Whither Corruption?
An Econometric Survey*

Nauro F. Campos
Brunel University, CEPR and IZA
nauro.campos@brunel.ac.uk

Ahmad Saleh
Brunel University
ahmad.saleh@brunel.ac.uk

This Draft: March 2008

This draft was prepared for presentation at the CSAE March 2008 Conference (Oxford) and the March 2008 Annual Conference of the Royal Economic Society (Warwick)

Very Preliminary
Please Do Not Cite, Quote or Distribute
Without the Authors' Permission

Abstract: This paper offers a comprehensive quantitative evaluation of the econometric literature on the macroeconomic effects of corruption, that is, on whether corruption "greases or sands the wheels of growth." We use data on 465 estimates of the effect of corruption on economic growth, from 41 different econometric studies, to carry out an econometric survey focusing on whether differences in estimation, measurement and specification affect the significance and magnitude of the corruption effect. Paying special attention to publication bias, we find that although this bias is indeed severe, there is sufficient evidence of a genuine negative corruption effect. Moreover, we find that studies written by authors in academia, with more degrees of freedom, using fixed-effects, controlling for human capital and using the Transparency International index are systematically less likely to report a negative and significant effect of corruption on growth.

JEL Classification: O11, P21, C49

* We would like to thank seminar participants at Brunel University for valuable comments on a previous version. All remaining errors are our own.

1. Introduction

In the last two decades or so, corruption became a major topic in mainstream economics. A large number of theoretical models have been constructed and they have been accompanied by an equally large number of empirical analyses trying to assess the economic determinants and, even more frequently, the economic consequences of corruption. Our main objective in this paper is to evaluate this vast body of econometric evidence. The underlying debate is whether corruption "greases or sands the wheels of commerce" and, in our case, whether it helps or hinders economic growth.

In this paper we use meta-analysis and meta-regression analyses (hereafter MRA) to investigate the relationship between the corruption and economic growth (GDP per capita growth rates). MRA has been widely used in economics despite being a relatively new technique. In environmental economics, Florax (2002) reviews 40 meta-regression studies (mostly on pollution valuation) published since 1980. It has also been used extensively in labour economics: Card and Krueger (1995) use MRA to assess the evidence on minimum wages, Stanley and Jurrell (1998) use it to evaluate that on gender wage differentials in the United States, while Ashenfelter et al. (1999) use MRA to investigate the robustness of the evidence on returns to education.[1] In international macroeconomics, Rose (2004) uses MRA to evaluate the evidence on the effects of currency unions on international trade, Fidrmuc and Korhonen (2006) to assess that on business cycle synchronisation, and Égert and Halpern (2006) to appraise that on equilibrium exchange rates. In this paper, we apply MRA to the econometric evidence on reform and growth.[2] MRA complements rather naturally a long and

---

[1] Jurrell and Stanley (1990) use MRA to evaluate the evidence on the union/non-union wage gap, Weichselbaumer and Winter-Ebmer (2001) to assess that on gender wage differentials across countries, and Doucouliagos (1995) uses it to take stock of the econometric evidence on worker participation. In public finance, MRA has been used to assess the impact of tax policies (Phillips and Goss, 1995) and to evaluate econometric findings on the Ricardian equivalence (Stanley, 1998).

[2] In comparative economics, Djankov and Murrell (2002) use MRA to assess the empirical evidence on enterprise restructuring. Havrylyshyn (2001) provides a review of the relationship between reform and growth but we are unaware of any MRA study of this issue.

important stream of evaluative work in the growth literature of which Levine and Renelt (1992) is one fulcral contribution (see Durlauf et al., 2006). While the objective of this evaluative work is to establish *which* variables are more or less robustly related to economic growth, MRA throws light on the main reasons *why* a given variable (or set of variables) is more or less robustly related to economic growth and that is why these are perfect complements.

A dataset of econometric studies was constructed for this paper, including journal articles and working papers. We put together a data set comprising 465 coefficients of the effect of corruption on economic growth from 41 different empirical studies (these are listed in Appendix 2). We use this data set to carry out an econometric survey: to try to quantitatively understand the effects of differences in estimation methods and econometric specification on the significance and magnitude of the effect of corruption on growth.

We pay special attention to the possibility of publication or reporting bias and to potentially important measurement issues uncovered by recent research (namely the differences between subjective and objective measures of corruption). On the former, one important use of Meta analysis is to identify the existence of publication bias which emerges when there is an explicit or implicit preference by the part of authors and journal editors for statistically significant results (Stanley, 2005). This publication (or reporting) bias may well cover the real effect. Accordingly, this paper investigates publication bias in this literature using a variety of tests and techniques recently developed for this purpose and studies the effects of corruption on economic growth through the available econometric papers.

Our second issue regards measurement. Corruption is often defined as misuse of power by public officials for private gain. Thus one should expect enormous difficulties in measuring corruption, as it broadly viewed as illegal behaviour and against the law. Measures of corruption depend mostly on subjective data collected via questionnaires, interviews, polls of experts from different countries, and for different organizations. The most used indicators of corruption surveyed in our database, ICRG, CPI, and CTC are constructed from subjective data (Svensson, 2005). These subjective data are considered excellent source for measuring this clandestine variable as corruption is illegal and in general unobservable. Many other indexes other than corruption use subjective data. Moreover, whether data is subjective or objective, there will still measurement error. It is hardly to find a complete and precise measure of corruption[3]. Our main finding is that although publication bias is severe, there seems to be a true strong negative effect of corruption on growth. Importantly, we find among the main explanations for this effect's direction and significance that studies with more degrees of freedom, not using fixed-effects, without authors in academia, that do not control for human capital and not use the Transparency International index are more likely to report a negative and significant effect of corruption on growth.

The paper is organized as follows: section 2 provides details on the dataset we construct to carry out our econometric survey. In Section 3 we deal with publication or reporting bias and whether or not a genuine effect of corruption on economic growth can be said to exist. Once we find satisfactory evidence for such an effect, the next task is to assess what factors are responsible for its variation across studies. Therefore, Section 4 puts forward a multinomial logit model that is used to discuss the underlying determinants of the relationship between the corruption and economic growth. We focus on features of the econometric specification used, of the measurement of corruption and of the econometric methodology used. Section 5 concludes.

[3] See Kaufman, Kraay, and Mastruzzi (2006).

2. What does the evidence about corruption and growth say?

The data set we put together for this paper comprises 41 papers. The criteria we used to include papers in our study were the following. In order to be included, a paper have to econometrically study the relationship between corruption and economic growth across countries, to report regression coefficients and their t-values or standard errors in addition to the number of observations and enough information so that we can create the additional explanatory variables described below (such as details of the estimator being used). We decided to exclude studies that deal with only one country, studies that focus on the effect of corruption on various macro-economic variables other than economic growth, such as FDI, investment, inflation, government expenditure, aid and income inequality.

At the time of writing, twenty of the papers in our dataset are published in academic journals, while the rest are still working papers. These 41 papers contain a grand total of 465 reported empirical estimates of the effect of corruption on growth which for present purposes are defined as observations. Nine of these working papers were written during the period 2005-2007 and they contain 180 observations which account for 75.95% of the observations from working papers and 38.7 % of the whole dataset. We also decided to include all reported regression results from each study as opposed to select one set of results as representative or preferred (this is because very few authors single out a set of results).

Figure 1 plots the histogram for the t-values of all corruptions' coefficients on economic growth we collected. The mean t-value for the corruption effect on economic growth is -1.35 with standard deviation 2.59, and the skewness/kurtosis test suggests that these are not normally distributed. The null hypothesis is that the variable is normally distributed and it is It is rejected for χ^2 = 22.26 with p=0.000. Moreover, when focusing only on journal papers (mean t-value is -1.43) the null is rejected for χ^2 =23.92 and p=0.000.[4] Interestingly, however, we accept the null when focusing solely on working papers (mean t-value is still below 1.96, now at -1.33), with χ^2 = 4.88 and p= 0.0871. That is, for working paper we can not reject the null that the distribution of these t-ratios is normally distributed.

{Insert Figure 1 about here}

Often, subjective data are used to measure corruption, which is often collected via interviews and questionnaires. Some scales use low values to indicate low corruption and high values indicate high corruption. While, some measures use low values to indicate high corruption, and low values indicate low corruption. For example, ICRG is ranked from 0 to 6, with 6 indicating no corruption while 0 indicates the existence of severe corruption, while the CTC index is ranked from -2.5 to +2.5, with -2.5 indicating severe corruption and +2.5 is better situation of less corruption. Some papers rescale and invert the original values to be consistent with the first rank, the higher values the higher the corruption. For this paper, we invert the origin sign to be also consistent with the same criteria so higher values indicate more corruption and the central hypothesis we hold is that corruption is harmful for economic growth.

Following Babetskii and Campos (2007), the explanatory variables are classified into three categories: methods, measurement, and specification. As shown in Table 1, features of the **econometric method** are captured by general features of each empirical study such as number of observations, number and types of explanatory variables, degrees of freedom, the current author affiliation (whether or not in academia), etc. The average number of explanatory variables used in our studies is 6 and ranges from 1 to 20 with standard deviation 3. The average degrees of freedom are 101 and ranges from 0 to 1498 with a standard deviation of 172. Dummy variables are created that take the value of 1 if the coefficients

[4] The STATA (sktest) command presents skewness-kurtosis test for normality which provide a test upon the combination of skewness and kurtosis tests.

originate from a cross sectional model (0 if panel model used), if fixed effects are used (0 otherwise), if an attempt to control for endogenity bias is used (0 otherwise), if the focus of the paper is exclusively one region (0 otherwise), and if the paper has been published in an academic journal (0 otherwise). A mid point of the time period each econometric study covers is calculated to try to capture short run and long run effects.

Authors in academia wrote 25 of the papers in our sample providing 378 estimates which present 82% of the total. The regressions for only one region represent just 36 observations and 7.74% of the total. Slightly more than half of the estimates in our data set were obtained using cross sectional data (54%), while the rest used panel data. Endogenity was controlled in 151 regressions which account for 32.47% of the total (these are studies using2SLS, 3SLS, and GMM techniques). Moreover, fixed effects or country dummies were used in 160 regressions form 34.41% of the total. Half of estimates are reported in journals 49.03% with the rest still in working papers.

{Insert Table 1 about here}

In terms of **measurement**, dummy variables are created to try to control for the differences in the corruption measures used in each study/regression. Table 2 shows the use of different measures of corruption. The most widely used are from Transparency International which issues the Corruption Perception Index (CPI)[5] which has been used in almost 36 percent of the cases, in 165 estimations. The index is available since 1995 and covers 150 countries. The CPI Score is base on perceptions of the degree of corruption as judged by business people and country analysts, and ranges from 10 ("highly clean") and 0 ("highly corrupt"). The second most common measure of corruption is that from the ICRG[6], which is used by about 28% of the regressions in our sample (130 cases). This index is issued by International Country Risk Guide and has a scale for corruption under theirs economic risk

[5] For more details see http://www.transparency.org/policy_research/surveys_indices/cpi
[6] See International Country Risk Guide Methodology, PRS group.

index in which low values indicate high corruption. The index starts in 1984, with monthly frequency. The COMB variable captures the existence of a mixture of different measures constructed by different organizations (WB[7], ICRG, and TI). It was used in 16 cases representing 3.44% of our sample. CTC stands for Control of Corruption and used in 45 cases accounting for 9.68% with mean value. CTC ranges from -2.5 (worst) to +2.5 (best) that higher rank is better condition for the country CTC is one of six indexes of governance measures[8]. It is a perception measure defined as the exercise of public power for private gain. WB variable captures the measures and indexes of corruption constructed either by World Bank or via World Bank data such the papers in the footnote 7. While, CTC is one of the governance indexes measuring corruption on the above scale Finally, OTHER[9] is a variable constructed for the case that the paper uses other corruption measures not covered by the above categories. It occurs in 94 cases accounting for 20% of our sample. Moreover, a dummy variable is constructed to show if the dependent variable refers to GDP growth rates or GDP level.

