The Economic Costs of Corruption: A Survey and New Evidence

Axel Dreher[♣] and Thomas Herzfeld[♦]

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Abstract

This paper reviews the empirical literature on the economic costs of corruption. Corruption affects economic growth, the level of GDP per capita, investment activity, international trade and price stability negatively. Additionally, it biases the composition of government expenditures. The second part of the paper estimates the effect of corruption on economic growth and GDP per capita as well as on six possible transmission channels. The results of this analysis allows to calculate the total effect of corruption: An increase of corruption by about one index point reduces GDP growth by 0.13 percentage points and GDP per capita by 425 US$.

1. Introduction

The harmful effects of corruption on countries' economic development are widely acknowledged in the economics literature. Using formal as well as empirical approaches several authors show that corruption detracts investors, reduces the productivity of public expenditures, distorts the allocation of resources and thus lowers economic growth. These findings are reflected in the strategies of multinational organizations like the World Bank, the International Monetary Fund, and the OECD, among others. The most well-known examples are the 1997 World Bank Anti-corruption Strategy, the OECD Convention on Bribery of Foreign Public Officials in International Business (1997) and the recent (2003) United Nations Anti-corruption Treaty.[1]

While the consequences of corruption on certain aspects of the economy have frequently been investigated, attempts to quantify the overall costs of corruption on the economy have only recently been made (DREHER, KOTSOGIANNIS and MCCORRISTON 2004a, 2004b, 2005). What are the quantitative costs of corruption? This is the question our paper

♣ Thurgau Institute of Economics, Hauptstrasse 90, CH-8280 Kreuzlingen, Switzerland, and University of Konstanz, Dept. of Economics, Germany, E-mail: mail@axel-dreher.de.
♦ Department of Agricultural Economics, University of Kiel.

[1] More information about international treaties and strategies against corruption are available at the World Bank (http://www1.worldbank.org/publicsector/anticorrupt/index.cfm), OECD (http://www.oecd.org/topic/0,2686,en_2649 _37447_1_1_1_1_37447,00.html), and Transparency International (http://www.transparency.org).

attempts to answer. We present cross-section regressions estimating the impact of corruption on the most important variables identified in the previous literature. Combining the direct and the most important indirect effects allows us to derive estimates of the overall costs of being more corrupt than the average sample country on economic growth.

The article proceeds as follows. The next section reviews the empirical literature on the consequences of corruption. In section 3 we present our econometric results. Finally, section 4 concludes.

2. Previous Literature

Since corruption is an old phenomenon of human history almost all centuries experienced discussion of this topic. Regarding the 20th century two popular examples of this discussion are HUNTINGTON (1968) and MYRDAL (1971), contemporaneously representing, however, opposing points of view. According to the first, corruption is a phenomenon of modernization that is not likely to affect economic development, whereas the latter clearly expects corruption to impose strong obstacles to a country's development. This discussion and the related literature are reviewed in BARDHAN (1997), JAIN (2001) and AIDT (2003). More formally, SHLEIFER and VISHNY (1993) show how corruption might affect economic welfare. They distinguish between corruption with theft and those without, the latter being characterised by an additional bribe besides the regular price for obtaining a certain service or good. The bureaucrat acts as monopolistic supplier, thus corruption reduces equilibrium demand and therefore public revenues decline and welfare losses arise. Alternatively, the bureaucrat does not charge the regular price but still demands a bribe. While the impact on supply is not straightforward to quantify, welfare losses arise at least in the form of reduced public revenues. They might be complemented by welfare losses due to lower supply, depending on the specific situation. Empirical studies estimating welfare effects usually focus on the impact of corruption on aggregated indicators instead of actual prices of single services or goods.[2] Until recently, the availability of appropriate measures of corruption posed the main obstacle to empirical research. This changed substantially over the second half of the 90s, however. Basically, three different groups of corruption indices emerged: First, indices like those of the International Country Risk Guide (ICRG) and Business International (BI) base on the assessment of country experts. The second group is derived from surveys among foreign or native businesspeople or the broad public. Examples are the indicators reported in the 1997 World Development Report (WDR), by the World Economic Forum (WEF) and by

[2] One exception is DI TELLA and SCHARGRODSKY (2003). They find a significant cut of prices for homogeneous hospital inputs over the period of an anti-corruption campaign in Buenos Aires.

the Institute for Management Development (IMD). The third and last group consists of so called 'polls of polls' and includes the Corruption Perception Index (CPI) of Transparency International and the Graft-index developed by the World Bank. Both indices are constructed using several corruption indicators with the aim of enlarging country coverage and reducing measurement error.

Starting with the seminal work of MAURO (1995) – employing the BI index – a broad empirical research based on those indices emerged. As another example, KNACK and KEEFER (1995) introduced the ICRG index to the literature, JOHNSON ET AL. (1998) and LAMBSDORFF (1998) were among the first to use Transparency International's index.

The availability of proxies for the degree of corruption inspired new research and resulted in more than 50 papers on the economic consequences of corruption.[3] Figure 1 shows the number of published articles, working papers and book chapters over the period 1995-2005.

Figure 1 around here

The bulk of recent research focuses on determinants of economic welfare like, e.g., the level of per capita GDP and its growth rate, the quality of the public infrastructure, public expenditure allocation, total investment and foreign direct investment. In the following, we discuss the impact of corruption on these variables. However, before proceeding to the main findings of the empirical studies, some general remarks should be raised. First, existing empirical analyses mainly base on cross-sectional approaches. Results from these studies may overestimate the impact of corruption on the dependent variable because they do not control for unobserved country specific characteristics that do not vary over time. Second, most empirical studies do not carefully disentangle the high correlation between explanatory variables like indices of institutional quality, investment and corruption – to some extent challenging their results. Third, while it is obvious that richer countries display a lower level of corruption, causality between corruption and economic wealth is still debated. Some studies apply two-stage least squares approaches and instrument corruption with an index of ethnolinguistic fractionalization or origins of the legal system to take endogeneity into account. However, the instruments employed clearly affect the results. Finally, the different indices of corruption available differ regarding the period of time and number of countries

[3] The literature analyzing the effects of institutional quality on economic growth is much broader and is reviewed by ARON (2000) and HALL and JONES (1999).

they cover.[4] Although correlation among the different indices of corruption is usually rather high, results of empirical studies might in some cases be driven by the underlying choice of corruption index.

