Corruption and Creditworthiness: Evidence from Sovereign Credit Ratings*

Craig Depken
Associate Professor
Department of Economics
University of Texas at Arlington

Courtney LaFountain
Assistant Professor
Department of Economics
University of Texas at Arlington†

Roger Butters
Assistant Professor and Director, Nebraska Council on Economic Education
Department of Economics
University of Nebraska - Lincoln

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†Corresponding author. Contact information: Department of Economics, University of Texas at Arlington, 701 S. West Street, Box 19479, Arlington, TX 76019. Email: cllafountain@uta.edu

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Abstract

We estimate the impact of corruption on a country's creditworthiness. Corruption affects creditworthiness through its impact on the size of the formal sector of an economy. We find that creditworthiness, as measured by sovereign credit ratings, is decreasing in corruption. It follows from our benchmark estimates that a one standard deviation decrease in corruption improves sovereign credit ratings by almost a full rating category (e.g. BBB to A). On long term foreign currency denominated debt, this translates into annual savings of roughly $10,100 for every $1 million of debt.

1 Introduction

We measure the impact of public corruption on a country's creditworthiness, or willingness and ability to repay its sovereign debts. Doing so contributes to a larger literature on identifying corruption's effect on a country's economy. We improve on this literature because the connection between corruption and creditworthiness allows us to sidestep measurement errors that can generate misleading estimates of the effect of corruption on other important macroeconomic variables, such as output or investment.

The link between corruption and creditworthiness begins with empirical evidence suggesting that public corruption drives economic activity, such as production and investment, out of the formal sector of an economy and into the informal or unofficial sector (de Soto, 1989; Johnson et al., 1997). The informal sector of an economy is by design out of reach of official tax collectors. This implies that if sovereign debt is repaid with revenues collected from the formal sector, then ability to repay sovereign debt is decreasing in the amount of public corruption, all else being equal.[1]

The central issue is measuring the direction and magnitude of public corruption's impact on an economy. The reasons why public corruption might be detrimental to an economy all boil down to some form of resource misallocation: Entrepreneurs pursue projects that are best suited for the informal sector, rather than the most valuable projects (de Soto, 1989, 2000). Talented people spend time trying to capture rents rather than engaging in productive activities (Murphy et al., 1991, 1993). Public officials direct resources towards public goods that offer the best opportunities to collect rents, rather than those that generate the highest social return (Shleifer and Vishny, 1993). Bureaucrats design the regulatory structure in order to maximize rent-collecting opportunities, rather than to maximize social welfare (Bliss and di Tella, 1997). However, it may be that the costs are small, or that

[1] A thorough discussion of sovereign debt is beyond the scope of this paper. Bulow and Rogoff (1989a,b); Eaton (1990); Eaton and Gersovitz (1987); Eaton et al. (1986); Hermalin and Rose (1999) provide a good start for looking into the issues.

corruption introduces market forces into bureaucracy and improves efficiency (Egger and Winner, 2005; Lui, 1985). Thus, whether or not corruption is detrimental to an economy is an empirical question.

Overcoming measurement error bias is a crucial issue in answering this question and is the main contribution of this paper. Data on many dependent variables we could use to address this question, such as output or investment, most likely measure only what takes place in the formal sector. If the informal sector of an economy is increasing in the amount of public corruption, then the more corrupt a country, the more likely it is that available data understate the true value of whatever dependent variable is under investigation. Any estimate of the effect of corruption on that variable will be biased.

Estimating the impact of public corruption on creditworthiness allows us to overcome this problem. If the sovereign can only raise revenue to repay debts from the formal sector of an economy, then there is a strong positive correlation between economic activity that can be measured and economic activity that can be taxed. It follows that creditworthiness depends on measurable, rather than total, economic activity. Thus, corruption will have the same effect on creditworthiness whether it changes the overall level of economic activity or merely shifts economic activity from the formal to the informal sector.

We find that public corruption reduces creditworthiness as measured by sovereign credit ratings. Our baseline estimates indicate that a one standard deviation increase in corruption causes credit ratings to fall by almost a full rating category on average. A rough calculation suggests that a one standard deviation decrease in corruption can save a country about $10,100 per $1 million of debt annually. Our results are robust across different estimators, including country-specific random effects, and controlling for selection bias.

The remainder of our paper is organized as follows: We describe the data in Section 2. We outline our econometric model in Section 3. We present our results in Section 4. We provide some back-of-the-envelope calculations in Section 5. We discuss the literature in

Section 6. We conclude in Section 7.

2 Data

We use Standard and Poor's sovereign credit ratings to measure a country's creditworthiness, or its willingness and ability to repay debt. The credit ratings we use are *issuer* credit ratings, which reflect Standard and Poor's opinion of a single borrower's overall creditworthiness, rather than the characteristics of a specific loan. Standard and Poor's publishes separate ratings of four different classes of debt: short term local currency denominated debt, long term local currency denominated debt, short term foreign currency denominated debt, and long term foreign currency denominated debt.

Short term applies to a borrower's willingness and ability to repay obligations that are considered short term by the market in which they are traded. Typically, short term debt has a maturity of one year or less. Standard and Poor's assigns one of 9 possible short term issuer credit ratings: A-1+, A-1, A-2, A-3, B, C, R, SD, and D, where A-1+ is the highest rating and D is the lowest. A borrower who is under regulatory supervision because of poor financial conditions receives a rating of R. A borrower who has defaulted on a specific loan or class of loans, but not on all obligations, receives a rating of SD. A borrower who has defaulted on most or all of its obligations receives a rating of D.

Long term applies to a borrower's willingness and ability to repay obligations that are not short term, and so typically have a maturity of more than one year. Standard and Poor's assigns sovereign borrowers one of 12 possible long term credit ratings. The major ratings categories are AAA, AA, A, BBB, BB, B, CCC, CC, C, R, SD, and D, where AAA is the highest rating and D is the lowest. Credit ratings of AA through CCC may also be assigned a "+" or a "-" to indicate relative creditworthiness within the major credit rating category. Ratings of R, SD, and D are assigned to borrowers in the same conditions as they are assigned for short term debt.

For both short and long term debt, Standard and Poor's further differentiates debt according to that denominated in the sovereign's own local currency and that denominated in a foreign currency. It does so because the risk factors that influence a country's local currency denominated debt rating are a strict subset of those that influence a country's foreign currency denominated debt rating.

We use the Corruption Perceptions Index (CPI), published by Transparency International, to measure public corruption in a country. The CPI is a composite index compiled from a variety of sources, including surveys of a country's residents, surveys of people doing business in a country, and assessments of experts. The values of the index range from 0 (highly corrupt) to 10 (highly clean). No particular distribution of values is imposed on the index *ex ante*, so the index is an absolute measure of the amount of corruption in a country; all countries could get low values of the index if all are considered highly corrupt. Transparency International requires information from a minimum of three independent sources before rating a country. The CPI is a noisy measure of the quantity of corruption in a country because it is based on subjective opinions and because the sources used to construct the index vary from year to year. However, the CPI is highly correlated with other measures of corruption, such as *The Economist*'s Business International ratings, and it has been used in other research to measure corruption (Ciocchini et al., 2003; Lambsdorff, 2001; Pellegrini and Gerlagh, 2004). Each country's corruption score on the CPI is between 1 and 10, where larger numbers indicate less corruption. To make the empirical results more intuitive, we assign each country a corruption score equal to 10 minus the CPI, so bigger values indicate more corruption.