{Insert Table 2 about here}

In terms of the potential **econometric specification** issues, our interest is driven by the identification of potential channels through which corruption may affect economic growth. To this end, a dummy variable was constructed taking the value of 1 if trade or a trade openness variable is included in the model (0 otherwise), if institutional variables are included in the model (0 otherwise), and the same for human capital, investment, political institutions (or democracy), and governmental expenditure or consumption. Trade or openness variables are included 149 times in the regressions presenting 32% of our sample. Different institutional quality variables are used in 43 estimations accounting for 9.25% of the total. Human capital

[7] This measure was used in 13 times paper of our data set, for instance Rock and Bonnett (2003) and Fitzsimons (2003.)
[8] See Kaufmann, Kraay, and Mastruzzi (2003).
[9] See for example, Li, et al. (2000) which uses this corruption data from IRIS.

or population variables are used in 337 studies, that is in 72.63% of the results in our sample. Investment is included in 155 estimations (33.3% of the cases) while political institutions (or democracy) are included 84 times, that is, in 18% of our dataset. Government spending or consumption is included 185 times (in about 40% of our sample). Finally, we also create a dummy variable for whether initial conditions are included in the model specification. Initial conditions included in 361 regressions presenting 77.63% of the sample

Regarding different regions, a series of dummy variables are created that takes the value of 1 if the coefficient of corruption on growth come from a regression which contains transition countries (0 otherwise), idem for LAC, MENA, ASIA, AFR, and OTHERS. This is different from above as here the focus is on the sample composition not on whether it only included a single region.

Exploring theses effects of corruption in different regions and countries is important. Transition countries were included in 401 regressions accounting for 86% of the total. Latin American countries included 430 times representing 92.5% of the total. Middle East and North African countries were included in 401 regressions representing 86% of the total. Asian countries were used 431 times (92.7%) and African countries were included in 424 estimations (91% of the total). The variable OTHERS is used for estimations containing other regions such as OECD (used 403 times accounting for 86.7% of the total). Finally, corruption effects on growth were measured in 14 regressions by composite indicators which were captured by a dummy variable (INCLUDED) with mean value 0.03 and standard deviation 0.17.

{Insert Table 3 about here}

In summary, according to our data set, a typical or normal piece of research in this area would be written by academic authors that our dataset determines in average that 0.82 of papers done by them. The suitable average period for studying the corruption effects is nine and half years. Controlling for endogenity or including country dummy or fixed effects is not much relevant that in average 0.65 and 0.67 of regressions did not do that respectively. While, it is indifferent either panel or cross-section data were used. Among the various indicators and measures of corruption it is better to employ TI (CPI) that in average used 0.35. Moreover, big sample including different regions and countries sounds better that in average 0.81 of estimates did it. Finally, human capital in average used 0.73 showing its importance in studying corruption economic growth nexus, while institutions play a minor role that in average used 0.09.

3. How severe is publication or reporting bias?

There are different methods for detecting publication bias and investigating whether a genuine effect exists in a body of evidence.[10] Stanley (2005) notes that "the association of publication bias and sample size forms the basis of several approaches to publication selection identification and correction" (p.311). In this section we first describe some of the main methods available to identify reporting bias and then apply them to our data.

Meta regression analysis (MRA) is employed to investigate publication bias. It starts with a simple model by regressing the effect estimate such as a regression coefficient in our case on its standard error which yields equation (1).

$$effect_i = B_1 + B_0 Se_i + \varepsilon_i \qquad (1)$$

The estimated effects will vary randomly around the true effect when there is no publication bias (Stanley, 2005). In order to overcome the heteroscedasticity in equation (1), the variables were divided by their relevant standard errors which generate the funnel asymmetry test (FAT) as shown in equation (2), and can be estimated by OLS.

$$t_i = B_0 + B_1 (1/Se_i) + \varsigma_i \qquad (2)$$

[10] Stanley (2005) provides a comprehensive review of the meta-analysis methods to detect the genuine effect beyond publication bias.

The dependent variable now is t-statistics for the effect .The constant is used to test for publication bias that is said to be present if the value of the constant term is not zero. The inverse of the standard error could be replaced by the square root of sample size or degrees of freedom to help reduce the bias in FAT due to low power which may also be compensated by using a lower significance level, say 10% (Egger et al ,1997). Another way to correct the bias is to employ instrumental variables such as square root of degrees of freedom, yet the correlation between these variables should be high[11].

The slope coefficient for the inverse of standard error could be used to test the existence of a genuine effect. In this case, it is called PET (precision effect test). Stanley (2008) develops a Heckman meta-regression method in which the coefficient of the inverse of the standard error estimates the magnitude of the genuine effect corrected for publication bias. That is,

$$t_i = B_0 Se_i + B_1 (1/Se_i) + v_i \qquad (3)$$

Another widely used test is the Meta Significance Test (MST). MST results from running the natural logarithm of the absolute value of the t-statistic on the natural logarithm of the degree freedom. When there is a genuine effect, the value of the regression slope coefficient should be precisely one-half.

Doucoligagos (2005) adopts funnel plots for detecting the presence of publication bias on the relationship between economic freedom and economic growth. The funnel plot compares the effect size (partial correlation) with a measure of precision (SE, sample size). Asymmetry in the funnel plot is considered as evidence of publication bias. Moreover, he applied meta-regression analysis using meta significant test (MST) which regresses the natural logarithm of the absolute value of the t-statistic on the natural logarithm of the degree

[11] The correlation between the moderator (Se) in equation (2) and square root of degrees of freedom as an instrumental is -0.0340, so we don't apply this correction. However, the constant value in our case is -.66 (p=0.004) which is negative and significant, indicating the existence of publication bias.

freedom, if the coefficient of the latter variable is > 0 it indicates the existence of genuine effect, if <0 it refers to publication bias, and if 0< and <0.5 it shows the existence of both. More precisely, when the value of the coefficient is exactly equal to 0.5 this means the existence of a "real" effect without publication bias. He also applies the funnel asymmetry test (FAT) which run the t-statistic on the inverse of the standard error, if the publication bias is present then the intercept of this regression should be statistically significant.

Mookerjee (2006) test for publication bias on the relationship between exports and economic growth. Firstly, by running a OLS regression of the log of the absolute value of the t-ratio on the log of the square root of degrees of freedom (SRDF), and testing the hypothesis that the coefficient on SRDF if equal to one. The rejection of this hypothesis indicates the existence of publication bias. Secondly he estimates regressions of the coefficient of the export variable (COEFF) on its standard error (SE) in which statistical significance raises the suspicion that publication bias is severe.

Funnel plot draws the effect size (regression estimates) against its precision (standard error). Symmetry is taken as evidence of the absence of publication or reporting bias. Figure 2 plots the estimated effects of corruption and their standard errors showing asymmetrical shape of the scatter which is considered an evidence of publication bias.[12] Figure 3 shows another funnel plot but now using t-values against DF. It again shows asymmetry. According to Galbraith plots (figures 4 and 5) a scatter diagram of the standardized effect (t-value) against its accuracy (1/SE)[13] show that there are real effects.

The meta-bias routine in STATA using Egger test (weighted regression) to decide if the intercept value is equal to zero or not when regressing the standardized effect on its precision.· For our dataset, this shows that the bias coefficient is -1.42 and t-value -11.79

[12] Outliers are excluded that all estimated coefficients under -10 omitted, there are 3 observations with very high values (two observations in Dreher and Herzfeld (2005), and one in Toatu (2004).
[13] Galbraith plot shows that "when there is no genuine effect; the points should be randomly distributed around zero, with no systematic relation to precision" (Stanley 2005, p.318).

(p=0.000) leading to reject the null that there is no bias. Figures 6 and 7 confirm the existence of publication bias. Figure 6 show asymmetrical distribution, while Figure 7 plots the standardized effect against its precision, and provides a regression line with a confidence interval. If zero is out of the confidence interval, it might be evidence of publication bias which is our case in figure 7.

The FAT test regresses the t-statistics on the inverse of its standard error. It can be expressed as equation (2). This test considers the t-value of the constant as evidence of publication bias. If the null $B_0 = 0$ is rejected, it would be indication of publication bias. The constant value is -1.4 (p-value=0.000) so we can reject the null, and confirm the publication bias in the literature of corruption effect on economic growth. Moreover, the sign of the constant refers to the direction of bias. The test here show a negative sign of the constant confirming that the literature of corruption largely tends to report the negative results.

The PET test run also equation (2), testing the null $B_1 = 0$ in order to provide information on the existence of a genuine effect. If the null hypothesis is rejected, a real effect exists. In our case, the slope coefficient is statistically insignificant with very low value 0.0000463 (p-value= 0.158) and so we accept the null of no real effect existence. This result is contradicted by MST. When replacing the inverse of standard error by the square root of degrees of freedom the result is associated with MST and FAT that the constant and the slope are statistically significant. -.0838671 (p-value= 0.000), -.6575182(p-value= 0.004) respectively. Notice that MST is affected by publication bias which makes it less powerful.

MST sets out that the existence of a genuine effect between two variables, in our case corruption and economic growth, leads to a positive relationship between the natural logarithm of the absolute value of the t-statistic and the natural logarithm of degrees of freedom (Stanely, 2005). This relationship can be presented in the following regression

$$\ln|t_i| = a_0 + a_1 \ln df_i + \varepsilon_i \qquad (4)$$

Testing the null hypothesis of $a_1 \le 0$. If the null rejected, a genuine effect exists. Columns 1 and 2 in table 4 report positive and significant coefficients of the logarithm of degrees of freedom with 0.144(t=2.54) and 0.144(t=2.68) respectively. This confirms the existence of a genuine effect.

Columns 3 and 4 show multivariate MST results[14]. We add all explanatory variables, in tables 1, 2 and 3, and keep the significant results at 5% significance level. The effect between corruption and economic growth is still positive and significant in column (3) 0.121(t=2.68), but is less clear when using bootstrap for standard errors in column (4) 0.118(t=-.196)

Moreover, Stanley (2005) points out that if $0 \le a_1 \le 1/2$ it would be evidence of publication bias. All results in table 4 confirm the existence of publication bias. In columns 1 and 2, we regress only the logarithm of degrees of freedom and find that its coefficient is 0.144 which is in the 0-0.5 range. Also, columns 3 and 4 show the result for multivariate regressions: the coefficient value of the logarithm of degrees of freedom is 0.121 and 0.118 for columns 3 and 4. Both of them are positive and significant indicating the existence of publication bias.