GDP per capita and GDP growth

Among the first empirical cross-country analyses of the consequences of corruption on economic development, MAURO (1995) focuses on GDP per capita growth. To measure corruption, he employs the corruption index provided by Business International. Among the 68 countries in the sample, and independent of the method of estimation, more corrupt countries experience both statistically significant lower GDP growth and investment rates. Various studies confirm these results. Among others, GDP per capita growth is used as dependent variable in MAURO (1996), BRUNETTI (1997), POIRSON (1998), LI, XU and ZOU (2000), MO (2001), ABED and DAVOODI (2002), LEITE and WEIDMANN (2002) and GYIMAH-BREMPONG (2002). All of these studies find a statistically significant negative impact of corruption on economic growth in at least some of the estimated specifications. In a more recent study MÉON and SEKKAT (2005) analyse how the interaction of corruption and indices of good governance affect economic growth. Besides the significantly negative impact of corruption on GDP per capita growth, the interaction of corruption and the rule of law as well as corruption and government effectiveness affect growth rates significantly negative. This leads MÉON and SEKKAT to conclude that corruption will be even more detrimental to growth in environments of weak rule of law and low government effectiveness.

However, the negative impact of corruption on growth is not always confirmed. According to PELLEGRINI and GERLAGH (2004), there is no statistically significant direct relationship once other relevant factors are controlled for. There are, however, indirect effects of corruption on economic growth, as corruption negatively affects investment, schooling, trade policies and political stability. Even more surprising, BARRETO (2001) finds a significantly positive direct relationship between GDP per capita growth and corruption (employing the same indicator of corruption as MAURO, 1995).

ROCK and BONNETT (2004), finally, analyze the newly industrializing East Asian countries which are frequently cited as an exception to the general rule of the negative impact corruption has on growth. Despite their comparably high levels of perceived corruption, these

[4] Almost half of the studies surveyed here use either the Transparency International (TI) or the International Country Risk Guide (ICRG) indices, which cover a large sample of countries and years. Surprisingly, the Graft-index of KAUFMANN, KRAAY and ZOIDO-LOBATON (1999a; 2002) and KAUFMANN, KRAAY and MASTRUZZI (2003) which shows by far the broadest country coverage is used in only one tenth of these studies. Figure A1 in Appendix A presents the different corruption indices and their frequency of use in empirical research.

countries experienced high growth rates over an extended period of time. Accordingly, ROCK and BONNETT find a significantly positive impact of corruption on growth in large East Asian countries, whereas the impact on other developing countries' growth rates remains negative and statistically significant.[5] One explanation might be that a strong centralized government can limit the negative effects of bribery compared to a decentralized corrupt bureaucracy (SHLEIFER and VISHNY, 1993). REJA and TALVITIE (2000) provide another explanation. They argue that corruption in Asia is part of the fixed costs of doing business, whereas it is a variable cost component in Africa.

The impact of corruption on the level of per capita GDP has also been frequently investigated. Not surprisingly, most of these papers find a negative impact of corruption on the level of economic development (EHRLICH and LUI, 1999; KAUFMANN, KRAAY and ZOIDO-LOBATON, 1999b; NEEMAN, PASERMAN and SIMHON, 2004 and WELSCH, 2004).

The results of these cross-section approaches have, however, recently been challenged. According to ISLAM (2004), the unobserved fixed country effects and high multicollinearity between explanatory variables are likely to bias the estimation of the impact of corruption on per capita GDP. Whereas he finds a significantly negative relationship between corruption and GDP per capita in a cross-section model, estimating the same model in first differences – thus eliminating the unobserved fixed effects and reducing the correlation between exogenous variables – the impact of corruption is no longer significant. The results of ISLAM, unfortunately, suffer from very limited country coverage, and the inclusion of only two explanatory variables – corruption and total investment.

As mentioned above, there is a range of different transmission channels by which corruption can affect economic development. These transmission channels are discussed in the following sections.

Investment

Starting again with the seminal work of MAURO (1995), the share of investment in GDP is employed as dependent variable. According to the results, more corrupt countries experience significantly lower investment rates. This result is confirmed by the bulk of literature focusing on the ratio of gross investment to GDP (MAURO, 1996; BRUNETTI, KISUNKO and WEDER, 1998; BRUNETTI and WEDER, 1998; CAMPOS, LIEN and PRADHAN, 1999; MO, 2001; LAMBSDORFF, 2003; PELLEGRINI and GERLAGH, 2004). It is also confirmed if the share of

[5] The group of large East Asian countries includes China, Indonesia, South Korea, Thailand and Japan. The result applies only in the largest sample using the Graft-index compiled by KAUFMANN, KRAAY and ZOIDO-LOBATON (1999a).

private investment in GDP is used as dependent variable instead (CAMPOS, LIEN and PRADHAN, 1999).[6] Interestingly, the authors find a significantly positive impact of the predictability of corruption on gross investment as well as private investment. High levels of corruption deter investment but the negative effect diminishes with higher predictability.

Another topic analyzed intensively is the effect of corruption on foreign direct investment (FDI). The view that corruption acts like a tax deterring FDI is empirically supported by studies of WEI (1999, 2000a, 2000b) and SMARZYNSKA and WEI (2000). An increase in the corruption index by about one point has the same effect as a 7.5 percentage points increase of the tax rate. In a panel of transition countries ABED and DAVOODI (2002) also find that corruption significantly reduces FDI inflows.

Inflation and exchange rate

According to AL-MARHUBI (2000), corrupt countries experience significantly higher inflation rates. Focusing on transition countries in Central and Eastern Europe, ABED and DAVOODI (2002) confirm this relationship – however, the result does no longer hold once the progress of structural reforms is controlled for. While HONLONKOU (2003) also finds a strong partial and significant correlation between corruption and the consumer price change, the study fails to control for endogeneity and suffers from omitted variables bias (as only one control variable is included).

BAHMANI-OSKOOEE and NASIR (2002) analyze a cross-section of 65 countries and find that countries with more corruption significantly tend to depreciate their real exchange rate. This depreciation could have positive effects for export oriented countries and sectors but will harm net-importers – the bulk of developing countries.