A stylized fact in the data is that credit ratings and the CPI are negatively correlated, as Figure 1 illustrates. For each class of bond ratings, greater levels of public corruption correspond to lower bond ratings, which reflect the anticipated risk of default. This stylized empirical finding is the motivation for our analysis.

Since public corruption is not the only determinant of a country's willingness and ability to repay its debt, we control for macroeconomic characteristics that the existing literature suggests will influence a country's credit rating:

1. *GDP per capita* measures the tax base the government can tap to repay debt. The greater is this tax base, the more likely the government will be able to generate revenues sufficient to repay its debt (Cantor and Packer, 1996).

2. *Growth* is the annual percent change in real GDP per capita. This measures the overall health of the economy and the quality of the country's economic institutions. Debt will be easier to service over time the faster the economy is growing (Cantor and Packer, 1996).

3. *Inflation* measures the quality of the government's finances and monetary policies, as well as the overall stability of the economy. Higher inflation indicates that the government's finances are not in good order and that it must resort to some extent to seignorage to cover current expenditures. Furthermore, very high inflation can lead to political instability (Cantor and Packer, 1996).

4. *Fiscal balance* is the government's budget surplus as a fraction of GDP. This measures the extent to which tax revenues are sufficient to cover current expenditures and debt service. A negative fiscal balance indicates a budget deficit. The larger the deficit, relative to GDP, the less desire and ability the government has to raise revenues sufficient to repay its debt (Cantor and Packer, 1996).

5. *External balance* is the current account as a fraction of GDP. A negative external balance indicates that a country imports more than it exports, with the difference financed by both public and private borrowing from foreign countries (Cantor and Packer, 1996).

6. *Lagged default* is equal to 1 if a country defaulted on any of its debt in the previous year and is equal to 0 otherwise. This variable controls for a country's short term credit history. A default in the previous year suggests that the country's finances are not currently in order, so any debt it issues is risker than debt issued by a country that did not default in the previous year, all else being equal.

7. *EU membership* is equal to 1 if a country is a member of the European Union (EU) and is equal to 0 otherwise. Members of the EU cannot exercise the same amount of autonomy over their local currency that non-EU members can exercise. For example, EU member governments cannot erode the real value of local currency denominated debt through seignorage, while non-EU member governments can. Furthermore, EU members were required to achieve certain fiscal and monetary standards regarding their inflation rate, currency stability, long term interest rate, budget deficit, and debt as a fraction of GDP that may affect their creditworthiness relative to non-EU members.

8. *Trade openness* is equal to a country's combined imports and exports as a fraction of GDP. Countries that are more open may be more vulnerable to shocks from other countries. Alternatively, countries that default on debt may be punished with exclusion from trade (Bulow and Rogoff, 1989a; Eaton et al., 1986). Thus, greater openness to trade may increase the opportunity cost of default, thus reducing the likelihood of default and improving creditworthiness.

These variables are similar to those used in other analyses of sovereign credit ratings (Cantor and Packer, 1996; Edwards, 1984; Larrain et al., 2000).

In some specifications, we also control for countries' geography, endowments, and institutional history using the following variables:

1. *Ethnolinguistic fractionalization* is an index of the likelihood that two people chosen at

random from a country's population will be from the same ethnic and linguistic group and thus measures ethnic diversity in a country. This variable measures an exogenous characteristic of countries that influences their institutional make-up and economic performance (Alesina and La Ferrara, 2005). Empirical evidence suggests that greater ethnic diversity increases the likelihood that a country will choose poor public policies (Easterly and Levine, 1997). Thus, this variable may influence willingness and ability to repay debt. This variable has been used to control for cultural and institutional features of countries in a variety of other studies, including analyses of corruption, economic growth, government performance, and financial system performance (La Porta et al., 1998a,b; Mauro, 1995).

2. *Latitude* measures distance of a nation's capital from the equator and controls for a country's endowment in terms of its climate. This is important because climate affects both agricultural productivity and the types of diseases that the population has to contend with. Both factors may in turn affect institutional development and government performance (Landes, 1998).

3. *Democracy* is an index of how democratic a country is between 1970 and 1994. Countries that are more democratic may differ from countries that are less democratic in their willingness and ability to repay debts.

4. *Legal origins* identify the legal tradition from which a country's commercial laws are derived. We control for legal origin by including dummy variables for whether a country's commercial laws are based on English common law, French civil law, German civil law, Scandinavian civil law, or a Socialist legal tradition. Different legal traditions lead to differences in legal protection of private lenders and corporate shareholders and differences in the quality of government (La Porta et al., 1998a,b). Thus, they may influence countries' willingness to repay debts.

5. *Oil* measures a country's production of oil and controls for a country's endowment. Countries that rely on oil wealth to finance the government may develop a different set of economic institutions than countries that are less well-endowed. On the other hand, oil-rich countries may have greater ability to repay debts regardless of other institutional factors.

6. *Exchange rate regime* is the *de facto* exchange rate regime identified by Reinhart and Rogoff (2004). A country's actual exchange rate regime may affect its liquidity and thus its ability to repay its debts. Choice of exchange rate regime may also reflect deeper institutional factors that influence willingness and ability to repay debts.

The ethnolinguistic fractionalization, latitude, democracy, and legal origins variables do not vary over time in our sample, and thus capture some country-level fixed effects.

Standard and Poor's provides credit ratings only for those countries that request them, not for every country that participates in international capital markets. If countries with more corruption are less likely to request a credit rating, or if countries request a rating as the amount of public corruption is decreasing, then the sample of countries with credit ratings is not a random sample and selection bias may lead us to understate the impact of corruption on sovereign credit ratings. We control for sample selection problems with the Heckman (1979) procedure in some specifications. We identify the selection equation using two variables that we do not use to explain credit ratings:

1. *Default since 1975* is equal to 1 if a country has defaulted on any of its debt since 1975 and is equal to 0 otherwise.

2. *Population* measures the number of people living in a country. We hypothesize that countries with larger populations may need to finance provision of larger quantities of public goods, which may influence how they borrow. Specifically, larger countries' borrowing needs may exceed the capacity of private lenders or banks, forcing them to

issue bonds.

The appendix summarizes the data and its sources. Table 1 provides descriptive statistics.