{Insert table 4 about here}

For more analysis of publication bias, and for robustness of findings, we use the mean, median, and 10th percentile estimates for each of the effects in our data set. Table 5 shows fixed and random meta-analysis estimates. Fixed-estimates method assumes that there is only one effect through each study, or in other words, it indicates no heterogeneity across studies. It uses the inverse variance for each estimate as a weight. The random-estimates method assumes the possibility of existence of more than one effect within each study and between studies. Moreover, both fixed and random estimates assume that the observations are

[14] See Doucouliagos (2005), Doucouliagos and Paldam (2006), and Stanley (2005)

independent, meaning that the estimates will be more reliable when using one estimate from each study (Abreu et al, 2005).

{Insert table 5 about here}

Table 5 show meta-analysis of corruption effect on growth applied for the whole set and for the individual estimates.[15] Whether the fixed or random method is used, all estimates are negative. Moreover, the upper and lower bounds of 95% of the confidence interval are reported. It is obvious that all bounds are either zero or negative indicating a negative corruption effect on growth. The fixed estimate for the whole set is zero; it might refer to no effect of corruption on economic growth. Moreover, meta-estimates are bigger than the mean values which mean that the true effects may be understated.[16]

The Q test of heterogeneity for all of the above individual meta analyses estimates show a clear rejection for the null of homogeneity in that all tests are significant. Q =311.7 (p-value= 0.000), 2.4(p-value=0.000), 325.9(p-value=0.000) for mean, 50th percentile, and 10th percentile.[17]

The funnel graphs in figures 8 and 9 demonstrate publication bias in that asymmetry can be easily detected visually. Figure 8 plots the individual estimates using the mean value for each study against their standard errors, while figure 9 uses the median individual estimates showing the asymmetry of the distribution of the observations as evidence of the bias.

{Insert figures 8 and 9}

---

[15] We use the meta routine in STATA.

[16] Except for 10th random estimate (-1.2). Generally, the estimates in smaller percentiles are lower.

[17] Table A1 states the heterogeneity of 16 single studies. Moreover, tables A2 and A3 show the fixed effect estimates when studies are omitted one by one, allowing investigating the influence of each study on the overall meta-analysis. All the confidence bounds are negative.

We also run the Egger test[18] for further investigation of publication bias and existence of a genuine effect. The bias coefficients are significant for mean estimates -1.69 (p=0.000) and for median individual estimates -1.8 (p=0.000), indicating the rejection of the null of no bias.

{Insert table 6 about here}

Table 7 show the result of MST, FAT, and PET for individual estimates. Notice that no genuine effect exists for all tests. For MST, the coefficient of the logarithm of the sample size is negative and insignificant for the mean estimate -0.04 (t=-0.18), and insignificant for the median estimate 0.035 (t=-0.16). The PET slope coefficients are also not significant for mean and median 0.001 (t=0.29) and .001 (t=-0.42) respectively. While publication bias is apparent and associate with the whole set. FAT and PET constant estimates are negative and significant for mean set -1.7 (t= -3.89) and for median set -1.8 (t=4.18)

4. Meta regression analysis

In this section, we present two main sets of results investigating the roles of method, measurement and econometric specification, firstly, in explaining the magnitude of the effect (partial correlation) and, secondly, in helping understand the sign and statistical significance of the effect of corruption on economic growth.

4.1 Understanding the determinants of the magnitude of the estimated corruption effect

Accounting for heterogeneity in reported results is a main task of Meta regression analysis. This allows exploring the sources of variation in the econometric literature of the corruption-economic growth nexus.

The estimation of MRA is shown in the following equation:

[18] Using metabias command at Meta routine in STATA, this requires including the effect estimates and their standard errors respectively.

$$Y_i = a_0 + \sum a_m X_m \quad + \varepsilon_i \qquad (5)$$

where, Y is the partial correlation between corruption and economic growth. X is a vector of explanatory variables expressing the characteristics of the studies; data, measurement, and specification. The left hand side also includes logarithm of degree of freedom to control for sample size.

Partial correlation is considered suitable dimensionless effect size which is required for Meta studies. Moreover, partial correlation neither depends on sample size nor unit of measurement (Rosenthal, 1991)[19]. Most of Meta studies utilize partial correlation when encounter economic growth[20]. The formula for calculation of partial correlation is as follows (Greene, 2003)

$$r_i^2 = \frac{t_i^2}{t_i^2 + df_i} \qquad (6)$$

where r_i^2 is the square of partial correlation between the two variables, t is the t-value, and df is the degrees of freedom of the ith regression.

MRA can be modelled either by fixed effect or random effect. Fixed effect model assumes that the heterogeneity is due to systematic differences across studies, and regarding to sampling error. While, random effect model assumes also that there are unobserved factors can't be captured by the moderatos. This kind of variance is randomly distributed.

The estimation of fixed effect model is done by OLS estimator; this estimator assigns equal weights for each observation. Also, WLS estimator is applied that give the aweigh for each observation equal to the inverse of the standard error. This gives more weights for the higher precision observations[21]. Moreover, as applying multi observations from each study, it

[19] For more detail see Meyer and Sinani (2005).
[20] See Docouligous and ulubasoglu (2008), and Docouligous and Paldam (2006).
[21] See Longhi, et al (2004).

is recommended by Dougouligous (2005) to use standard error bootstrap that there is interdependence between these observations in each study.

The random effect estimation assumes that the variance consists of two parts; the first is a result of sampling error calculated in dependence of standard error for each partial correlation[22]. While the latter is emerged from randomly distributed unobserved factors, and calculated using REML via Metareg routine in STATA.

A homogeneity test (Q-test) show if the studies have common effect size or not. If Q is significant that means the heterogeneity is due to sampling error, and random errors. In our case Q test is significant (10000) on (437) degrees of freedom with (p=0.000). However, the between variance is equal to 0.01 which is not very big.

Table 8 reports both fixed effect estimates done by OLS in column (2), OLS Bootstrap in column (3), and WLS in column (4), and random effect estimates in column (6). All explanatory variables included in addition to logarithm of degree of freedom to control for the samples' size.

Tables 9, 10, and 11 report estimation for econometric methods, measurements, and specification respectively. Many of estimations are not statistically significant. This might indicate that some controls don't have effect on the effect size, or as a result of multicollinearity.[23]

The control of sample size is significant at all tests and estimations with negative sign; this indicates that the partial correlation coefficients tend to be smaller in larger studies.

4.1.1 The role of method

The econometric methods are captured by variety of dummy variables. The type of publication sounds positively statistically significant as shown in column (4) and (6) in Table

---

[22] See Fisher (1970), pp194.
[23] Docouligous and Paldam (2006).

8 for the whole set with all moderators. Moreover, all estimations in Table 9 confirm this. The journal papers tend to report more positive effects or less negative effects. However, the positive significant estimates are 11.40 % of journal papers' regressions, and 10.34 % of working papers. It seems that published works support the role of corruption in economic growth.

The influence of academic authors is identified. It is negative and statistically significant for WLS and RE estimates as shown in columns (4) and (6) in table 8, which is confirmed in all estimates in table 9. The papers written by academics are in favour to report more negative partial correlation or less positive ones. Hence, practitioners find less harmful effect of corruption more than academia people.

The papers or regressions restricted to one region or country found to support a positive partial correlation. This is clear in all estimates in table 8 and confirmed in columns (2), (3), and (4) in table 9. It might be concluded that corruption lubricates the economics when happens intra countries.

The utilization of panel data or cross-section data seem has no effect on the partial correlation. All estimates in table 8 are not significant. Only WLS estimates in column (3) in table 9 is negative and statistically significant.

Controlling for endogenity is also captured by a dummy variable. All estimates in table 8 are negative and statistically significant. It is also the same in column (3) and (4) in table 10. The partial correlations are more likely to be more negative or less positive in regressions apply instruments, GMM.

The regression use fixed effect of countries or specific periods tend to report more positive partial correlations. All estimates in table (8) and (9) are positive significant and statistically significant.

The effect of time covered in the study is captured by the medium period variable. It is positive and significant in all estimates in table 8 and 9 except for WLS. It indicates that the longer the period the higher partial correlation are reported.

4.1.2 The role of measurement

It is surprisingly noticed that measuring corruption in various measures are indifferent. Applying any variable capturing any corruption index has no effect on the partial correlations. All estimates are not significant as shown in table 8. However, table 10 reports that the papers use World Bank indexes, Transparency International index, or a combination of measures tend to report positive partial correlations. While, if the corruption is measured via composite index, the papers would report bigger and positive partial correlation. This appears in all estimates in table 8, but in contrast in table 10 that all estimates are not significant. Kufmand found that there is no difference in estimations whether TI(CPI) or CTC are used, that correlation between these two measures are more 90%[24].

4.1.3 The role of specification

The different regions used in papers are categorized. The transition countries seems to raise the partial correlation in the regressions include them as shown in column (4) and (6) in table 8. But these results are not confirmed in table 10. Latin American region is just significant in WLS estimate in table 1 and bootstrap one in table 11. MENA region are significant in columns (2), (3), and (6) in table 8 and in column (1), (2), and (4) in table 11. This indicates that papers include MENA region tends to report more negative partial correlations or less positive one. Asia region is just negative and significant for WLS estimates. While, including Africa region seems to have little effect on the partial correlations. In general, it seems that inclusion different regions in the sample will not affect the relation of corruption on growth.

---

[24] In our Meta data the correlation between them is -0.2402

Indirect effect of the relationship of corruption and economic growth where identified through different variables; trade or openness, institutional quality, human capital, investment, political or democracy effect, and governmental intervention.

The negative effect of corruption on growth is not right one hundred percentage (Dreher and Herzfeld, 2005). They mentioned that Barreto (2001) finds a positive direct effect of corruption on growth. Regarding the investment channel, Mauro (1995) found that the higher corruption the less investment. Dreher and Herzfeld (2005) stated the same conclusion. Regarding the human capital, it is not clear that corruption is harmful; some studies don't find statistical significant effects[25].

Only political variable are positive and significant in column (4) and (6) in table 8 and WLS in table 11. Human capital is positive and statistically significant in table 11, while not significant in table 8 and negative in column (4) and (6). Interestingly, it can be seen that the indirect channels have no effect on the partial correlations. The initial conditions variable is positive and significant in column (4) and (6) in table 8. However, it is no longer significant in table 11. It seems has no effect the partial correlation between corruption and economic growth.

Table 12 shows regressions just for estimates that are significant in tables 8, 9, 10 and 11. The coefficients of degrees of freedom, academic authors, MENA region are negative and significant indicating that regressions with these variables tend to report more negative partial correlations. While, controlling for fixed effect, medium time period are still positive and significant indicating that papers include these variables are in favour to report positive and significant results. Papers done by academic authors are still negative and significant except for WLS. The studies restricted for region is positive and significant just for fixed effect model as shown in columns (2), (3). Journal papers tend to report more positive significant

[25] See (Dreher and Herzfeld, 2005) for detailed survey of corruption effects.

results just as shown in columns (3), (4). OTHERS, PANEL, ENDO, ASIA, TRADE, POLITICAL variables seem do not have effect on the relationship between corruption and economic growth.

4.2 Understanding the sign and significance of the corruption effect

The focus of this research is to investigate the determinants of the effect of corruption on economic growth (GDP). The ordered probit econometric model is built to capture the sign and significance of corruption on economic growth. While, the previous analysis using the partial correlation as dependent variable enables us to determine which factors exploring the variation on the reported effects. Moreover, using ordered probit estimation is considered categorical, and the partial correlation model as continuous.