International trade

In a cross-country analysis LAMBSDORFF (1998) shows that exporters from less corrupt countries face disadvantages in import countries with a high corruption level. He uses the market share of the 19 largest exporting countries in 86 import markets as dependent variable. The corruption index of the importing country is negative and statistically significant, thus increasing the market share of the exporter, in the case of Belgium, France, Italy and South Korea. The Netherlands and Sweden experience a significantly lower market share in corrupt countries. Regarding the competitiveness of US exporters after the 1977 Foreign Corrupt

[6] However, POIRSON (1998) does not find a statistically significant impact of corruption on the ratio of private investment to GDP.

Practices Act, HINES (1995) shows that growth rates of US aircraft exports are significantly lower in high corruption destinations.

Government revenues, expenditures and the shadow economy

Recent research has shown that corruption lowers the quality of public infrastructure, biases state expenditures via military expenditures and lowers expenditures on education and health. Some studies also relate corruption to the informal sector. The issue of public infrastructure quality is analyzed by TANZI and DAVOODI (2002a). In a panel of 68 countries over the period 1980-95 they find evidence that corruption lowers the quality of roads and increases the number of electricity interruptions. Additionally, they find a significantly negative impact of corruption on public revenues. Similar results are obtained by TANZI and DAVOODI (2002b) employing a larger sample of countries, and by FRIEDMAN ET AL. (2000) focusing on the share of tax revenues in GDP. The results of the empirical analysis of FRIEDMAN ET AL. also support their hypothesis that corruption significantly increases the shadow economy. JOHNSON, KAUFMANN and SHLEIFER (1997) investigate forty-nine countries in Latin America, the OECD, and the former Soviet Union block and find a statistically significant positive relationship between various measures of corruption and the shadow economy. As they note `[…] the relationship between the share of the unofficial economy and the rule of law (including corruption) is strong and consistent across seven measures. Countries with more corruption have higher shares of the unofficial economy,' (p. 391). As is now well known, corruption can act like a tax, can undermine the quality of the bureaucracy and the trust in administration and. As a consequence, entrepreneurs might refuse to start business in the official economy. As more and more enterprises go underground, governments' revenue base can be substantially eroded.[7]

Turning to the expenditure side, MAURO (1996; 1998) finds clear evidence that corruption lowers government expenditures on education. On the other hand, corrupt governments tend to increase military spending significantly (GUPTA, DE MELLO and SHARAN, 2001).

Educational and health indicators

The impact of corruption on various educational and health indicators is explored in a number of studies. Among them, GUPTA, DAVOODI and TIONGSON (2002) find a statistically

[7] However, the relationship between corruption and the informal sector can also be positive. DREHER, KOTSOGIANNIS and MCCORRISTON (2005) employ structural equation modelling and show for the OECD countries that corruption and shadow economy are substitutes rather than complements.

significant negative impact of corruption on child and infant mortality, low birth weight babies, births attended by health staff, and repeater and drop out rates in elementary school. Regarding child mortality, these findings are supported by KAUFMANN, KRAAY and ZOIDO-LOBATON (1999b). Additionally, KAUFMANN ET AL. find a significantly negative effect on adult literacy. This is in line with MO (2001) who shows that average years of schooling are significantly lower in countries with more corruption. PELLEGRINI and GERLAGH (2004), to the contrary, do not find a significant relationship between these two variables.

Other effects of corruption

It is obvious that corruption also affects institutional quality. As one example, corruption leads to more restrictions on the capital account (WEI, 2000c; BAI and WEI, 2000; DREHER and SIEMERS, 2003). HERZFELD and WEISS (2003) analyze the relationship between corruption and the rule of law and find a strong negative relationship. Countries with more corruption experience lower acceptance of established institutions, weakened political institutions and a deficient court system. Finally, MO (2001) shows that more corrupt countries are exposed to higher political instability.

A number of studies focus on the impact of corruption on poverty and inequality. They find a strongly positive relationship between corruption and income inequality (GUPTA, DAVOODI and ALONSO-TERME, 2002; BARRETO, 2001; GYIMAH-BREMPONG, 2002). FOELLMI and OECHSLIN (2003) show that more corruption is significantly related to an increase of the income share of the richest 20 percent. LI, XU and ZOU (2000) estimate a nonlinear relationship in including the squared corruption index and find that the initial increase in inequality due to corruption is eventually reversed. An increase in corruption results in an increase of income inequality up to an index of 2.9 on a scale between 0 and 6 and in a decreasing effect afterwards.[8]

WELSCH (2004) analyzes the influence of corruption on environmental characteristics and finds a significantly positive impact on ambient pollution, like the concentration of SO_2, NO_2 or total suspended particles in urban air. Interestingly, there is no significant relationship between corruption and environmental stress, measured as fertilizer and pesticide use and emissions per populated land.

Analyzing the effect of corruption on aid, ALESINA and WEDER (2002) find no statistically significant effect of corruption on multilateral aid flows. The same applies to debt

[8] Again this analysis shows that the results crucially depend on the methodology chosen. Estimation by 2SLS results in a threshold of 4.7, implying a much higher level at which corruption reduces inequality.

relief. To the contrary, analyzing bilateral aid flows, ALESINA and WEDER find significantly higher flows from the USA and significantly lower flows from Australia and Scandinavian countries to more corrupt recipient countries.

3. Empirical Evidence

In this section, we analyze the impact of corruption on economic growth and GDP per capita empirically – following the cross-country framework established by BARRO (1997). Our cross-section data are averages over the years 1975-2001 and extend to a maximum of 71 countries. Since some of the data are not available for all countries or years, the number of observations depends on the choice of explanatory variables. To measure corruption, we employ the perceptions based ICRG index. However, we rescale the index so that higher levels represent more corruption instead of less as on the original scale. All variables, their precise definitions and data sources are listed in Appendix B.

While the main focus of the analysis is on economic growth and GDP per capita, we employ six additional dependent variables also. All of them have been identified as being affected by corruption in the previous section. We include them to our analysis because in order to estimate the overall impact of corruption on GDP and GDP growth, we have to take the indirect effects via other potentially important determinants of those variables into account as well. We follow the previous literature to identify variables that are likely to contribute to GDP per capita and GDP growth: The initial level of GDP per capita in the year 1970 is included to measure the conditional rate of convergence to the steady state growth rate. Secondary school enrolment and life expectancy are employed as indicators of human capital. Higher domestic investment as a share of GDP should lead to higher growth rates whereas the effect of higher government consumption is not obvious a priori. On the one hand, a large government sector may induce inefficiencies and crowd out the private sector. On the other hand, the provision of an efficient infrastructure and a proper legal framework may promote growth (HANSSON, 2000). Foreign aid has also been suggested to impact on growth – either positively, because aid allows the financing of development projects and helps overcoming inefficiencies or negatively, as it helps staying autocratic governments in power and reduces incentives to develop (see DREHER, 2004, for a discussion). Finally, we include a country's rate of inflation which has been shown to have a significant effect on growth in previous studies.