3 Specification

The ordinal nature of the credit ratings data suggests we use an ordered probit estimator to estimate the impact of corruption on creditworthiness. We first specify a reduced form model,

$$CREDITWORTHINESS_{it} = \alpha + \beta CORRUPTION_{it} + X'_{it}\gamma + \epsilon_{it}, \tag{1}$$

where i is the country index, t is the time index, X is a vector of control variables, α, β, and γ are parameters, and ϵ is an i.i.d. normal error term. We do not observe the continuous latent variable, $CREDITWORTHINESS_{it}$. Rather, we observe the ordinal variable, $RATING_{it}$, which denotes the sovereign credit rating of country i in year t. One way of interpreting the ordinal score is that it reflects that category in which the latent continuous variable falls. If there are J ratings categories, then for $j = 1, \ldots, J$,

$$RATING = j \text{ if } \mu_{j-1} \leq CREDITWORTHINESS \leq \mu_j, \tag{2}$$

where $\mu_0 = -\infty$, $\mu_{j-1} \leq \mu_j$, and $\mu_J = \infty$. If we assume the error term is normally distributed, the probability that country i has sovereign credit rating j in year t is

$$Prob(RATING_{it} = j) = \Phi(\mu_j - \alpha - \beta CORRUPTION_{it} - X'_{it}\gamma)$$

$$-\Phi(\mu_{j-1} - \alpha - \beta CORRUPTION_{it} - X'_{it}\gamma), \tag{3}$$

where $\Phi(\cdot)$ is the standard normal distribution function. We cannot separately identify α and all the cut points μ_j, so we normalize $\alpha = 0$. Applied to the specification in equation 3, maximum likelihood generates efficient estimates for β, γ, and, for $j = 1, \ldots, J$, μ_j.

4 Results

We report our base case results in Tables 3 and 4. We report the results of a variety of robustness checks in Table 5.

4.1 Base case

We are able to collect data on sovereign ratings, corruption score, GDP per capita, growth, inflation, fiscal balance, external balance, lagged default, EU membership, and trade openness for 57 countries for at least one year between 1995 and 2003, inclusive. The sample includes both developed and developing countries, as well as countries from every region of the world. Data for every country are not available for every year, so our panel is unbalanced. Rather than discard potentially valuable information by artificially limiting the sample size, we allow the sample size to vary across countries and address potential sample selection issues in our econometric analysis.

Table 2 shows the frequency with which each rating appears in the base case data. In the data, 43, 36, 40, and 41 of 57 countries have the same short term local currency credit rating, long term local currency credit rating, short term foreign currency credit rating, and long term foreign currency credit rating, respectively, throughout the sample.

We report in Table 3 the pooled ordered probit estimates of the parameters for each class of sovereign credit rating. The reported coefficients indicate the marginal effects of the independent variables on the unobserved latent variable, $CREDITWORTHINESS$. The estimates suggest that creditworthiness is negatively correlated with countries' corruption scores for all four classes of sovereign debt. Furthermore, the relationship is statistically

significant at the 1 percent level. These results support the stylized fact that sovereign credit ratings are negatively correlated with corruption scores, as we show in Figure 1.

The signs of the estimated parameters of the other explanatory variables are, for the most part, consistent with expectations. For all four types of debt, creditworthiness increases with GDP per capita and openness to trade, but decreases with the rate of inflation and a default in the previous year. Membership in the European Union only has a positive impact on debt ratings in the case of foreign currency denominated debt. Growth in GDP per capita has a positive but statistically insignificant impact on creditworthiness. We find that creditworthiness decreases with fiscal balance and, for all but short term local currency denominated debt, external balance. Previous research suggests that both fiscal balance and external balance should be positively related to creditworthiness (Butler and Fauver, 2006; Cantor and Packer, 1996; Edwards, 1984). We conjecture that our results are driven by developed countries that tend to run deficits and have negative current account balances, but also good credit ratings.[2]

Table 4 shows the direction and magnitude of the effect on the latent variable of a one standard deviation change in each continuous independent variable or a discrete change in a dummy variable. Comparing these effects to the distance between the cut points provides a sense of the qualitative, or economic, impact of each independent variable on the observed variable, $RATING$. The estimation results suggest that a one standard deviation increase in a country's corruption score causes that country's sovereign credit rating to deteriorate by almost one full rating category for all four types of debt. Furthermore, the effect is larger than the effect of a one standard deviation change in any other explanatory variable other than GDP per capita.

For each country in the sample, we also estimate, but do not report here for brevity, the effect of a one standard deviation increase in corruption on the probability of observing each

[2]There may be an endogeneity problem here – countries are able to borrow to finance deficits *because* they are creditworthy.

possible credit rating (Depken et al., 2006). For every country in the sample, an increase in its corruption score reduces its probability of getting a high rating and increases its probability of getting a low rating, all else being equal. The specific results vary by country. For example, for the U.S., a one standard deviation increase in its corruption score reduces its probability of getting the top rating in each class (A-1+ for short term debt and AAA for long term debt), and increases its probability of getting every other rating. For India, a one standard deviation increase in its corruption score reduces its probability of getting the top four short term local currency credit ratings (A-1+, A-1, A-2, A-3), the top four long term local currency credit ratings (AAA, AA, A, BBB), the top five short term foreign currency credit ratings (A-1+, A-1, A-2, A-3, B), the top five long term foreign currency debt ratings (AAA, AA, A, BBB, BB), and increases its probability of getting every other rating.

4.2 Linear Model

We report in the first row of Table 5 the pooled ordinary least squares estimates of the coefficient on corruption in equation 1. To obtain these estimates, we assign each rating category the numerical value listed in Table 2 and use this variable as a proxy for creditworthiness. Thus, the coefficients reported in the first row of Table 5 are estimates of how much creditworthiness increases when each explanatory variable changes by one unit. This approach is based on the assumption that the distance between cut points, the μ_j, is one unit of creditworthiness. The average distance between cut points estimated by the ordered probit estimator is 1.15, 1.56, 1.70, and 1.28 for short term local currency, long term local currency, short term foreign currency, and long term foreign currency ratings, respectively. Thus, the OLS estimates will slightly overestimate sovereign credit ratings' response to changes in the independent variables. However, the signs, significance, and relative magnitudes of the coefficients are similar to the ordered probit estimates.

4.3 Selection Bias

A country receives a rating from Standard and Poor's only if it so requests, thus the set of rated countries may not be a random sample of all countries. If more corrupt countries are less likely to request credit ratings, or if countries request ratings when they are becoming less corrupt, then we may underestimate the effect of corruption on credit ratings if we do not control for selection bias. However, selection bias is likely to be small for two reasons: First, Standard and Poor's has never stopped rating a country once it starts. Second, countries can raise capital either by issuing bonds or by borrowing from banks. Almost all countries that make use of bonds have a sovereign credit rating. Thus, the decision on whether or not to be rated is likely driven by capital needs rather than corruption.

Nevertheless, we report in row 2 of Table 5 the pooled ordinary least squares estimates of the coefficient on corruption after controlling for selection using the method of Heckman (1979). We identify the selection equation by including as explanatory variables whether or not a country has ever defaulted after 1975 and population. We find that the inverse Mills ratio is statistically significant at the 5 percent level for all four classes of creditworthiness, indicating that selection may bias our estimates, and that the estimated coefficient on the inverse Mills ratio is negative, suggesting an upward selection bias (towards zero) (Depken et al., 2006). However, the coefficient estimates are only slightly different than those reported for long term foreign currency denominated credit ratings in row 1 of Table 5, so the bias is relatively small.