The dependent variable is constructed as a dummy variable to capture the sign and the significance of the effect of corruption and economic growth. The dependent variable is coded +1 to refer to the positive and significant. -1 if negative and significant. 0 if not significant. Further, the dependent variable is constructed according to three significance levels; 00.1, 0.05, and 0.1. Table (13) present the frequency of dependent variable according to the significance levels.

Table 14 provide meta-regression analysis of the effect of corruption on economic growth using probit model that dependent variable is constructed for (0.01) significance level. Column (2) holds for the econometric methods' variables; regressions with higher number of DF are less likely to get positive and significant effects of corruption and economic growth, and papers use fixed effects tend to report negative and significant effects. Moreover, academic authors tend to report more positive and significant results, and the papers include just one region or one country, are also more likely to get positive and significant results. Column (3) accounts for measurement; only papers use WB, CPI, or COMP are less likely to report negative and significant results. Column (4) shows specification roles; papers use OTHERS countries and control for human capital are less possibility to obtain negative and significant effects. Columns (5), (6) show two set of specification variables; regions and channels. Finally, column (7) runs regression for all explanatory variables; it can be noticed that papers with less degrees of freedom, include fixed effects, OTHERS region, period of study on average is ten years, and apply WB, CPI have negative and significant effects. While, academic authors just tend to report more positive and significant results.

Table 15 is for MRA that dependent variable on probit model is constructed for (0.05) significance level. Column (2) shows the econometric methods' variables; regressions with higher number of DF are less likely to get positive and significant effects of corruption and economic growth, and papers use fixed effects tend to report negative and significant effects. Moreover, the papers include just one region or one country, are likely to get positive and significant results. Column (3) accounts for measurement; only papers use CPI, or COMP are less likely to report negative and significant results. Column (4) shows specification roles; papers use OTHERS countries and control for human capital are less possibility to obtain negative and significant effects. Papers include political or democracy variable tend report positive and significant results. Columns (5), (6) show two set of specification variables; regions and channels. Finally, column (7) runs regression for all explanatory variables; the papers with less degrees of freedom, include fixed effects, OTHERS region, and investment variable, have negative and significant effects. While, academic authors just tend to report more positive and significant results.

Table 16 show estimations for MRA that dependent variable on probit model is constructed for (0.1) significance level. Column (2) present estimations for the econometric methods' variables; regressions with higher number of DF are less likely to get positive and significant effects of corruption and economic growth, and papers use fixed effects tend to report negative and significant effects. Moreover, academic authors tend to report more positive and significant results, and the papers include just one region or one country, are also more likely to get positive and significant results. Column (3) run the variables for measurement; only papers use CPI, or COMP are less likely to report negative and significant results. Column (4) shows specification roles; papers use OTHERS countries and control for human capital, include investment variables, are less possibility to obtain negative and significant effects. While, papers with trade or openness variables, and political or democracy variables tend to report more positive and significant effects. Columns (5), (6) show both sets of specification variables; regions and channels. Finally, column (7) runs regression for all explanatory variables; it can be shown that papers with less degrees of freedom, include fixed effects, OTHERS region, investment variable have negative and significant effects. While, academic authors just tend to report more positive and significant results. Controlling for endogeneity, and including trade or openness variables show also positive and significant effect of corruption on economic growth.

5. Conclusions

A dataset of econometric studies was constructed for this paper, including journal articles and working papers. We put together a data set comprising 465 coefficients of the effect of corruption on economic growth from 41 different empirical studies (these are listed in Appendix 2). We use this data set to carry out an econometric survey: to try to quantitatively understand the effects of differences in estimation methods and econometric specification on the significance and magnitude of the effect of corruption on growth.

We pay special attention to the possibility of publication or reporting bias and to potentially important measurement issues uncovered by recent research (namely the differences between subjective and objective measures of corruption). On the former, one important use of Meta analysis is to identify the existence of publication bias which emerges when there is an explicit or implicit preference by the part of authors and journal editors for statistically significant results (Stanley, 2005). This publication (or reporting) bias may well cover the real effect. Accordingly, this paper investigates publication bias in this literature using a variety of tests and techniques recently developed for this purpose and studies the effects of corruption on economic growth through the available econometric papers.

Our second issue regards measurement. Corruption is often defined as misuse of power by public officials for private gain. Thus one should expect enormous difficulties in measuring corruption, as it broadly viewed as illegal behaviour and against the law. Measures of corruption depend mostly on subjective data collected via questionnaires, interviews, polls of experts from different countries, and for different organizations. The most used indicators of corruption surveyed in our database, ICRG, CPI, and CTC are constructed from subjective data (Svensson, 2005). These subjective data are considered excellent source for measuring this clandestine variable as corruption is illegal and in general unobservable. Many other indexes other than corruption use subjective data. Moreover, whether data is subjective or objective, there will still measurement error. It is hard to find a complete and precise measure of corruption[26]. Our main finding is that although publication bias is severe, there seems to be a true strong negative effect of corruption on growth. Importantly, we find among the main explanations for this effect's direction and significance that studies with more degrees of freedom, not using fixed-effects, without authors in academia, that do not control for human capital and not use the Transparency International index are more likely to report a negative and significant effect of corruption on growth.

[26] See Kaufman, Kraay, and Mastruzzi (2006).

References

Card, D. and Krueger, A.B., 1995. "Time-Series Minimum Wage Studies: a Meta-Analysis," *American Economic Review*, 85, pp. 238–43.

Djankov S. and Murrell, P., 2002. "Enterprise Restructuring in Transition: A Quantitative Survey," *Journal of Economic Literature*, 40(3), pp. 736–92.

Doucouliagos, C., 1995. "Worker Participation and Productivity in Labor-Managed and Participatory Capitalist Firms: A Meta-Analysis," *Industrial and Labor Relations Review*, 49/1, pp. 58–77.

Durlauf, S., P. Johnson and J. Temple, 2006. "Growth Econometrics," in P. Aghion and S. Durlauf (eds) *Handbook of Economic Growth*, North-Holland.

Égert, B. and Halpern, L. 2006. "Equilibrium Exchange Rates in Central and Eastern Europe: A Meta-Regression Analysis," *Journal of Banking and Finance*, 30 (5), pp. 1359–74.

Egger, M., Smith, G. D., Schneider, M. and Minder, C. 1997. "Bias in meta-analysis detected by a simple, graphical test," *British Medical Journal*, 315: 629–634.

Ernst, E., Gong, G., Semmler, W. and Bukeviciute, L., 2006. "Quantifying the Impact of Structural Reforms," *ECB Working Paper*, No. 666, August.

Fidrmuc, J. and Korhonen, I., 2006. "Meta-Analysis of the Business Cycle between the Euro Area and the CEECs," *Journal of Comparative Economics*, 34 (3), pp. 518–37.

Florax, R.J.G.M., 2002. "Meta-Analysis in Environmental and Natural Resource Economics: The Need for Strategy, Tools and Protocol," Department of Spatial Economics, Free University, Amsterdam.

Florax, R.J.G.M., de Groot, H. L.F. and De Mooij, R. A., 2002. "Meta-Analysis: A Tool for Upgrading Inputs of Macroeconomic Policy Models," *Tinbergen Institute Discussion Paper*, No. TI 041/3.

Glass, G.V., 1976. "Primary, Secondary, and Meta-Analysis of Research," *The Educational Researcher,* 10, pp. 3–8.

Hedges, L.V. and Olkin, I., 1985. *Statistical Methods for Meta-Analysis*, Orlando: Academic Press.

Jurrell, S. B. and Stanley, T.D., 1990. "A Meta-Analysis of the Union-Non-Union Wage Gap," *Industrial and Labor Relations Review*, 44/1, pp. 54–67.

Levine, R. and D. Renelt, 1992. "A Sensitivity Analysis of Cross-Country Growth Regressions," *American Economic Review*, 82 (4), pp. 942–963.

Light, R.J. and Smith, P.V., 1997. "Accumulating Evidence: Procedures for Resolving Contradictions Among Different Research Studies," *Harvard Educational Review*, 41, pp. 429–71.

Megginson, W. and Netter, J., 2001. "From State to Market: A Survey of Empirical Studies on Privatization," *Journal of Economic Literature*, 39(2), pp. 321–89.

Phillips, J. M. and Goss, E. P., 1995. "The Effect of State and Local Taxes on Economic Development: A Meta-Analysis," *Southern Economic Journal*, 62/2, pp. 320–33.

Rose, A. K., 2004. "A Meta-Analysis of the Effect of Common Currencies on International Trade," *NBER Working Paper*, No. 10373.

Stanley T.D., 1998. "New Wine in Old Bottles: A Meta-Analysis of Ricardian Equivalence," *Southern Economic Journal*, 64, pp. 713–27.

Stanley T.D., 2001. "Wheat From Chaff: Meta-Analysis as Quantitative Literature Review," *Journal of Economic Perspectives*, 15/3, pp.131–50.

Stanley, T.D., 2005. "Beyond Publication Bias," *Journal of Economic Surveys*, 19(3), pp. 309–345.

Stanley T.D. and Jurrell, S. B., 1998. "Gender Wage Discrimination Bias? A Meta-Regression Analysis," *Journal of Human Resources,* 33/4, pp. 947–73.

Stanley, T.D. and Jurrell, S. B., 1989. "Meta-Regression Analysis: A Quantitative Method of Literature Surveys," *Journal of Economic Surveys*, 3, pp.54–67.

Weichselbaumer, D. and Winter-Ebmer, R., 2007. "The Effects of Competition and Equal Treatment Laws on the Gender Wage Differentials," *Economic Policy*, 50, pp. 237–287.