Most of the independent variables in our growth and GDP equations, however, have also been identified as being affected by corruption (see the literature review above). If, e.g.,

investment is affected by corruption, it is endogenous to our regressions, and the same is true for the other covariates. Therefore, we treat all those variables (except for initial GDP) as endogenous and explain them with their most important determinants as identified in the previous literature.

Following GUPTA, DAVOODI and TIONGSON (2002), the school enrolment ratio is hypothesized to depend on public spending on education (in percent of GDP), the Age Dependency Ratio and the percent of urban population in total population. Life expectancy is explained by health expenditure (in percent of GDP) and the ratio of girls to boys in primary and secondary education (GUPTA, DAVOODI and TIONGSON, 2002). We explain investment in percent of GDP with the 1970 value of GDP, openness to trade and the school enrolment ratio (MÉON and SEKKAT, 2005), government consumption with real GDP growth and the rate of inflation (DREHER and VAUBEL, 2004), the rate of inflation with government consumption (in percent of GDP) and a dummy for fixed exchange rate regimes (ABED and DAVOODI, 2002), and aid in percent of GDP with the budget deficit and the current account balance (both in percent of GDP), an index of democracy and GDP per capita (DREHER and VAUBEL, 2004).

We start by estimating individual regressions for the eight dependent variables (Table 1). Tables 2 and 3 contain systems of all equations estimated jointly by 3SLS, either including GDP growth (Table 2) or GDP per capita (Table 3). In the first stage, 3SLS uses instruments for all endogenous variables. These instruments are the predicted values resulting from a regression of each endogenous variable on all exogenous variables included in the system. The second stage estimates the covariance matrix of the equation errors using the residuals from a 2SLS estimation of each equation. In the third stage, GLS estimation employing the covariance matrix estimated in the second stage and the instruments in place of the endogenous variables is performed. This procedure is consistent and, in general, asymptotically more efficient than 2SLS.[9]

As can be seen in the Tables, the results crucially depend on whether the equations are estimated separately, or jointly as a system. In the following, we discuss the results for the individual dependent variables separately.

School enrolment and life expectancy

As can be seen in Tables 1 - 3, school enrolment is significantly lower in an aging society – with a coefficient significant at the one percent level in all three equations. When estimated as a system, school enrolment is also significantly affected by education expenditures (at the one

[9] See ZELLNER and THEIL (1962) for a detailed treatment of 3SLS.

percent level of significance), with a positive coefficient. Urbanization, to the contrary, only affects schooling in the regression of Table 1 – and only at the ten percent level of significance. As the tables show, life expectancy rises significantly with a higher girls to boys ratio in schooling. In all three regressions this relationship is significant at the one percent level, whereas – surprisingly – health expenditures increase life expectancy only in the regressions of Table 1.

Regarding corruption, the results show that life expectancy is significantly lower in corrupt countries, while there is no consistent result for the school enrolment ratio. Only the individual regression of Table 1 implies a negative impact of corruption on schooling, at the five percent level of significance. The coefficients show that the impact is, however, quantitatively important. An increase in the index of corruption by one point reduces school enrolment by almost 5 percentage points and life expectancy by about 2½ years. This is in line with previous results. MO (2001), e.g., finds that a one unit increase of the corruption index lowers average schooling years by 0.25 years.

Investment

Across all equations, investment (as a percent of GDP) is significantly higher with more openness to trade. The 1970 level of GDP significantly reduces investment in two regressions; a better educated population implies more investment when the equations are estimated jointly. Surprisingly, investment is not significantly affected by corruption in any regression. This is contrary to the results of PELLEGRINI and GERLAGH (2004), concluding that a one standard deviation increase in corruption lowers investment by around 2.5 percentage points. According to MAURO (1995), the impact amounts to 2.9 percentage points; MAURO (1996) presents estimates between 2.3-4.5 percentage points.

Government expenditures

Again, there are no unanimous results regarding the covariates across the three equations. According to the results of Tables 1 and 3, government expenditure (as a percent of GDP) is not significantly affected by GDP growth and inflation, whereas Table 2 shows significant coefficients for both variables. According to those results, expenditures are lower when the economy is growing and inflation is high. Corruption reduces expenditures in the regressions of Tables 1 and 2, but is marginally insignificant in the system including per capita GDP (Table 3). The magnitude of the coefficients implies that an increase in corruption by one point reduces expenditures between 1.3 and 3 percentage points.

Inflation

Inflation is significantly lower when the exchange rate is pegged. Government expenditures have no significant impact on inflation. Corruption has a significant impact in only one of the three regressions and only at the ten percent level of significance. When estimated as part of the system including economic growth, an increase in the corruption index by one point reduces the inflation rate by about 45 percentage points. The negative impact of corruption on inflation is not in line with AL-MARHUBI (2000). His results show that reducing corruption by one index point reduces the log of average annual inflation by 0.17 – 0.26 points.

Aid

Aid (as a percent of GDP) is significantly lower when countries experience current account surpluses and – in two regressions – are more democratic. This is true although we control for GDP per capita, which is also significant in two equations. As can be seen, however, aid is declining with per capita GDP in the results of Table 3 and rising in those of Table 2. Regarding corruption, we only obtain a significant coefficient in one regression (reported in Table 2). The coefficient – significant at the five percent level – shows that aid is increasing with corruption. This contrasts the findings by ALESINA and WEDER (2002). They find for a variety of corruption indices in 11 out of 17 specifications a positive relationship between corruption and aid per capita inflows. All except one of these coefficients, however, fail to be statistically significant at least at the 10 percent level.

GDP per capita and GDP growth

Turning to the overall costs of corruption in terms of GDP per capita and GDP growth, we focus on the two systems shown in Tables 2 and 3. In both systems, the corruption index is jointly significant at the five percent level. Regarding GDP growth, Table 2 shows that growth is significantly higher with more investment, less government expenditures, less inflation, less aid received, and, of course, less corruption. Life expectancy, school enrolment and initial GDP do not significantly affect growth.