4.4 Country-specific effects

Perhaps corruption is significant because it is highly correlated with unobserved features of countries that affect their creditworthiness, and not because corruption itself plays an important role in sovereigns' willingness and ability to repay debts. If this is the case, the stylized facts illustrated in Figure 1 are caused by some other factor. A simple test of

this hypothesis is to allow for unobserved country-specific heterogeneity by including in the reduced form model a country-specific, time-invariant random effect that is uncorrelated with the observed explanatory variables. Specifically, the reduced form model of the effect of corruption on the latent variable $CREDITWORTHINESS$ becomes

$$CREDITWORTHINESS_{it} = \alpha_i + \beta CORRUPTION_{it} + X'_{it}\gamma + \epsilon_{it},$$

where α_i is the random effect and all the other terms are as previously defined. We use a random effects ordered probit estimator to estimate the coefficients of the obvious analog to the base case model specified in Section 2. Row 3 of Table 5 presents the random effects ordered probit estimates of the corruption coefficients. Row 4 of Table 5 presents the random effects OLS estimates of the coefficients we obtain using the same numerical proxy for the dependent variable we used to obtain the pooled OLS estimates in row 1 of Table 5.

Our base case results are for the most part robust to including country-specific random effects. Specifically, we see that the effect of corruption remains negative and statistically significant for all four classes of debt.

We also allow for arbitrary correlation between the country-specific effect and the observed explanatory variables and report in row 5 of Table 5 the linear fixed effects estimates of the coefficient on corruption.[3] The coefficient on corruption has the same signs as those reported in the other specifications, but the magnitudes are different. For example, the OLS estimates of coefficients on countries' corruption scores are 3 to 12 times larger than the fixed effects estimates, and the random effects estimates are 3 to 7 times larger than the fixed effects estimates.

The differences between the fixed effects estimates and the other estimates of the coefficients reflect a stylized fact in the data. We can see from Table 1 that most of the

[3]Ideally, we would also like to estimate a fixed effects ordered probit estimates of the coefficients. However, we do not pursue this because the fixed effects ordered probit estimator is inconsistent and suffers from an incidental parameters problem (Wooldridge, 2002, p. 484).

variation in the dependent variable and many of the independent variables is between countries, not within countries. Since the fixed effects estimator throws out between country variation, there is relatively little variation for the regression to explain. Indeed, we show in the technical appendix to this paper that few of the other independent variables are statistically significant: A country's external balance and whether or not it defaulted in the previous year are statistically significant determinants of its creditworthiness for all four classes of debt. A country's openness to trade is important in determining its short term foreign currency denominated credit rating. Inflation is important in determining a country's long term foreign currency denominated credit rating. No other explanatory variables are statistically important (Depken et al., 2006).

4.5 Omitted Variables

The linear fixed effects estimates suggest that unobserved country-specific effects may be the overwhelming determinant of sovereign credit ratings and that few other factors, either macroeconomic or otherwise, play an important role. To further pursue this possibility, we expand the set of explanatory variables to control for countries' geography, natural endowments, and institutional history.

We report the estimates of the effect of corruption on creditworthiness controlling for these additional factors in rows 6 through 11 of Table 5. For the most part, adding additional controls does not seem to change the impact of corruption on creditworthiness. The exceptions are again the fixed effects estimates, which generate positive but insignificant estimates of the effect of corruption on creditworthiness for all but the long term foreign currency case. The corruption score variable is not unique in having the "wrong" sign in this specification. For example, we show in the technical appendix that the fixed effects estimates indicate that inflation has a positive and statistically significant effect on creditworthiness and that GDP per capita has a negative and statistically insignificant impact

on creditworthiness (Depken et al., 2006). Our sense from the unexpected estimates on the other control variables is that the fixed effects specification is the wrong specification. However, investigating this specification may be an important avenue for future research.

5 What is the Cost of Public Corruption?

The estimation results in the previous sections suggest that public corruption has a statistically significant impact on credit ratings for sovereign debt. Yet, the estimates themselves provide no evidence about the economic impact of public corruption in the area of sovereign debt. To address this question, we combine our results with those of other authors to make back-of-the-envelope calculations of the benefits from reducing corruption.

Sy (2001, Table 4, p. 25) estimates that a one unit increase in long term foreign currency creditworthiness causes bond spreads to decrease by about 14.6 percent. In this case, the bond spread for a country is a weighted average of the difference between the interest rates on individual bonds issued by that country and the comparable U.S. Treasury bond, controlling for the characteristics of the bond, and creditworthiness is measured on a scale from 0 to 20 (Sy, 2001). In our analysis, long term foreign currency creditworthiness is measured on a scale from 1 to 11 (see Table 2). It follows that a one unit change in creditworthiness measured by Sy is equivalent to a 0.5 unit change in creditworthiness on our scale. Thus, a one unit increase in creditworthiness, measured on our scale, corresponds to a 29 percent ($= 100(0.146)(1/0.5)$) decrease in bond spread.

We find that a one standard deviation decrease in a country's corruption scores corresponds with an increase in long term foreign currency creditworthiness by approximately one unit (Table 4), and thus causes bond spreads to fall by about 29 percent.

The average long term foreign currency sovereign bond spread in a sample of emerging market countries was 347 basis points (Ciocchini et al., 2003, Table 1, p. 507). Thus, a one standard deviation decrease in corruption score causes the bond spread to fall by about

$101(= 0.29 \times 347)$ basis points. If the annual interest rate on a U.S. 10-year treasury bond is about 6 percent, then this implies that the average interest rate on long term foreign currency denominated debt is about 9.47 percent annually and falls to 8.46 percent.

These calculations suggest that a one standard deviation decrease in corruption leads to a savings of about \$10,100 per \$1 million of debt. For example, Argentina had about \$127,687 million in debt outstanding at the end of 2003 (The World Bank, 2005, Table 4.16). Reducing corruption in Argentina by one standard deviation in 2003, to the level of Tunisia, would save approximately \$1,289 million in interest annually. In 2003, Argentina had a gross domestic product of approximately \$129,596 million (The World Bank, 2005, Table 4.2). Therefore, without accounting for the costs of reducing corruption, reducing corruption in Argentina by one standard deviation before the debt was issued might have saved as much as 1 percent of the nation's gross domestic product.

Another example is that of Chile. In 2003, Chile had approximately \$35,727 million in outstanding debt (The World Bank, 2005, Table 4.16). A one standard deviation improvement in Chile's corruption index would put that country on par with Finland, the least corrupt country in 2003. Chile would have been able to save approximately \$361 million in annual interest payments had its corruption been reduced to this level when the debt was issued. In 2003, Chile's GDP was approximately \$72,415 million. The reduced interest payments would represent about 0.5 percent of Chile's GDP.