Figure 1. Histogram for 465 t-values of the coefficients of corruption on growth

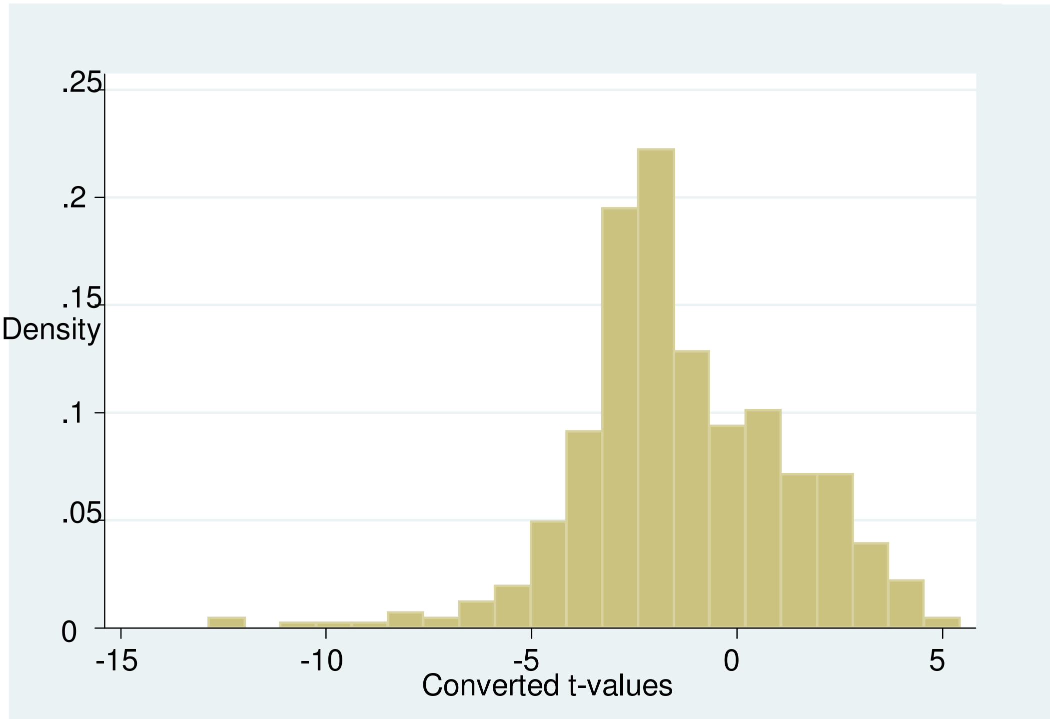

Figure 2. Funnel plot of corruption effect on economic growth using 460 estimates

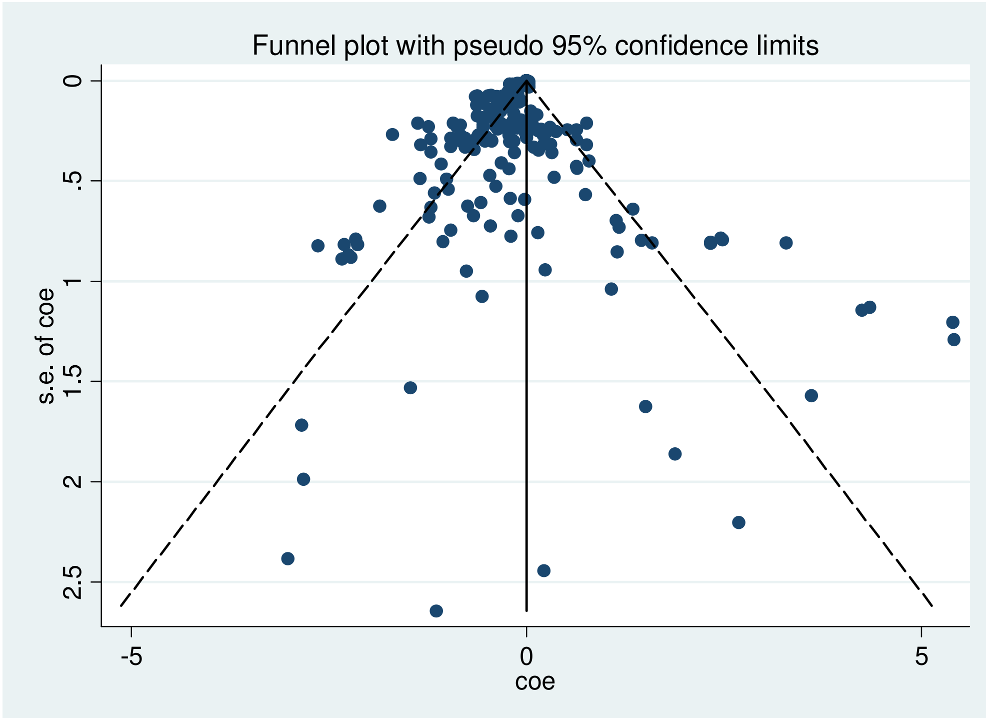

Figure 3. Funnel plot using t-values and degrees of freedom for 460 observations

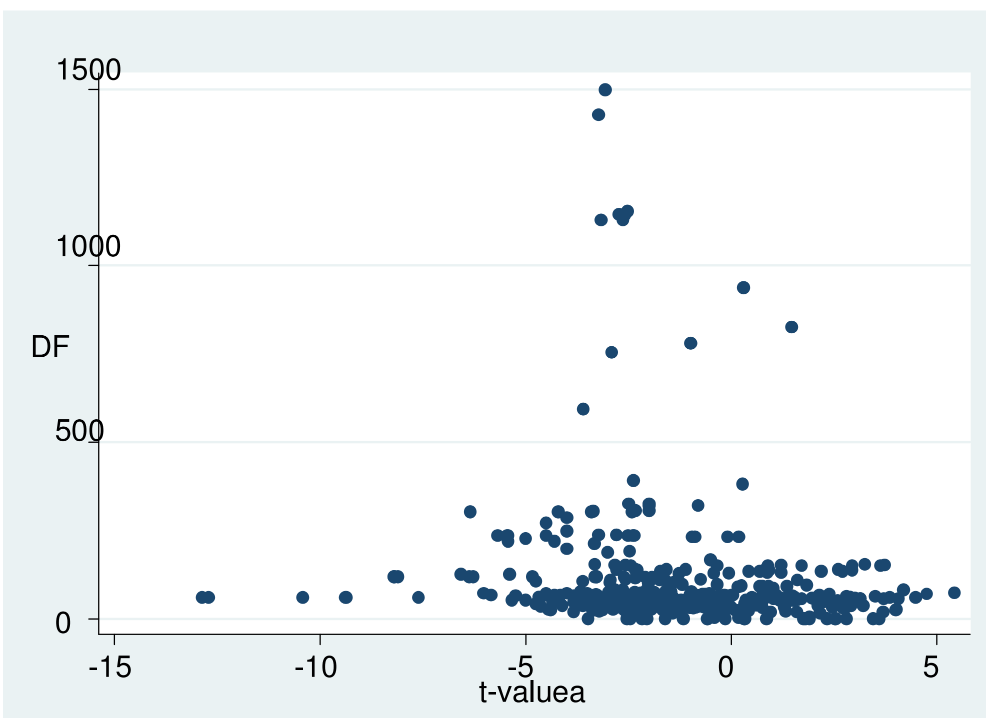

Figure 4 Galbraith plot for 460 observations using effect size and its inverse standard error

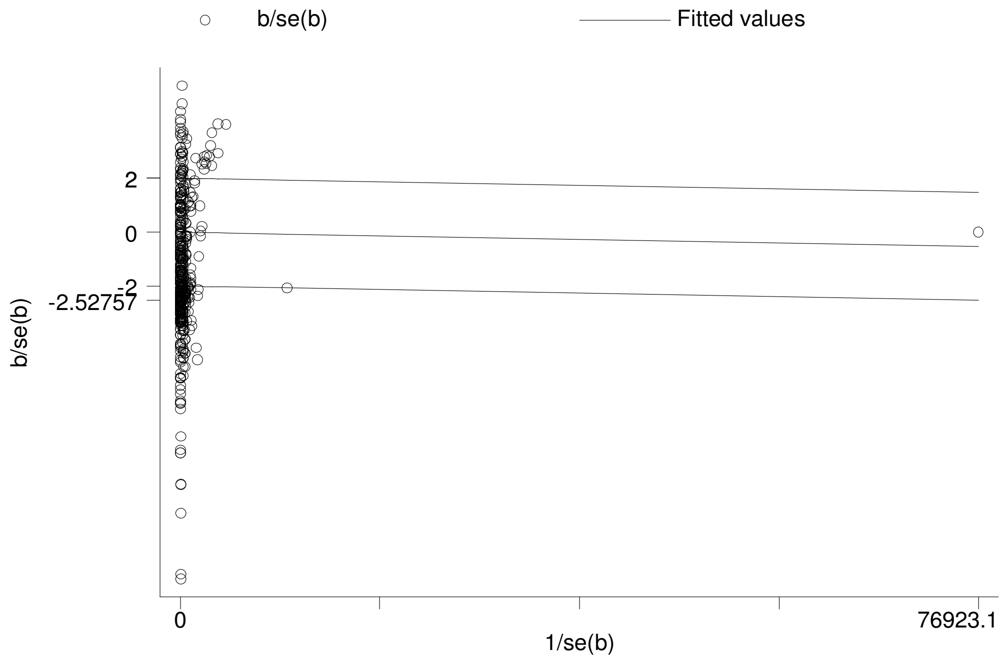

Figure 5. Galbraith plot for 458 observations, corruption effect on economic growth