In estimating the direct and indirect effects of corruption on growth, we only take those coefficients into account that are significant in the growth equation at the ten percent level at least. As one example, one point increase in the index of corruption reduces government expenditures (in percent of GDP) by 1.96 percentage points. A one percentage point increase in government consumption, in turn, reduces economic growth by 0.23

percentage points per year. The overall effect of an increase in the index of corruption (implying an increase in corruption) by one point via the government's expenditure channel thus amounts to an increase in growth of 0.451 percentage points. Calculating the indirect effects for all significant explanatory variables along those lines gives the following results: a one percentage point increase in the corruption index increases growth by 0.129 percentage points via the investment channel, by 0.225 percentage points via the inflation channel and reduces growth by 0.106 percentage points via the foreign aid channel. Overall, and taking the direct impact of corruption on economic growth into account, the effect amounts to 0.13 percentage points per year. Compared to the previous literature, this estimate is at the lower bound. According to the estimates of AIZENMAN and GLICK (2003), GDP growth would rise by 0.5 percentage points due to a reduction of corruption by one index point, GYIMAH-BREMPONG (2002) estimates this effect to be in the range of 0.39-0.41.

Turning to GDP per capita, the results of Table 3 show that only four variables have a significant impact. GDP per capita rises with higher initial GDP, lower school enrolment, a higher investment ratio, and less corruption. As can be seen in the Table, a reduction in the index of corruption by one point reduces GDP per capita by about 683 constant 1995 US$ via the direct impact. Regarding the indirect effects, a one percentage point increase in the corruption index reduces per capita GDP by 28 US$ via the school enrolment channel and increases GDP by 286 US$ via the investment channel. Overall thus, a one percentage point increase in the corruption index reduces GDP per capita by 425 US$ (per year).

As a next step we employ our estimates to calculate the costs of corruption on the economy. For each country in the sample with a level of corruption exceeding the sample average, we calculate the costs of being more corrupt than the average sample country. The sample average of 2.91 comes close to the levels of corruption of Kuwait, Croatia, Zimbabwe, Turkey, and Thailand. Table 4 reports the results for the direct and overall impact of corruption. As can be seen, the results for the direct costs of corruption vary between a yearly reduction of 0.04 percentage points for Syria and 1.66 percentage points for Liberia.

Table 5 reports the costs of being more corrupt than the average sample country in terms of GDP per capita. The results show that the costs of corruption are substantial. The biggest loss due to corruption is again experienced by Liberia. With an actual average GDP of 535 constant 1995 US$ over the period 1970-2001, the overall loss due to being more corrupt than the average sample country amounts to more than 100 percent – a staggering 847 US$.

4. Conclusion

The WORLD BANK (2001) has identified corruption as `the single greatest obstacle to economic and social development'. More recently, the WORLD BANK (2004) has estimated that more than US$ 1 trillion is paid in bribes each year and that countries that tackle corruption, improve governance and the rule of law could increase per capita incomes by 400 percent. These results have recently been supported by DREHER, KOTSOGIANNIS and MCCORRISTON (2004a, 2004b), applying a structural equation modelling approach to measure corruption as a latent variable. This method directly relates the incidence of corruption across countries to causes and indicators of corruption rather than to perception-based surveys. As a consequence, their index of corruption is both ordinal and cardinal in nature, allowing to calculate the economic losses due to corruption as a percentage of GDP. Based on a sample of approximately 100 countries covering five different time periods, DREHER, KOTSOGIANNIS and MCCORRISTON (2004a, 2004b) show that the losses due to corruption are especially high in Sub-Saharan Africa and have been increasing in transition economies since the 1980s. According to their results, in 1991-97, Guinea-Bissau is the world's most corrupt country, with a loss of almost 70 percent of its potential GDP. For the period 1998-2002, using a different set of explanatory variables, however, the estimated loss is much lower: about 27 percent of GDP.

In this paper, we followed a different strategy. Using simple cross-section analysis, we estimated the effect of corruption on economic growth and per capita GDP in a system where we allow for their main determinants also being affected by corruption. Calculating the direct and indirect effects of corruption from the regression estimates, we estimated for each individual country the costs of being more corrupt than the average sample country. Our results show that these costs are indeed substantial.

However, our results also show that the estimates have to be interpreted with caution. Comparing the results of the individual regressions of Table 1 with those of the system-regressions of Tables 2 and 3, for example, reveals that the results crucially depend on the method of estimation. Previous research has shown that they do also depend on the choice of corruption measures, country coverage, endogeneity of corruption, and the period of estimation. This lends support to recent alternative approaches in calculating the costs of corruption as useful complements to traditional econometric analysis.

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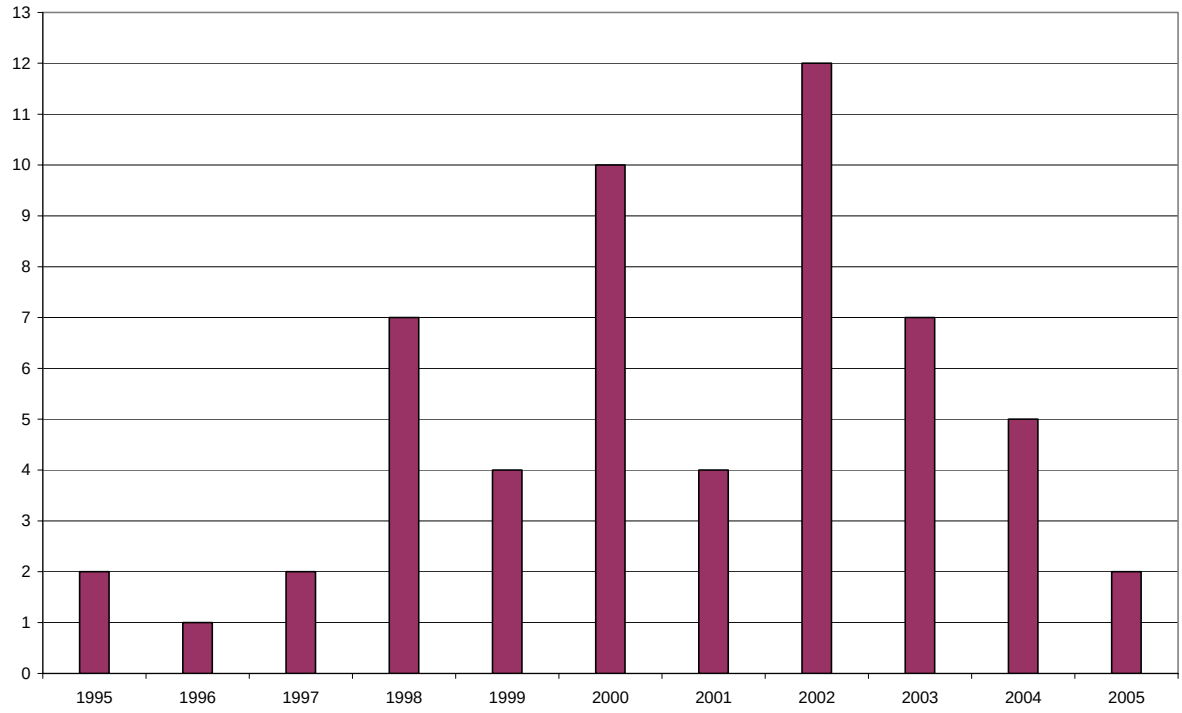

