollment rate (log)	4.12	0.60	1.59	5.36
Growth rate of GDP	3.26	3.68	-14.53	18.83
Population growth	1.45	1.07	-1.70	11.83
Government expenditure(% GDP)	14.76	5.66	2.12	29.99
Total factor productivity (log)	5.05	0.88	2.93	6.44
GDP per worker (log)	9.02	1.49	5.83	11.37
Capital per worker (log)	9.92	1.56	6.47	12.55

There are 1089 observations in the sample. A high value of Political Risk Service (PRS) index means the country has good institutions. The Barro (1991) repressors are Risk to investment, primary and secondary education, population growth, government expenditures, openness and GFDI.

APPENDIX III:

CORRELATION MATRIX FOR POLITICAL RISK SERVICE INDICES

	Bureaucratic quality	Corruption	Democratic accountability	External conflicts	Governme nt stability	Internal conflicts	Law and order	Military in politics	Risk to investment
Bureaucratic quality	1								
Corruption	0.76	1							
Democratic accountability	0.71	0.72	1						
External conflicts	0.40	0.43	0.51	1					
Government stability	0.35	0.23	0.30	0.28	1				
Internal conflicts	0.61	0.60	0.59	0.62	0.41	1			
Law and order	0.73	0.74	0.67	0.55	0.41	0.82	1		
Military in politics	0.73	0.74	0.78	0.50	0.32	0.68	0.74	1	
Risk to investment	0.45	0.32	0.43	0.33	0.68	0.40	0.42	0.44	1

APPENDIX IV:

CORRELATION MATRIX FOR BARRO TYPE VARIABLES

	Capital per worker (log)	Government expenditure	Population growth	Primary school enrollment rate (log)	Secondary school enrollment rate (log)	Foreign direct investment (gross)	Openness
Capital per worker (log)	1.00						
Government expenditure	0.59	1.00					
Population growth	-0.65	-0.36	1.00				
Primary school enrollment rate (log)	0.33	0.08	-0.34	1.00			
Secondary school enrollment rate (log)	0.80	0.50	-0.69	0.55	1.00		
Foreign direct investment (gross)	0.33	0.31	-0.27	0.19	0.36	1.00	
Openness	0.21	0.25	-0.09	0.00	0.22	0.30	1.00