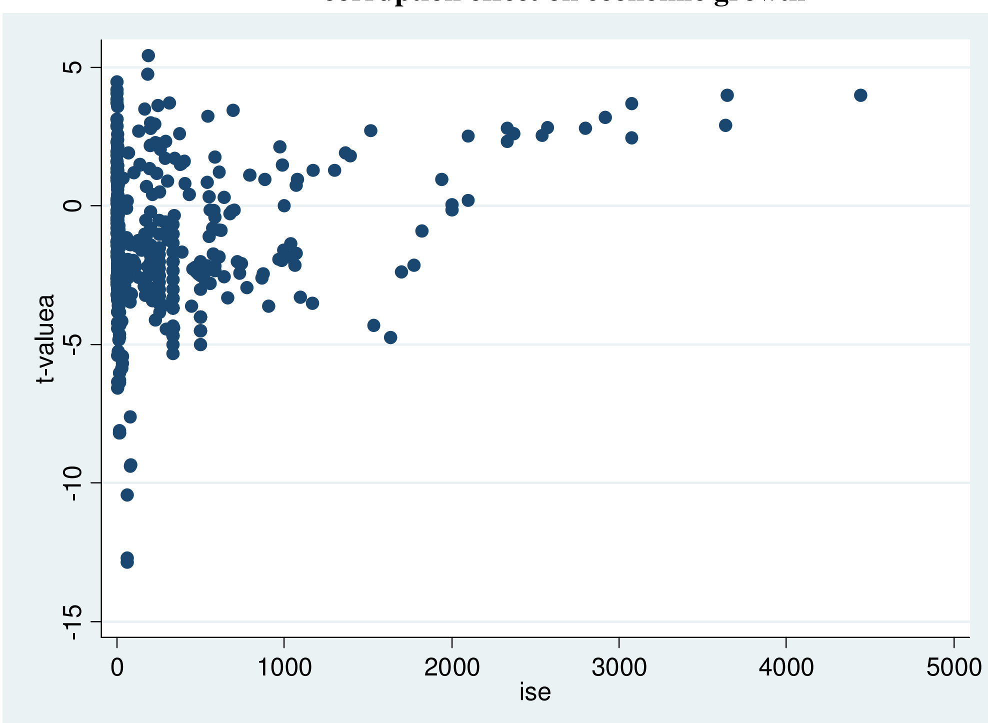

Figure 6. Begg funnel plot using 460 observations

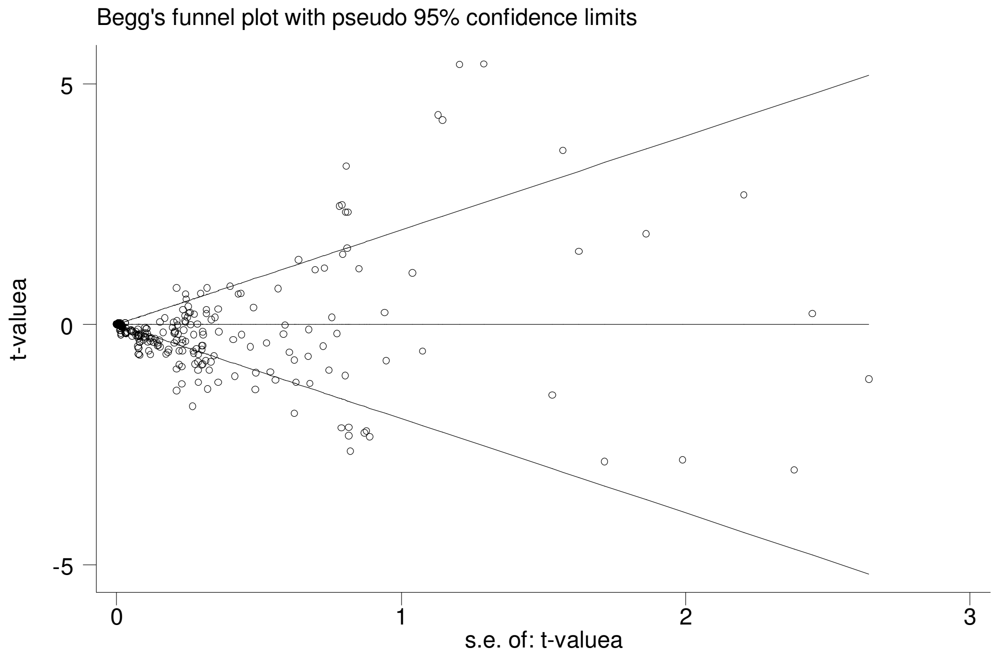

Figure 7. Egger plot using 458 observations

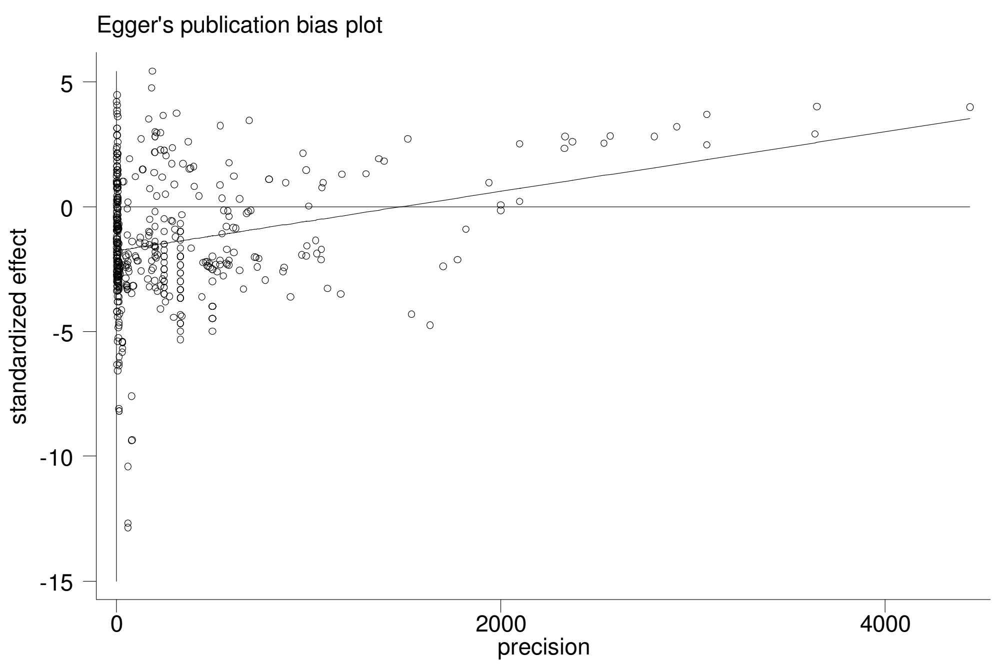

Figure 8. Funnel plot of corruption effect on economic growth using 40 mean individual estimates

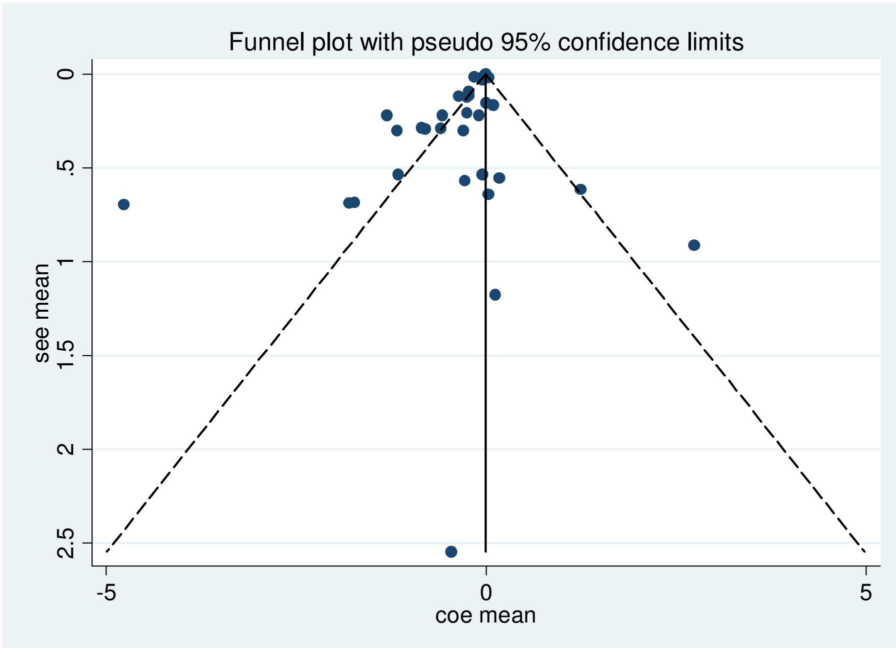

Figure 9. Funnel plot of corruption effect on economic growth using 40 median individual estimates

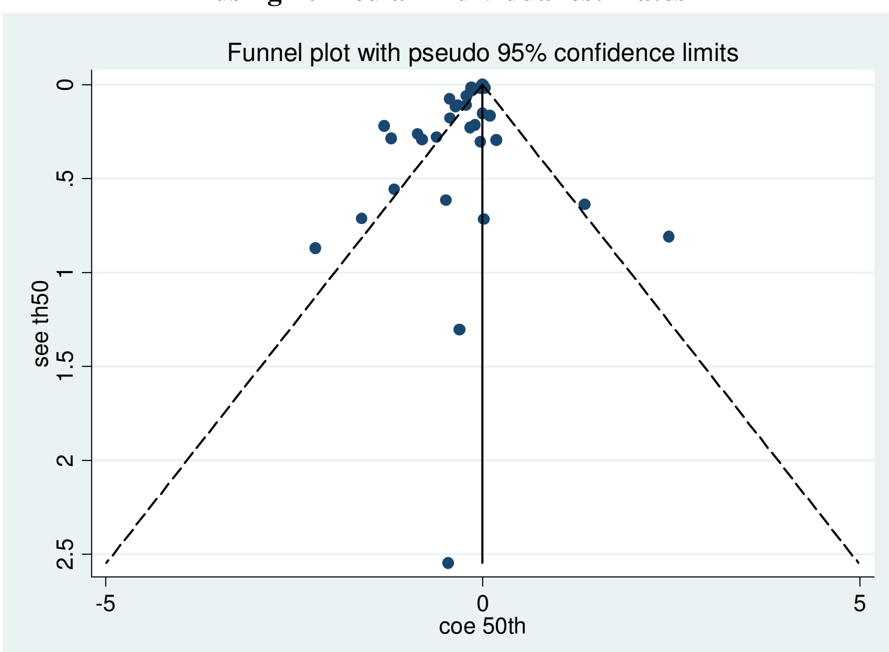

Table 1. Descriptive statistics for econometric method variables

	DEFINITION	OBS	MEAN	SD.	MIN	MAX	FREQ	PERCENT
df	number of degrees of freedom for each estimation	465	101.00	172.18	0	1498	-	-
authors	Dummy, if all authors from academia=1.	461	0.82	0.39	0	1	378	82.00
country (region)	Dummy, if the study on one country=1.	465	0.08	0.27	0	1	36	7.74
panel	Dummy, if the model use cross section=1.	465	0.54	0.50	0	1	249	53.55
endo	Dummy, if the model control for endogenity=1.	465	0.32	0.47	0	1	151	32.47
fixed	Dummy, if the regression account for fixed effects or country dummy=1.	465	0.34	0.48	0	1	160	34.41
mid	The length of the study period divided by two ; (end-start)/2.	464	9.53	6.20	0	20	-	-
Type of publication	Dummy, if the study published on journal=1.	465	0.49	0.50	0	1	228	49.03

Table 2. Descriptive statistics for measurement methods variables

	DEFINITION	OBS	MEAN	SD.	MIN	MAX	FREQ	PERCENT
WB	Dummy, if corruption measured by one of world bank corruption measure =1.	465	0.03	0.17	0	1	13	2.8
ICRG	Dummy, if corruption measured by International Country Risk Guide measure of corruption =1.	465	0.28	0.45	0	1	130	27.96
TI(CPI)	Dummy, if corruption measured by Transparency international measure=1.	465	0.35	0.48	0	1	165	35.48
COMB	Dummy, if corruption measured by different organizations, or combined of (WB, ICRG, TI) =1.	465	0.03	0.18	0	1	16	3.44
OTHER	Dummy, if corruption measured by the authors' measure=1.	465	0.20	0.40	0	1	94	20.22
Ctc.	Dummy, if corruption measured by Control to Corruption measure=1.	465	0.10	0.30	0	1	45	9.68
INCLUDED	Dummy, if corruption measured by composite measure=1.	465	0.03	0.17	0	1	14	3.01

Table 3. Descriptive statistics for specification variables

	DEFINITION	OBS	MEAN	SD.	MIN	MAX	FREQ	PERCENT
TRADE	Dummy, if the study contains trade or openness variable=1.	465	0.32	0.47	0	1	149	32.04
INSTIT	Dummy, if the study contains institutional variable=1.	465	0.09	0.29	0	1	43	9.25
HUMAN	Dummy, if the study contains human capital or population variable=1.	464	0.73	0.45	0	1	337	72.63
INVEST	Dummy, if the study contains investment variable=1.	465	0.33	0.47	0	1	155	33.33
POLITICAL	Dummy, if the study contains political or democracy variable=1.	465	0.18	0.39	0	1	84	18.06
GOV	Dummy, if the study contains governmental intervention or public spending variable=1.	465	0.32	0.47	0	1	185	39.78
TRANSIT	Dummy, if the study contains transition countries=1.	465	0.86	0.34	0	1	401	86.24
LAC	Dummy, if the study contains Latin American countries=1.	465	0.92	0.26	0	1	430	92.47
MENA	Dummy, if the study contains Middle East and North Africa countries=1.	465	0.93	0.26	0	1	401	86.24
ASIA	Dummy, if the study contains Asian countries=1.	465	0.91	0.28	0	1	431	92.69
AFR	Dummy, if the study contains African countries=1.	465	0.87	0.34	0	1	424	91.18
OTHERS	Dummy, if the study contains other countries not specified above=1.	465	0.86	0.34	0	1	403	86.67
Initial Condition	Dummy, if initial conditions included in the regression=1.	465	.78	.42	0	1	361	77.63

Table 4. Meta Significance Tests for 460 estimations,
Dependent variable is logarithm of absolute value of degrees of freedom