Figure 1: Number of studies on the consequences of corruption

Table 1: Impact of Corruption, OLS (cross-section, average 1975-2001)

School Enrolment		Life Expectancy		Investment (percent of GDP)		Government Expenditure (percent of GDP)	
Expenditure on Education (percent of GDP)	0.34 (0.51)	Expenditure on Health (percent of GDP)	0.77 (2.09**)	Initial GDP (year 1970)	-0.0001 (1.06)	GDP growth	-0.26 (1.11)
Age Dependency Ratio	-81.02 (5.31***)	Ratio of girls to boys in school	0.39 (7.98***)	Openness to Trade	0.04 (3.60***)	Inflation	0.002 (0.90)
Urban Population (percent of total)	0.20 (1.74*)			School Enrolment	0.02 (1.04)		
Corruption	-4.65 (2.34**)	Corruption	-2.53 (3.99***)	Corruption	-0.66 (1.16)	Corruption	-1.75 (4.27***)
Constant	71.84 (4.14***)	Constant	16.09 (4.18***)	Constant	17.04 (9.96***)	Constant	10.91 (6.45***)
number of observations	134		136		93		126
adjusted R^2	0.47		0.59		0.15		0.12

Table 1 (continued)

Inflation		Aid (percent of GDP)			GDP growth	GDP per capita
Government Expenditure (percent of GDP)	2.12 (0.57)	Democracy, Index	-0.40 (2.19**)	Initial GDP (year 1970)	-0.00006 (1.15)	0.683 (10.00***)
Fixed Exchange Rates, Dummy	-322.12 (4.69***)	Overall Budget Deficit (percent of GDP)	-0.20 (1.49)	School Enrolment	-0.014 (1.69*)	1.448 (0.13)
		GDP per capita	-0.0002 (1.30)	Life Expectancy	0.021 (0.60)	36.03 (0.76)
		Current Account Balance (percent of GDP)	-0.44 (3.91***)	Investment (percent of GDP)	0.14 (3.81***)	116.36 (2.38**)
				Government Expenditure (percent of GDP)	-0.011 (0.30)	-38.3 (0.79)
				Inflation	-0.004 (3.67***)	-0.903 (0.73)
				Aid (percent of GDP)	-0.059 (1.55)	-16.82 (0.33)
Corruption	10.67 (0.69)	Corruption	-0.38 (0.52)	Corruption	-0.327 (1.41)	-874.46 (2.83***)
Constant	334.46 (4.20***)	Constant	3.47 (1.66*)	Constant	-0.389 (0.22)	-5325.46 (2.23**)
number of observations	102		97		71	71
adjusted R^2	0.16		0.37		0.44	0.74

Notes:
Dependent variables are school enrollment, life expectancy, investment, government expenditure, inflation, aid, GDP growth, and GDP per capita.
‘t’-statistics in parentheses: ***, **, * significant at the 1, 5 and 10 percent levels, respectively.

Table 2: Impact of Corruption, System including Economic Growth, 3SLS (cross-section, 54 countries, average 1975-2001)

School Enrolment		Life Expectancy		Investment (percent of GDP)		Government Expenditure (percent of GDP)	
Expenditure on Education (percent of GDP)	5.38 (3.36***)	Expenditure on Health (percent of GDP)	0.10 (0.20)	Initial GDP (year 1970)	-0.0004 (2.89***)	GDP growth	-3.51 (5.55***)
Age Dependency Ratio	-92.53 (4.68***)	Ratio of girls to boys in school	0.31 (4.64***)	Openness to Trade	0.05 (4.14***)	Inflation	-0.03 (3.76***)
Urban Population (percent of total)	-0.09 (0.71)			School Enrolment	0.15 (4.10***)		
Corruption	-0.98 (0.27)	Corruption	-2.26 (1.92*)	Corruption	0.99 (1.10)	Corruption	-1.96 (2.88***)
Constant	84.91 (3.89***)	Constant	27.30 (5.02***)	Constant	18.33 (7.04***)	Constant	20.23 (6.09***)
"R^2"	0.33		0.46		0.09		0.66

Table 2 (continued)

Inflation		Aid (percent of GDP)		GDP growth	
Government Expenditure (percent of GDP)	-6.26 (1.32)	Democracy, Index	-0.41 (2.28**)	Initial GDP (year 1970)	0.00002 (0.43)
Fixed Exchange Rates, Dummy	-316.73 (3.45***)	Overall Budget Deficit (percent of GDP)	-0.11 (0.70)	School Enrolment	-0.002 (0.13)
		GDP per capita	0.0005 (2.92***)	Life Expectancy	-0.10 (1.58)
		Current Account Balance (percent of GDP)	-0.76 (6.24***)	Investment (percent of GDP)	0.13 (2.96***)
				Government Expenditure (percent of GDP)	-0.23 (3.98***)
				Inflation	-0.005 (2.68***)
				Aid (percent of GDP)	-0.07 (1.69*)
Corruption	-44.91 (1.77*)	Corruption	1.51 (2.18**)	Corruption	-0.83 (3.02***)
Constant	289.97 (2.30**)	Constant	5.38 (2.84***)	Constant	8.13 (2.51**)
"R^2"	0.15		0.69		0.01

Notes:
All regressions estimated jointly.
't'-statistics in parentheses: ***, **, * significant at the 1, 5 and 10 percent levels, respectively.