6 Literature

Our results complement empirical evidence that corruption degrades credit ratings in a cross-section of countries (Butler and Fauver, 2006). Our results build on this evidence by verifying that the relationship remains negative after (1) controlling for selection and (2) including country-specific effects that are uncorrelated with the other explanatory variables, which requires a panel of data.

An alternative approach to measure corruption's effect on creditworthiness is to measure corruption's effect on bond spreads directly. Using this approach, Ciocchini et al. (2003, Table 4, p. 512) find that a one point increase in the CPI increases the spread on a foreign currency-denominated bond issued by an emerging market country by approximately 26 percent. The standard deviation of CPI values for the countries in their sample is about 1.5, whereas the standard deviation in our sample is 2.5, and the average sovereign bond spread for their sample is 347 basis points (Ciocchini et al., 2003, Table 1, p. 507). Thus, a one standard deviation increase in the CPI will increase the spread on the average bond by about 135 basis points. Our estimate is smaller – 101 basis points.

Estimates of corruption's effect on U.S. state and municipal debt are qualitatively similar. Both Butler (2004) and Depken and LaFountain (2006) find that corruption imposes economically significant borrowing costs on U.S. states and municipalities. Butler (2004) further points out that the magnitude of the cost varies dramatically with the institutional arrangement employed to issue a particular bond. For example, corrupt states are more likely to have credit insurance, to have a letter-of-credit backing, or to have their bonds underwritten by investment banks with good reputations. Whether sovereign countries can substitute similar third party institutions for a lack of corruption in order to signal creditworthiness to the market is an important matter for future research. This is important because sovereign debt carries no collateral or other enforceable guarantees of repayment (Eaton et al., 1986).

Our results are also consistent with a larger literature documenting that the quality of the public sector is an important determinant of a country's creditworthiness. For example, creditworthiness is a decreasing function of political instability (Brewer and Rivoli, 1990).

Estimates of corruption's effect on creditworthiness contribute to a larger literature on the economic impact of corruption. Is corruption detrimental to an economy? If so, what is the magnitude of the problem?

Micro level studies find that corruption imposes economically significant costs on businesses and households. For instance, the growth rate of sales of Ugandan firms in the mid-1990s fell by at least 3 percentage points, on average, when the fraction of sales allocated to bribes increased by 1 percent (Fisman and Svensson, 2000). The prices public hospitals in Argentina paid for inputs produced in competitive markets fell by 10 to 15 percent following a crackdown on corruption during 1996 and 1997 (Di Tella and Schargrodsky, 2003). Primary schools in Uganda received only 13 percent, on average, of grants intended to finance their non-wage expenses (Reinikka and Svensson, 2004). Approximately 18 percent of the rice intended for distribution to poor households in Indonesia in the late 1990s went missing (Olken, 2005).

These studies provide relatively precise estimates of the costs of corruption in a specific situation, but they are only partial equilibrium measures. If the corruption identified by these studies merely involves transfers of resources, then it might not have a significant aggregate economic effect.

Macro level studies suggest that the aggregate effects of corruption are negative and economically significant. For example, corruption is negatively correlated with investment (Mauro, 1995; Pellegrini and Gerlagh, 2004), productivity (Lambsdorff, 2003), education expenditures (Mauro, 1998), infrastructure quality (Tanzi and Davoodi, 2002), birth weights (Gupta et al., 2002), trade openness (Pellegrini and Gerlagh, 2004), political stability (Pellegrini and Gerlagh, 2004), and foreign direct investment and net capital flows (Lambsdorff, 2001; Wei, 2000a,b), and positively correlated with infant and childhood mortality rates and primary school dropout rates (Gupta et al., 2002). Strikingly, there is no robust evidence that corruption has a significant impact on economic growth (Svensson, 2005).

However, the quality of the data used in these macro-level studies may itself be correlated with the level of corruption. If corruption in the formal sector drives economic activity into the informal sector, but data only reflect what takes place in the formal sector, then

variables like investment and productivity will be measured with errors. Furthermore, the measurement error will be be positively related to the level of corruption. Thus, the results of many macro-level studies need to be interpreted with these issues in mind. For example, a negative relationship between investment and corruption may indicate that corruption causes total investment in a country to fall, or it my indicate that corruption causes investment to migrate from the formal sector to the informal sector, where it is not reflected in official data. While this paper and the paper by Ciocchini et al. (2003) are both macro-level studies, the link between corruption and creditworthiness via the formal sector implies that they are less likely to suffer from this problem. As a result, we may place slightly more confidence on our results that corruption has a negative and economically significant impact on a country.

7 Conclusion

The goal of this paper is to measure a cost of corruption through its impact on a country's creditworthiness. Corruption is expected to have an adverse effect on creditworthiness because it affects the size of a country's formal sector: that which can be (easily) taxed to repay debts. Moreover, the formal sector is reflected in the the data used by the majority of researchers. Therefore, the data used to test the relationships between corruption and any number of macroeconomic variables might bias estimates of corruption's true effect through systematic measurement error.

Our approach is to use a dependent variable that avoids potential measurement-error bias. Specifically, we use third-party credit ratings of four types of sovereign (national) debt (short term and long term local currency denominated debt and short term and long term foreign currency denominated debt) to measure creditworthiness. We relate perceived creditworthiness to economic "fundamentals" thought to influence the willingness and ability to repay sovereign debt, as well as the subjective measure of corruption developed by

Transparency International.

For all four types of sovereign debt, we find that creditworthiness, as reflected by credit ratings, decreases with corruption. This relationship is statistically significant and persists across a variety of different estimators. Furthermore, rough estimates suggest that the relationship between creditworthiness and corruption is also economically significant. On long term foreign currency denominated debt, the results suggest that a one standard deviation decrease in corruption would reduce a country's annual interest payment by about $10,100 per $1 million of debt. This suggests that unilateral and multilateral attempts to curb corruption, especially in developing countries, might provide positive pecuniary externalities.

Appendix

Description of the Data

Rating. Sovereign debt ratings assigned as of November 1, 2004, by Standard and Poor's. *Units*: Ordinal (AAA, AA+, etc.). *Source*: Standard & Poor's, "Sovereign Ratings History Since 1975," available at www.standardandpoors.com.

Corruption score. Ten minus the corruption score on the Corruption Perceptions Index. *Units*: Index (0=least corrupt through 10=most corrupt). *Source*: Transparency International website www.transparency.org.

GDP per capita. Real GDP per capita, calculated as follows: Real GDP per capita in year t measured in millions of 2000 U.S. dollars is $RGDP$. Nominal GDP in year t in millions of national currency units is $NGDP$. The GDP deflator for year t in millions of national currency units relative to the year 2000 is d. The exchange rate in U.S. dollars per unit of national currency in the year 2000 is r. Population in year t is POP. Then $RGDP = \frac{NGDP}{d}\frac{r}{POP}$. *Units*: Thousands of 2000 U.S. dollars. *Source*: International Monetary Fund, International Financial Statistics, April 2005.

Growth. Annual percent change in real GDP per capita. *Units*: Percent. *Source*: International Monetary Fund, International Financial Statistics, April 2005.