	1	2	3	4
	lnatvaluea	lnatvaluea^	lnatvaluea	lnatvaluea^
lndf	0.144	0.144	0.121	0.118
	(2.54)*	(2.68)**	(2.04)*	-1.96
authors			-0.5	-0.494
			(4.13)**	(3.75)**
ENDO			-0.371	-0.339
			(3.89)**	(3.14)**
FIXED			0.478	0.519
			(4.68)**	(4.97)**
MID			0.047	0.046
			(6.21)**	(6.19)**
INCLUDED			0.765	
			(2.73)**	
ASIA			-0.934	-0.937
			(3.81)**	(4.53)**
OTHERS			0.521	0.537
			(2.68)**	(3.32)**
INSTIT			-0.475	
			(2.83)**	
Constant	-0.042	-0.042	0.404	0.362
	-0.17	-0.18	-1.32	-1.28
Observations	438	438	433	433
R-squared	0.01	0.0145	0.21	0.1912
Absolute value of t statistics in parentheses				
* significant at 5%; ** significant at 1%				
^ bootstrap to derive robust standard error with 1000 replication				

Table 5. Meta- analysis of corruption effect on growth using individual estimates

META- ANALYSIS OF CORRUPTION EFFECT ON GROWTH						
Obs	Number of obs	effect	Pooled estimate	Lower bound of 95% CI	Upper bound of 95% CI	p-value H_0: no effect
All obs	460	Fixed	0	0	0	.588
		Random	-0.003	-0.003	-0.003	.000
Mean	40	Fixed	-0.005	-0.007	-0.003	.000
		Random	-0.024	-0.036	-0.011	.000
10th	40	Fixed	-0.034	-0.035	-0.034	.000
		Random	-1.201	-1.354	-1.047	.000
50th	40	Fixed	-0.003	-0.004	-0.001	.000
		Random	-0.019	-0.027	-0.011	.000

Table 6. Egger test for individual estimates

	MEAN-COEFFICIENT	10TH-COEFFICIENT	MEDIAN-COEFFICIENT
Slope	0.0009(0.003)	0.0055(0.065)	0.0008(0.002)
Bias	-1.69(0.435)***	-64.42(41.9)	-1.8(0.43)***

Standard errors in the parentheses. Egger test shows the existence of bias if the coefficient of the Bias is statically significant.

Table 7 MST, FAT, and PET for individual estimates

	1	2	3	4
	MST		FAT& PET	
	$\ln\lvert t_i\rvert$ mean	$\ln\lvert t_i\rvert$ median	t_i-value mean	t_i-value median
ln (n)	-0.04	0.035		
	-0.18	-0.16		
inverse standard error for mean estimates			0.001	
			0.29	
inverse standard error for median estimates				0.001
				-0.42
Constant	0.248	0.21	-1.7	-1.799
	-0.53	-0.44	(-3.89)**	(4.18)**
Observations	40	40	40	40
R-squared	0	0	0.02	0
Absolute value of t statistics in parentheses				
* significant at 5%; ** significant at 1%				

MST is Meta significant test for genuine effect existence; the coefficient of logarithm of sample size (or degrees of freedom) is significant should be positive and significant as indication of real effect. FAT is funnel asymmetry test for publication bias existence that the coefficient of the inverse of standard error should be significant as a proof of publication bias. PET is precision effect test for test the genuine effect.

Table 8. Meta-regression analysis
the effect of corruption on economic growth (all variables)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	bootstrap	WLS	RE	RE
lndf	-0.073	-0.056	-0.056	-0.085		-0.080
	(8.03)**	(4.43)**	(4.22)**	(5.73)**		(6.07)**
type of publication		0.041	0.041	0.079		0.056
		(1.84)	(1.68)	(2.91)**		(2.35)*
authors		-0.067	-0.067	-0.087		-0.070
		(2.74)**	(2.60)**	(2.71)**		(2.69)**
Country(region)		0.153	0.153	0.225		0.166
		(2.25)*	(2.32)*	(3.37)**		(2.11)*
PANEL		0.007	0.007	-0.021		-0.001
		(0.30)	(0.25)	(0.73)		(0.06)
ENDO		-0.036	-0.036	-0.065		-0.051
		(2.06)*	(1.99)*	(2.93)**		(2.74)**
FIXED		0.170	0.170	0.263		0.201
		(7.30)**	(4.86)**	(8.63)**		(8.69)**
MID		0.005	0.005	0.002		0.004
		(3.60)**	(3.22)**	(1.26)		(2.64)**
WB		0.059	0.059	0.112		0.102
		(0.58)	(0.59)	(1.19)		(0.88)
ICRG		-0.047	-0.047	-0.059		-0.042
		(0.48)	(0.52)	(0.67)		(0.38)
TI (CPI)		-0.022	-0.022	-0.020		-0.012
		(0.23)	(0.24)	(0.23)		(0.10)
COMB		0.082	0.082	0.053		0.080
		(0.79)	(0.85)	(0.56)		(0.68)
OTHER		-0.014	-0.014	0.030		0.007
		(0.15)	(0.16)	(0.34)		(0.06)
Ctc		-0.083	-0.083	-0.089		-0.067
		(0.72)	(0.77)	(0.86)		(0.50)
INCLUDED		0.173	0.173	0.263		0.235
		(3.41)**	(2.32)*	(3.23)**		(4.44)**
Initial Condition		0.063	0.063	0.130		0.092
		(2.32)*	(1.79)	(3.52)**		(3.27)**
TRANSIT		0.057	0.057	0.138		0.088
		(1.68)	(1.37)	(3.37)**		(2.50)*
LAC		0.229	0.229	0.183		0.249
		(1.52)	(1.58)	(2.07)*		(1.07)
MENA		-0.158	-0.158	-0.109		-0.124
		(2.87)**	(1.97)*	(1.53)		(2.09)*
ASIA		-0.245	-0.245	-0.312		-0.321
		(1.72)	(1.77)	(3.80)**		(1.42)
AFR		0.004	0.004	0.004		-0.005
		(0.07)	(0.05)	(0.06)		(0.08)

OTHERS		0.077	0.077	0.099		0.067
		(2.29)*	(1.81)	(1.91)		(1.72)
TRADE		-0.046	-0.046	-0.062		-0.044
		(1.98)*	(1.78)	(2.14)*		(1.80)
INSTIT		-0.023	-0.023	-0.061		-0.056
		(0.70)	(0.60)	(1.43)		(1.62)
HUMAN		0.007	0.007	-0.008		-0.001
		(0.34)	(0.31)	(0.29)		(0.03)
INVEST		0.002	0.002	-0.024		-0.011
		(0.10)	(0.09)	(1.09)		(0.51)
POLITICAL		0.042	0.042	0.117		0.081
		(1.70)	(1.30)	(3.55)**		(3.14)**
GOV		-0.014	-0.014	-0.029		-0.029
		(0.66)	(0.59)	(1.02)		(1.29)
Constant	0.578	0.454	0.454	0.551	0.282	0.569
	(14.89)**	(3.71)**	(3.39)**	(4.03)**	(31.93)**	(4.16)**
Observations	438	432	432	432	438	432
R-squared	0.13	0.41		0.64		
Absolute value of t statistics in parentheses						
* significant at 5%; ** significant at 1%						

Dependent variable is partial correlation. Bootstrap is used derive robust standard errors with (1000) replications. WLS is weighted least squares by the inverse in the standard error. RE in random effect is estimated by metareg routine in STATA.

Table 9. Meta-regression analysis
the effect of corruption on economic growth (the role of method)

	(1)	(2)	(3)	(4)
	OLS	BOOTSTRAP	WLS	RE
lndf	-0.075	-0.075	-0.122	-0.101
	(7.55)**	(6.70)**	(8.70)**	(9.78)**
type of publication	0.044	0.044	0.093	0.048
	(2.49)*	(2.39)*	(3.67)**	(2.52)*
authors	-0.083	-0.083	-0.065	-0.068
	(4.18)**	(4.45)**	(2.69)**	(3.13)**
Country(region)	0.054	0.054	0.073	0.047
	(1.66)	(1.99)*	(2.10)*	(1.34)
PANEL	-0.014	-0.014	-0.064	-0.027
	(0.85)	(0.77)	(2.61)**	(1.50)
ENDO	-0.031	-0.031	-0.058	-0.044
	(1.83)	(1.92)	(2.91)**	(2.37)*
FIXED	0.115	0.115	0.200	0.124
	(6.58)**	(5.66)**	(5.59)**	(6.68)**
MID	0.006	0.006	0.001	0.004
	(4.64)**	(4.27)**	(0.31)	(3.44)**
Constant	0.556	0.556	0.820	0.693
	(10.34)**	(9.33)**	(10.39)**	(11.98)**
Observations	433	433	433	433
R-squared	0.27	0.26	0.44	
Absolute value of t statistics in parentheses				
* significant at 5%; ** significant at 1%				

Dependent variable is partial correlation. Bootstrap is used derive robust standard errors with (1000) replications. WLS is weighted least squares by the inverse in the standard error. RE in random effect is estimated by metareg routine in STATA

Table 10. Meta-regression analysis
the effect of corruption on economic growth (the role of measurement)

	(1)	(3)	(4)	(5)
	OLS	BOOTSTRAP	WLS	RE
lndf	-0.064	-0.064	-0.078	-0.081
	(6.65)**	(7.11)**	(11.96)**	(8.10)**
WB	0.084	0.084	0.115	0.111
	(0.72)	(0.83)	(1.31)	(0.84)
ICRG	0.067	0.067	0.076	0.075
	(0.61)	(0.72)	(0.93)	(0.59)
TI (CPI)	0.063	0.063	0.098	0.082
	(0.58)	(0.68)	(1.19)	(0.66)
COMB	0.168	0.168	0.160	0.158
	(1.45)	(1.74)	(1.92)	(1.19)
OTHER	0.063	0.063	0.233	0.094
	(0.57)	(0.66)	(2.32)*	(0.75)
Ctc	-0.016	-0.016	-0.004	-0.003
	(0.15)	(0.17)	(0.04)	(0.03)
INCLUDED	0.067	0.067	0.023	0.066
	(1.57)	(1.47)	(0.42)	(1.50)
Constant	0.479	0.479	0.547	0.555
	(4.16)**	(4.76)**	(6.47)**	(4.25)**
Observations	438	438	438	438
R-squared	0.17	0.154	0.30	
Absolute value of t statistics in parentheses				
* significant at 5%; ** significant at 1%				

Dependent variable is partial correlation. Bootstrap is used derive robust standard errors with (1000) replications. WLS is weighted least squares by the inverse in the standard error. RE in random effect is estimated by metareg routine in STATA

Table 11. Meta-regression analysis
the effect of corruption on economic growth (the role of specification)