Table 3: Impact of Corruption, System including GDP per capita, 3SLS (cross-section, 54 countries, average 1975-2001)

School Enrolment		Life Expectancy		Investment (percent of GDP)		Government Expenditure (percent of GDP)	
Expenditure on Education (percent of GDP)	4.68 (2.89***)	Expenditure on Health (percent of GDP)	0.17 (0.33)	Initial GDP (year 1970)	-0.0004 (2.95***)	GDP growth	-0.57 (1.47)
Age Dependency Ratio	-89.22 (4.49***)	Ratio of girls to boys in school	0.33 (4.78***)	Openness to Trade	0.06 (5.43***)	Inflation	-0.005 (0.75)
Urban Population (percent of total)	-0.003 (0.03)			School Enrolment	0.16 (4.25***)		
Corruption	-0.69 (0.19)	Corruption	-2.03 (1.71*)	Corruption	1.21 (1.35)	Corruption	-1.31 (1.62)
Constant	81.68 (3.72***)	Constant	25.08 (4.47***)	Constant	17.78 (6.87***)	Constant	12.43 (4.95***)
"R^2"	0.35		0.46		0.05		0.05

Table 3 (continued)

Inflation		Aid (percent of GDP)		GDP per capita	
Government Expenditure (percent of GDP)	-2.64 (0.53)	Democracy, Index	-0.28 (1.46)	Initial GDP (year 1970)	0.59 (8.40***)
Fixed Exchange Rates, Dummy	-363.01 (3.81***)	Overall Budget Deficit (percent of GDP)	0.08 (0.49)	School Enrolment	-40.31 (1.89*)
		GDP per capita	-1.07 (1.79*)	Life Expectancy	119.11 (1.58)
		Current Account Balance (percent of GDP)	-0.69 (5.53***)	Investment (percent of GDP)	236.56 (3.92***)
				Government Expenditure (percent of GDP)	21.40 (0.29)
				Inflation	1.24 (0.54)
				Aid (percent of GDP)	-9.00 (0.15)
Corruption	-39.13 (1.54)	Corruption	0.55 (0.79)	Corruption	-683.32 (2.10**)
Constant	295.62 (2.28***)	Constant	12.08 (2.90***)	Constant	-12485.91 (3.23***)
"R^2"	0.232		0.697		0.701

Notes:
All regressions estimated jointly.
't'-statistics in parentheses: ***, **, * significant at the 1, 5 and 10 percent levels, respectively.

Table 4: Average yearly reduction of GDP growth due to above average corruption

country	overall	direct	country	overall	direct
Liberia	0.26	1.66	Uganda	0.08	0.48
Bangladesh	0.23	1.47	Egypt, Arab Rep.	0.07	0.46
Haiti	0.21	1.33	Ethiopia	0.07	0.44
Paraguay	0.20	1.26	Cameroon	0.07	0.41
Gabon	0.19	1.22	Jamaica	0.07	0.41
Indonesia	0.19	1.17	United Arab Emirates	0.06	0.39
Iraq	0.16	1.03	Kazakhstan	0.05	0.34
Sudan	0.16	1.01	Niger	0.05	0.32
Myanmar	0.16	0.99	Vietnam	0.05	0.31
Nigeria	0.15	0.94	Zambia	0.04	0.27
Guyana	0.14	0.87	Guatemala	0.04	0.25
Mali	0.14	0.87	Yugoslavia, Fed. Rep.	0.04	0.25
Sierra Leone	0.12	0.78	Ukraine	0.04	0.24
Armenia	0.12	0.76	Colombia	0.04	0.23
Azerbaijan	0.12	0.76	Ghana	0.03	0.20
Guinea-Bissau	0.12	0.76	Kenya	0.03	0.18
Honduras	0.12	0.76	Suriname	0.02	0.15
Moldova	0.12	0.76	Angola	0.02	0.13
Panama	0.12	0.76	El Salvador	0.02	0.13
Qatar	0.12	0.76	Cuba	0.02	0.12
Togo	0.12	0.76	India	0.02	0.11
Pakistan	0.11	0.69	Morocco	0.02	0.11
Bahamas	0.11	0.68	Trinidad and Tobago	0.02	0.11
Lebanon	0.11	0.66	Kuwait	0.01	0.09
Bolivia	0.09	0.56	Zimbabwe	0.01	0.09
Russian Federation	0.09	0.55	Thailand	0.01	0.08
Saudi Arabia	0.09	0.55	Croatia	0.01	0.06
Somalia	0.09	0.54	Turkey	0.01	0.06
Philippines	0.08	0.50	Syrian Arab Republic	0.01	0.04

Table 5: Average yearly reduction in per capita GDP due to above average corruption (constant 1995 US$)

country	overall	direct	country	overall	direct
Liberia	847	1363	Uganda	245	395
Bangladesh	752	1211	Egypt, Arab Rep.	233	376
Haiti	682	1097	Ethiopia	224	361
Paraguay	646	1040	Cameroon	210	338
Gabon	623	1002	Jamaica	210	338
Indonesia	599	964	United Arab Emirates	198	319
Iraq	528	850	Kazakhstan	175	281
Sudan	517	831	Niger	162	261
Myanmar	505	812	Vietnam	157	252
Nigeria	481	774	Zambia	139	224
Guyana	446	717	Guatemala	127	205
Mali	446	717	Yugoslavia, Fed. Rep.	127	205
Sierra Leone	399	643	Ukraine	121	195
Armenia	387	623	Colombia	116	186
Azerbaijan	387	623	Ghana	104	167
Guinea-Bissau	387	623	Kenya	92	148
Honduras	387	623	Suriname	75	120
Moldova	387	623	Angola	68	110
Panama	387	623	El Salvador	68	110
Qatar	387	623	Cuba	62	101
Togo	387	623	India	57	91
Pakistan	351	566	Morocco	57	91
Bahamas	349	562	Trinidad and Tobago	57	91
Lebanon	340	547	Kuwait	45	72
Bolivia	287	461	Zimbabwe	45	72
Russian Federation	281	452	Thailand	39	63
Saudi Arabia	281	452	Croatia	33	53
Somalia	274	442	Turkey	33	53
Philippines	257	414	Syrian Arab Republic	21	34