Inflation. Annual percent change in the consumer price index. *Units*: Percent. *Source*: International Monetary Fund, International Financial Statistics, April 2005.

Fiscal balance. Annual government budget surplus relative to GDP. *Units*: Percent. *Source*: International Monetary Fund, International Financial Statistics, April 2005.

External balance. Annual current account surplus relative to GDP. *Units*: Percent. *Source*: International Monetary Fund, International Financial Statistics, April 2005.

Lagged default. Did the country default on debt in previous year? *Units*: Dummy = 1 if yes, 0 otherwise. *Source*: Standard & Poor's, "Sovereign Defaults Set to Fall Again in 2005," available at www.standardandpoors.com.

EU membership. Is the euro the national currency? *Units*: Dummy = 1 if yes, 0 otherwise. *Source*: International Monetary Fund, World Economic Outlook, various years.

Trade openness. Absolute value of exports relative to GDP plus absolute value of imports relative to GDP. *Units*: Percent. *Source*: International Monetary Fund, International Financial Statistics, April 2005.

Default since 1975. Has the country ever defaulted on debt since 1975? *Units*: Dummy = 1 if yes, 0 otherwise. *Source*: Standard & Poor's, "Sovereign Defaults Set to Fall Again in 2005," available at www.standardandpoors.com.

Population. Country population. *Units*: Millions. *Source*: International Monetary Fund, International Financial Statistics, April 2005.

Ethnolinguistic fractionalization. Index of ethnolinguistic fractionalization. *Units*: Index (0=no fractionalization through 1=100 percent fractionalized). *Source*: La Porta et al. (1998a). As of April 11, 2006, data used in La Porta et al. (1998a) are available at http://mba.tuck.dartmouth.edu/pages/faculty/rafael.laporta/publications.html.

Latitude. Absolute value of the country's latitude normalized to the interval [0,1]. *Units*: Index (0=located at the equator through 1=located at the North or South pole). *Source*: La Porta et al. (1998a).

Democracy. Average of democracy score 1970-1994. *Units*: Index (0=least democratic through 10=most democratic). *Source*: La Porta et al. (1998a).

Legal origin. Dummy variables that identifies the legal origin of the country's commercial law as French, German, Scandinavian, or Socialist. The omitted category is English legal origin. *Units*: Dummy = 1 if yes, 0 otherwise for each possible legal origin. *Source*: La Porta et al. (1998a).

Oil. Oil production. *Units*: Thousands of barrels per day. *Source*: OPEC Annual Statistical Bulletin 2003 (Table 39, Interactive version) available at www.opec.org.

Exchange rate regime. Dummy variables that identify the *de facto* exchange rate regime. There are five possible regimes, ranging from least to most floating: Regime 1 = a country has no separate legal tender, a pre-announced peg or currency board arrangement, a pre-announced horizontal band narrower than or equal to +/- 2%, or a de facto peg. Regime 2 = a country has a pre-announced crawling peg, a pre-announced crawling band that is narrower than or equal to +/- 2%, a de facto crawling peg, a de facto

crawling band that is narrower than or equal to +/- 2%, or a pre-announced crawling band that is wider than or equal to +/- 2%. Regime 3 = a country has a de facto crawling band that is narrower than or equal to +/- 5%, a moving band that is narrower than or equal to +/- 2%, or a managed float. Regime 4 = a country's exchange rate is freely floating. The omitted category is Regime 5 = a country's exchange rate is freely falling. *Units*: Dummy = 1 if yes, 0 otherwise for each possible exchange rate regime. *Source*: Reinhart and Rogoff (2004). Data from Reinhart and Rogoff (2004) are available at http://www.publicpolicy.umd.edu/faculty/reinhart/annual1.dta as of April 11, 2006.

Countries in the sample are Argentina, Australia, Austria, Belgium, Bolivia, Botswana, Brazil, Canada, Chile, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Dominican Republic, El Salvador, Estonia, Finland, France, Germany, Greece, Guatemala, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jordan, Kazakhstan, Latvia, Lithuania, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Tunisia, Turkey, United Kingdom, United States, and Uruguay.

Table 1: Summary Statistics by Rating Class

Variable		Short term local currency Mean	S.D.	Long term local currency Mean	S.D.	Short term foreign currency Mean	S.D.	Long term foreign currency Mean	S.D.
Rating	tot	6.70	1.58	8.26	1.67	6.15	1.85	7.58	1.76
	b/w		1.63		1.59		1.82		1.63
	w/i		0.37		0.58		0.38		0.51
Corruption	tot	4.16	2.46	4.26	2.46	4.26	2.48	4.38	2.47
score	b/w		2.36		2.36		2.37		2.36
	w/i		0.37		0.38		0.39		0.40
Growth	tot	1.10	14.74	1.24	14.44	1.30	14.52	1.37	14.14
	b/w		8.17		8.11		8.13		8.11
	w/i		13.15		12.91		12.97		12.64
Inflation	tot	6.18	11.77	6.49	11.94	6.99	14.09	7.76	14.87
	b/w		11.15		11.26		12.45		12.79
	w/i		6.55		6.89		6.59		7.13
GDP per	tot	13.88	12.64	13.44	12.53	13.64	12.56	13.17	12.46
capita	b/w		11.78		11.74		11.72		11.66
	w/i		1.52		1.51		1.78		2.25
Fiscal	tot	-29.86	132.38	-30.98	135.90	-31.49	136.71	-29.81	132.87
balance	b/w		99.78		103.22		103.23		103.24
	w/i		92.81		94.24		94.85		92.06
External	tot	-0.43	2.94	-0.43	2.88	-0.42	2.89	-0.41	2.82
balance	b/w		2.44		2.42		2.45		2.42
	w/i		1.37		1.37		1.34		1.34
Lagged	tot	0.03	0.16	0.03	0.16	0.03	0.16	0.02	0.15
default	b/w		0.19		0.15		0.19		0.15
	w/i		0.11		0.13		0.11		0.13
EU	tot	0.08	0.27	0.08	0.27	0.08	0.27	0.07	0.26
membership	b/w		0.23		0.23		0.23		0.23
	w/i		0.20		0.20		0.20		0.19
Trade	tot	0.77	0.36	0.76	0.37	0.76	0.37	0.75	0.37
openness	b/w		0.39		0.38		0.38		0.38
	w/i		0.07		0.07		0.07		0.08
Obs.		299		314		310		329	
Groups		57		57		57		57	