Appendix A

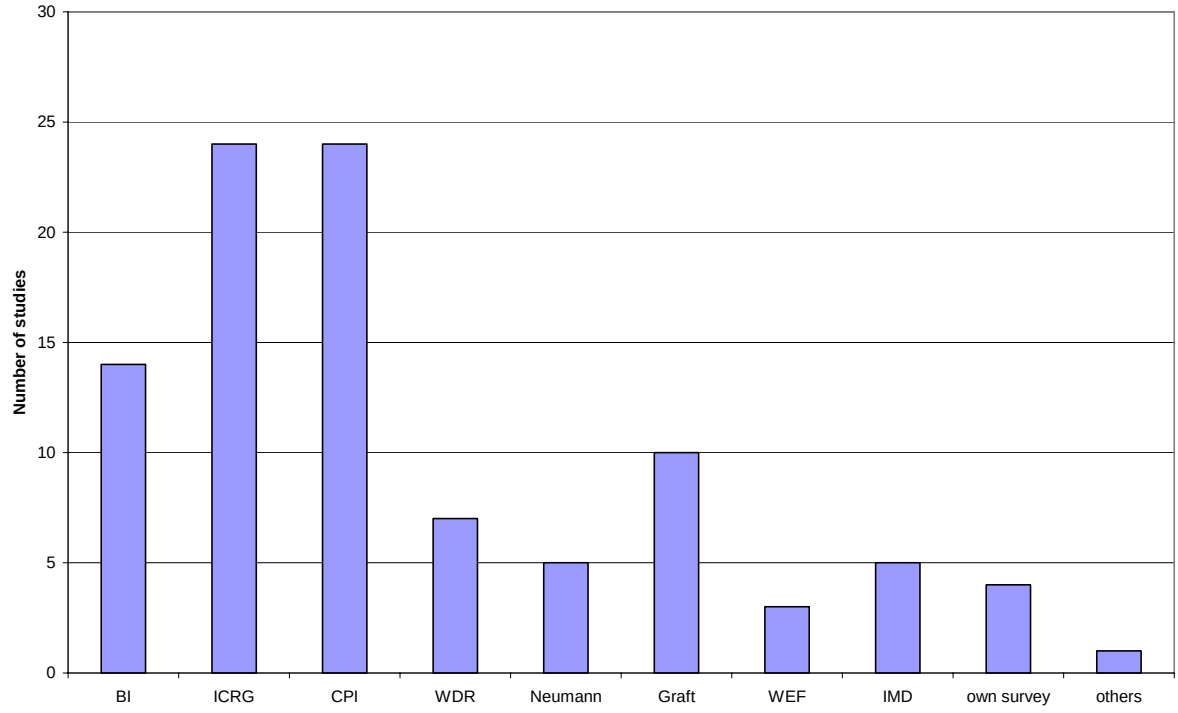

Figure A1: Use of corruption indicators in empirical research on the consequences of corruption

Appendix B: Variable Definitions and Sources

Variable	Source	Definition
GDP growth (annual %)	WORLD BANK (2003)	Annual percentage growth rate of GDP at market prices based on constant 1995 U.S. dollars.
GDP per capita	WORLD BANK (2003)	GDP per capita is gross domestic product divided by midyear population. Data are in constant U.S. dollars.
School enrolment, preprimary (% gross)	WORLD BANK (2003)	Preprimary education refers to the initial stage of organized instruction, designed primarily to introduce very young children to a school-type environment.
Life expectancy at birth, total (years)	WORLD BANK (2003)	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.
Democracy	MARSHALL and JAGGERS (2000)	0-10 (0 = low; 10 = high) democracy score. Measures the general openness of political institutions.
Investment (% of GDP)	WORLD BANK (2003)	Outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.
General government final consumption expenditure (% of GDP)	WORLD BANK (2003)	General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees).
Inflation, consumer prices (annual %)	WORLD BANK (2003)	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.
Trade (% of GDP)	WORLD BANK (2003)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.
Public spending on education, total (% of GDP)	WORLD BANK (2003)	Public expenditure on education consists of public spending on public education plus subsidies to private education at the primary, secondary, and tertiary levels.

Appendix B (continued)

Variable	Source	Definition
Age dependency ratio (dependents to working-age population)	WORLD BANK (2003)	Age dependency ratio is the ratio of dependents--people younger than 15 and older than 64--to the working-age population--those ages 15-64. For example, 0.7 means there are 7 dependents for every 10 working-age people.
Urban population (% of total)	WORLD BANK (2003)	Urban population is the share of the total population living in areas defined as urban in each country.
Ratio of girls to boys in primary and secondary education (%)	WORLD BANK (2003)	Ratio of girls to boys in primary and secondary education is the percentage of girls to boys enrolled at primary and secondary levels in public and private schools.
Health expenditure, total (% of GDP)	WORLD BANK (2003)	Total health expenditure is the sum of public and private health expenditures. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation.
Overall budget balance, including grants (% of GDP)	WORLD BANK (2003)	Overall budget balance is current and capital revenue and official grants received, less total expenditure and lending minus repayments. Data are shown for central government only.
Money and quasi money growth (annual %)	WORLD BANK (2003)	This definition is frequently called M2
Short-term debt (% of total external debt)	WORLD BANK (2003)	Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt.
Fixed Exchange Rates, dummy	REINHART and ROGOFF (2004)	Equals zero if one of the following categories applies: Freely Floating, Freely Falling, Freely Falling/Freely Floating, Freely Falling/Managed Floating, Freely Floating/Dual Market, Freely falling/Dual Market, Freely Falling/Multiple Rates, Freely Falling/Crawling Band, Freely Falling/Parallel Market.
Current account balance (% of GDP)	WORLD BANK (2003)	Current account balance is the sum of net exports of goods, services, net income, and net current transfers.

Appendix B (continued)

Variable	Source	Definition
Aid (% of GNI)	WORLD BANK (2003)	Official development assistance and net official aid record the actual international transfer by the donor of financial resources or of goods or services valued at the cost to the donor, less any repayments of loan principal during the same period. Grants by official agencies of the members of the Development Assistance Committee are included, as are loans with a grant element of at least 25 percent, and technical cooperation and assistance. Aid dependency ratios are computed using values in U.S. dollars converted at official exchange rates.
Corruption	ICRG perception based index (rescaled)	Measures corruption in the political system as a threat to foreign investment based on the analysis of a worldwide network of experts. Range 0 (no corruption) to 6 (highest corruption).