Table 1: Summary Statistics by Rating Class

		Short term local currency		Long term local currency		Short term foreign currency		Long term foreign currency	
Variable		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Ethnolinguistic	tot	0.20	0.21	0.23	0.23	0.22	0.22	0.23	0.24
fractionalization	b/w		0.23		0.23		0.23		0.23
	w/i		0.00		0.00		0.00		0.00
Latitude	tot	0.43	0.18	0.41	0.19	0.42	0.19	0.41	0.19
	b/w		0.19		0.19		0.19		0.19
	w/i		0.00		0.00		0.00		0.00
Democracy	tot	6.98	3.47	6.92	3.47	7.07	3.34	6.80	3.47
	b/w		3.57		3.57		3.57		3.57
	w/i		0.00		0.00		0.00		0.00
French	tot	0.42	0.49	0.42	0.50	0.40	0.49	0.43	0.50
legal origin?	b/w		0.51		0.51		0.51		0.51
	w/i		0.00		0.00		0.00		0.00
Socialist	tot	0.08	0.27	0.07	0.26	0.07	0.25	0.07	0.26
legal origin?	b/w		0.25		0.25		0.25		0.25
	w/i		0.00		0.00		0.00		0.00
German	tot	0.08	0.27	0.08	0.27	0.08	0.27	0.07	0.26
legal origin?	b/w		0.25		0.25		0.25		0.25
	w/i		0.00		0.00		0.00		0.00
Scandinavian	tot	0.14	0.34	0.13	0.33	0.13	0.34	0.12	0.33
legal origin?	b/w		0.31		0.31		0.31		0.31
	w/i		0.00		0.00		0.00		0.00
Oil	tot	587.42	1293.50	586.43	1257.11	568.98	1263.02	565.44	1230.00
	b/w		1123.30		1123.56		1126.13		1123.53
	w/i		70.61		68.97		65.91		67.20
Exchange rate	tot	0.33	0.47	0.31	0.46	0.31	0.46	0.30	0.46
regime #1	b/w		0.44		0.43		0.43		0.43
	w/i		0.17		0.18		0.19		0.19
Exchange rate	tot	0.23	0.42	0.24	0.43	0.26	0.44	0.26	0.44
regime #2	b/w		0.42		0.42		0.42		0.42
	w/i		0.19		0.21		0.19		0.21
Exchange rate	tot	0.30	0.46	0.29	0.46	0.29	0.45	0.29	0.45
regime #3	b/w		0.40		0.40		0.41		0.40
	w/i		0.18		0.18		0.18		0.19
Exchange rate	tot	0.11	0.32	0.12	0.32	0.11	0.31	0.11	0.32
regime #4	b/w		0.31		0.29		0.31		0.28
	w/i		0.06		0.09		0.06		0.09
Obs		221		236		230		249	
Groups		47		47		47		47	

Table 2: Distribution of Credit Ratings

	Short-term local currency denominated		Short-term foreign currency denominated	
Rating	Freq.	Percent	Freq.	Percent
1=D	0	0.0	0	0.0
2=SD	2	0.7	2	0.7
3=R	0	0.0	0	0.0
4=C	7	2.3	10	3.2
5=B	32	10.7	82	26.5
6=A-3	24	8.0	40	12.9
7=A-2	56	18.7	19	6.1
8=A-1	29	9.7	25	8.1
9=A-1+	149	49.8	132	42.6
Total	299	100.0	310	100.0

	Long-term local currency denominated		Long-term foreign currency denominated	
Rating	Freq.	Percent	Freq.	Percent
1=D	0	0.0	0	0.0
2=SD	3	1.0	3	0.9
3=R	0	0.0	0	0.0
4=CC	0	0.0	1	0.3
5=CCC-, CCC, CCC+	0	0.0	3	0.9
6=B-, B, B+	13	4.1	24	7.3
7=BB-, BB, BB+	26	8.3	75	22.8
8=BBB-, BBB, BBB+	64	20.4	55	16.7
9=A-, A, A+	54	17.2	45	13.7
10=AA-, AA, AA+	51	16.2	70	21.3
11=AAA	103	32.8	53	16.1
Total	314	100.0	329	100.0

Table 3: Ordered Probit Estimates

	Dependent variable: Credit rating			
Independent variable	Short Term Local Currency	Long Term Local Currency	Short Term Foreign Currency	Long Term Foreign Currency
Corruption score	-0.41^{**}	-0.48^{**}	-0.69^{**}	-0.40^{**}
	(0.11)	(0.08)	(0.10)	(0.06)
Growth	0.00	0.01	0.01	0.00
	(0.01)	(0.00)	(0.01)	(0.00)
Inflation	-0.02^{**}	-0.02^{**}	-0.03^{**}	-0.03^{**}
	(0.01)	(0.01)	(0.01)	(0.01)
GDP per capita	0.19^{**}	0.13^{**}	0.14^{**}	0.12^{**}
	(0.04)	(0.02)	(0.02)	(0.02)
Fiscal balance	-0.01^{**}	-0.01^{**}	-0.01^{**}	-0.00^{**}
	(0.00)	(0.00)	(0.00)	(0.00)
External balance	-0.01	-0.07^{**}	-0.09^{**}	-0.05^{**}
	(0.02)	(0.02)	(0.02)	(0.02)
Lagged default	-1.44^{**}	-1.24^{**}	-1.37^{**}	-1.36^{**}
	(0.35)	(0.34)	(0.48)	(0.40)
EU membership	0.60	0.34	2.77^{**}	1.80^{**}
	(0.64)	(0.32)	(0.87)	(0.27)
Trade openness	0.98^{**}	0.90^{**}	1.33^{**}	0.81^{**}
	(0.23)	(0.17)	(0.22)	(0.15)
μ_1^a	-4.82	-5.93	-7.25	-4.94
	(0.96)	(0.82)	(0.95)	(0.74)
μ_2	-3.65	-4.65	-5.86	-4.80
	(0.91)	(0.69)	(0.90)	(0.74)
μ_3	-2.15	-3.58	-2.83	-4.47
	(0.88)	(0.67)	(0.79)	(0.67)
μ_4	-1.52	-2.15	-1.58	-3.13
	(0.85)	(0.63)	(0.75)	(0.58)
μ_5	-0.16	-0.66	-0.72	-1.35
	(0.82)	(0.59)	(0.73)	(0.57)
μ_6	0.93	1.87	1.23	-0.08
	(0.78)	(0.55)	(0.73)	(0.55)
μ_7	–	–	–	1.98
	–	–	–	(0.60)
μ_8	–	–	–	4.07
	–	–	–	(0.67)
Year effects?	Yes	Yes	Yes	Yes
N	299	314	310	329
Percent correctly predicted	46.7	51.2	57.9	46.5
Log-likelihood	-212.81	-250.12	-176.14	-308.18
Pseudo R-squared	0.51	0.52	0.62	0.49

Maximum likelihood estimation.
Robust standard errors in parentheses.
* Significant at the 5 percent level. ** Significant at the 1 percent level.
^{a} Ratings categories for which there are no observations are ignored. For example, Table 2 shows that there are no countries in the sample with a short term local currency denominated credit rating of R. Thus, μ_1 is the boundary between values of the latent variable that generate a rating of SD and a rating of C.

Table 4: Estimated Impact of Explanatory Variables on Creditworthiness

Independent variable	Short Term Local Currency	Long Term Local Currency	Short Term Foreign Currency	Long Term Foreign Currency
Corruption score	-1.00	-1.18	-1.71	-1.00
Growth	0.04	0.07	0.12	0.04
Inflation	-0.20	-0.26	-0.38	-0.50
GDP per capita	2.34	1.62	1.78	1.50
Fiscal balance	-0.39	-0.72	-0.90	-0.56
External balance	-0.03	-0.19	-0.26	-0.15
Lagged default	-0.01	-0.07	-0.09	-0.05
EU membership	0.60	0.34	2.77	1.80
Trade openness	0.36	0.34	0.50	0.30
$\mu_2 - \mu_1$	1.18	1.28	1.39	0.14
$\mu_3 - \mu_2$	1.50	1.07	3.02	0.33
$\mu_4 - \mu_3$	0.63	1.43	1.26	1.34
$\mu_5 - \mu_4$	1.36	1.49	0.86	1.78
$\mu_6 - \mu_5$	1.09	2.53	1.95	1.27
$\mu_7 - \mu_6$	–	–	–	2.06
$\mu_8 - \mu_7$	–	–	–	2.09
Average difference	1.15	1.56	1.70	1.29

Table 5: Other Estimates of the Effect of Corruption on Creditworthiness

Coefficient Estimate
(Robust Standard Errors in Parentheses)

	Dependent Variable: Sovereign Credit Rating			
	Short Term Local Currency	Long Term Local Currency	Short Term Foreign Currency	Long Term Foreign Currency
Base case set of controls:				
OLS	-0.33^{**}	-0.31^{**}	-0.43^{**}	-0.26^{**}
	(0.04)	(0.03)	(0.03)	(0.04)
Heckman Selection	-0.22^{**}	-0.26^{**}	-0.35^{**}	-0.24^{**}
	(0.08)	(0.05)	(0.07)	(0.04)
Random Effects Ordered Probit[a]	-0.52^{**}	-0.87^{**}	-0.84^{**}	-0.86^{**}
	(0.20)	(0.14)	(0.17)	(0.12)
Random Effects	-0.19^{**}	-0.28^{**}	-0.33^{**}	-0.27^{**}
	(0.05)	(0.05)	(0.04)	(0.05)
Fixed Effects	-0.03	-0.10	-0.06	-0.06
	(0.06)	(0.09)	(0.06)	(0.07)
Full set of controls:[b]				
Ordered Probit	-1.04^{**}	-0.82^{**}	-0.66^{**}	-0.77
	(0.19)	(0.11)	(0.12)	(0.09)
OLS	-0.37^{**}	-0.38^{**}	-0.39^{**}	-0.36^{**}
	(0.05)	(0.05)	(0.05)	(0.05)
Heckman Selection	-0.35^{**}	-0.38^{**}	-0.38^{**}	-0.37^{**}
	(0.05)	(0.05)	(0.04)	(0.04)
Random Effects	-0.15^{**}	-0.34^{**}	-0.17^{**}	-0.31^{**}
	(0.05)	(0.06)	(0.05)	(0.05)
Fixed Effects	0.07	0.02	0.04	-0.01
	(0.04)	(0.08)	(0.05)	(0.07)

* Significant at the 5 percent level. ** Significant at the 1 percent level.
[a] To estimate the parameters for long term foreign currency denominated debt ratings, we collapse the lowest five ratings categories, CCC, CC, R, SD, and D, into one "bin" because the small number of countries with these ratings caused problems with the estimation procedure.
[b] Controls include ethnolinguistic fractionalization, latitude, democracy, legal origin dummy variables, oil, and exchange rate regime dummy variables, as well as the controls in the base case estimates.

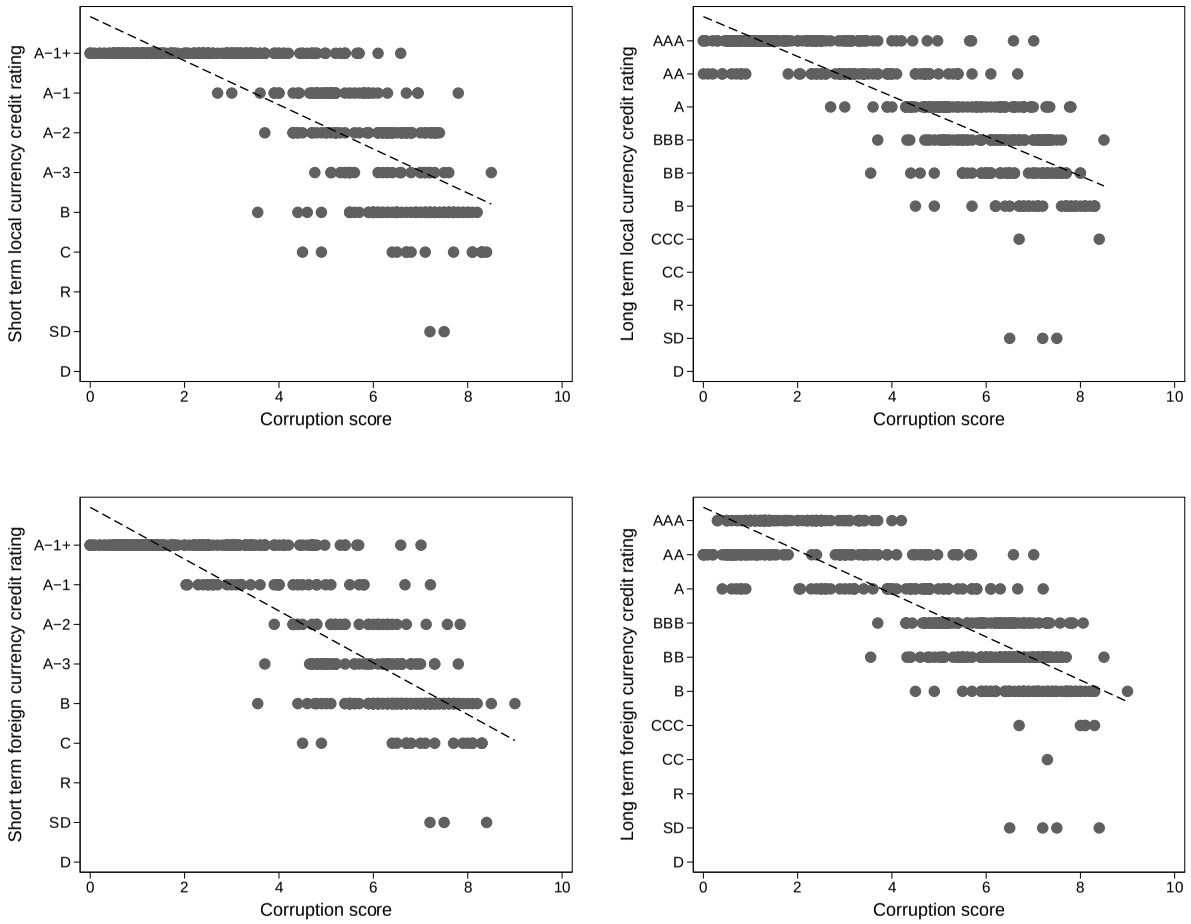

Figure 1: Sovereign credit rating vs. corruption score.

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