	(1)	(2)	(3)	(4)
	OLS	BOOTSTRAP	WLS	RE
lndf	-0.064	-0.064	-0.100	-0.083
	(6.62)**	(7.67)**	(8.97)**	(8.33)**
Initial Condition	-0.010	-0.010	0.015	-0.001
	(0.47)	(0.49)	(0.59)	(0.04)
TRANSIT	0.020	0.020	0.010	0.025
	(0.72)	(0.74)	(0.31)	(0.89)
LAC	0.281	0.281	0.149	0.291
	(1.75)	(2.08)*	(1.59)	(1.21)
MENA	-0.195	-0.195	-0.113	-0.177
	(3.37)**	(2.56)*	(1.66)	(2.79)**
ASIA	-0.234	-0.234	-0.278	-0.288
	(1.51)	(1.88)	(4.61)**	(1.21)
AFR	0.037	0.037	0.065	0.049
	(0.72)	(0.55)	(1.18)	(0.87)
OTHERS	0.075	0.075	0.157	0.075
	(2.28)*	(1.93)	(3.29)**	(1.90)
TRADE	-0.032	-0.032	-0.082	-0.028
	(1.59)	(1.52)	(2.84)**	(1.31)
INSTIT	-0.035	-0.035	-0.109	-0.047
	(1.27)	(1.04)	(2.41)*	(1.61)
HUMAN	0.044	0.044	0.094	0.057
	(2.06)*	(2.11)*	(3.42)**	(2.41)*
INVEST	0.028	0.028	-0.014	0.019
	(1.45)	(1.38)	(0.54)	(0.92)
POLITICAL	-0.025	-0.025	0.118	0.011
	(1.09)	(0.80)	(2.41)*	(0.44)
GOV	0.069	0.069	0.077	0.056
	(3.77)**	(3.59)**	(3.20)**	(2.80)**
Constant	0.512	0.512	0.665	0.607
	(7.96)**	(6.81)**	(9.17)**	(8.68)**
Observations	437	437	437	437
R-squared	0.26	0.43	0.43	
Absolute value of t statistics in parentheses				
* significant at 5%; ** significant at 1%				

Dependent variable is partial correlation. Bootstrap is used derive robust standard errors with (1000) replications. WLS is weighted least squares by the inverse in the standard error. RE in random effect is estimated by metareg routine in STATA

Table 12. Meta-regression analysis
the effect of corruption on economic growth (sensitivity regression)

	(1)	(2)	(3)	(4)
	OLS	BOOTSTRAP	WLS	RE
lndf	-0.068	-0.065	-0.112	-0.089
	(7.48)**	(7.26)**	(8.64)**	(9.45)**
authors	-0.068	-0.074	-0.042	-0.049
	(3.73)**	(4.28)**	(1.54)	(2.42)*
FIXED	0.091	0.092	0.200	0.111
	(5.87)**	(5.43)**	(6.33)**	(6.58)**
MID	0.006	0.007		0.004
	(5.14)**	(5.30)**		(3.38)**
MENA	-0.158	-0.126		-0.107
	(6.62)**	(5.79)**		(4.76)**
OTHERS	0.073			
	(2.97)**			
Country(region)		0.044	0.070	
		(2.16)*	(2.13)*	
type of publication			0.085	0.046
			(4.15)**	(2.84)**
ENDO				-0.031
				(1.77)
Constant	0.602	0.620	0.790	0.712
	(13.64)**	(13.89)**	(10.92)**	(14.36)**
PANEL			-0.025	
			(1.04)	
ASIA			-0.074	
			(2.13)*	
TRADE			-0.053	
			(2.22)*	
POLITICAL			0.122	
			(3.34)**	
Observations	433	433	434	433
R-squared	0.30		0.48	
Absolute value of t statistics in parentheses				
* significant at 5%; ** significant at 1%				

Dependent variable is partial correlation. Bootstrap is used derive robust standard errors with (1000) replications. WLS is weighted least squares by the inverse in the standard error. RE in random effect is estimated by metareg routine in STATA

Table 13. The distribution of the dependent variable for probit model

	D1 (0.01)		D2 (0.05)		D3 (0.1)	
	freq	percent	freq	percent	freq	percent
-1	146	31.74	221	48.04	244	53.16
0	287	62.39	193	41.96	162	35.29
+1	27	5.87	46	10.00	53	11.55
	460	100	460	100	459	100

Dependent variable constructed regarding the level of significance of the coefficient of effect of corruption on economic growth.

Table 14. Meta-regression analysis D1(0.01)
the effect of corruption on economic growth (probit model)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DF	-0.001	-0.002					-0.002
	(3.25)**	(3.21)**					(2.93)**
type of publication		-0.010					-0.033
		(0.07)					(0.17)
authors		0.580					0.584
		(3.44)**					(2.55)*
Country(region)		0.633					-0.357
		(2.38)*					(0.60)
PANEL		-0.062					-0.162
		(0.48)					(0.80)
ENDO		0.214					0.277
		(1.52)					(1.69)
FIXED		-0.588					-0.707
		(4.30)**					(3.71)**
MID		-0.016					-0.033
		(1.62)					(2.79)**
TRANSIT				0.172		0.448	0.066
				(0.78)		(2.25)*	(0.21)
LAC				0.542		-0.133	1.005
				(0.41)		(0.10)	(0.70)
MENA				0.022		0.124	-0.288
				(0.05)		(0.27)	(0.57)
ASIA				0.928		1.235	0.547
				(0.71)		(0.97)	(0.40)
AFR				-0.690		-0.613	-0.420
				(1.58)		(1.43)	(0.87)
OTHERS				-0.516		-0.346	-0.619
				(2.16)*		(1.58)	(2.32)*
Initial Condition				-0.327	-0.202		-0.286
				(1.80)	(1.16)		(1.17)
TRADE				-0.067	-0.124		0.271
				(0.42)	(0.88)		(1.18)
INSTIT				-0.123	-0.150		-0.368
				(0.56)	(0.69)		(1.17)
HUMAN				-0.352	-0.284		-0.356
				(2.03)*	(1.73)		(1.75)
INVEST				-0.024	-0.118		-0.047
				(0.16)	(0.89)		(0.26)
POLITICAL				0.263	0.461		0.181
				(1.43)	(2.66)**		(0.78)
GOV				-0.107	-0.234		-0.003
				(0.72)	(1.65)		(0.01)
WB			-2.140				-2.143
			(2.31)*				(2.26)*

ICRG			-1.701				-1.311
			(1.96)				(1.43)
TI (CPI)			-1.970				-1.852
			(2.27)*				(2.04)*
COMB			-1.974				-1.518
			(2.16)*				(1.57)
OTHER			-1.522				-1.404
			(1.75)				(1.55)
Ctc			-0.862				-0.987
			(0.98)				(0.93)
INCLUDED			-0.274				-0.126
			(0.84)				(0.27)
Observations	460	455	460	459	459	460	454
Absolute value of z statistics in parentheses							
* significant at 5%; ** significant at 1%							

Dependent variable is ordered; D1 take the value of -1 if the coefficient of corruption on growth is negative and statistically significant at 1%, 0 if the coefficient is not significant, and +1 if the coefficient is positive and statistically significant at 1%,. Estimation done by ordered probit

Table 15. Meta-regression analysis D2(0.05)
the effect of corruption on economic growth (probit model)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DF	-0.002	-0.002					-0.002
	(3.39)**	(3.02)**					(2.91)**
type of publication		0.100					0.307
		(0.70)					(1.55)
authors		0.562					0.422
		(3.47)**					(1.93)
Country(region)		0.355					-0.762
		(1.43)					(1.36)
PANEL		0.091					0.028
		(0.72)					(0.14)
ENDO		0.090					0.309
		(0.66)					(1.93)
FIXED		-0.547					-0.678
		(4.15)**					(3.60)**
MID		-0.010					-0.015
		(1.07)					(1.29)
TRANSIT				0.204		0.529	0.325
				(0.92)		(2.59)**	(1.02)
LAC				1.063		-0.170	1.061
				(0.89)		(0.15)	(0.83)
MENA				-0.415		-0.113	-0.630
				(0.89)		(0.25)	(1.27)
ASIA				0.360		1.047	0.066
				(0.31)		(0.92)	(0.06)
AFR				-0.547		-0.480	-0.286
				(1.26)		(1.14)	(0.60)
OTHERS				-0.731		-0.382	-0.791
				(3.26)**		(1.87)	(3.10)**
Initial Condition				-0.301	-0.228		-0.373
				(1.77)	(1.37)		(1.59)
TRADE				0.197	-0.027		0.395
				(1.26)	(0.19)		(1.78)
INSTIT				0.003	-0.031		-0.430
				(0.01)	(0.14)		(1.41)
HUMAN				-0.388	-0.233		-0.433
				(2.35)*	(1.50)		(2.27)*
INVEST				-0.284	-0.222		-0.375
				(1.94)	(1.68)		(2.14)*
POLITICAL				0.523	0.584		0.384
				(2.91)**	(3.44)**		(1.68)
GOV				-0.146	-0.199		0.089
				(1.00)	(1.42)		(0.47)
WB			-1.493				-1.321
			(1.68)				(1.45)

ICRG			-1.572				-0.946
			(1.88)				(1.08)
TI (CPI)			-1.740				-1.255
			(2.08)*				(1.44)
COMB			-2.307				-1.833
			(2.57)*				(1.94)
OTHER			-1.157				-0.685
			(1.38)				(0.79)
Ctc			-0.767				-0.126
			(0.91)				(0.12)
INCLUDED			-0.205				0.254
			(0.62)				(0.55)
Observations	460	455	460	459	459	460	454
Absolute value of z statistics in parentheses							
* significant at 5%; ** significant at 1%							

Dependent variable is ordered; D2 take the value of -1 if the coefficient of corruption on growth is negative and statistically significant at 5%, 0 if the coefficient is not significant, and +1 if the coefficient is positive and statistically significant at 5%. Estimation done by ordered probit

Table 16. Meta-regression analysis D3(0.1)
the effect of corruption on economic growth (probit model)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DF	-0.001	-0.001					-0.002
	(3.05)**	(2.85)**					(2.60)**
type of publication		0.095					0.303
		(0.65)					(1.51)
authors		0.570					0.482
		(3.45)**					(2.16)*
Country(region)		0.497					-0.471
		(1.99)*					(0.85)
PANEL		-0.042					-0.135
		(0.33)					(0.68)
ENDO		0.114					0.371
		(0.82)					(2.24)*
FIXED		-0.446					-0.492
		(3.37)**					(2.60)**
MID		-0.008					-0.013
		(0.86)					(1.12)
TRANSIT				0.066		0.416	0.289
				(0.30)		(2.03)*	(0.92)
LAC				1.626		0.153	1.576
				(1.38)		(0.14)	(1.25)
MENA				-0.510		-0.102	-0.706
				(1.09)		(0.23)	(1.42)
ASIA				0.099		0.874	-0.175
				(0.09)		(0.78)	(0.15)
AFR				-0.616		-0.555	-0.390
				(1.42)		(1.31)	(0.82)
OTHERS				-1.033		-0.584	-1.136
				(4.51)**		(2.82)**	(4.33)**
Initial Condition				-0.255	-0.180		-0.232
				(1.48)	(1.07)		(0.96)
TRADE				0.316	0.010		0.568
				(1.98)*	(0.07)		(2.52)*
INSTIT				0.081	0.042		-0.133
				(0.38)	(0.20)		(0.43)
HUMAN				-0.485	-0.263		-0.540
				(2.89)**	(1.68)		(2.76)**
INVEST				-0.336	-0.193		-0.429
				(2.27)*	(1.45)		(2.40)*
POLITICAL				0.542	0.544		0.404
				(2.96)**	(3.18)**		(1.76)
GOV				-0.189	-0.208		0.000
				(1.27)	(1.46)		(0.00)
WB			-1.680				-1.642
			(1.89)				(1.80)

ICRG			-1.534				-1.169
			(1.85)				(1.34)
TI (CPI)			-1.654				-1.352
			(2.00)*				(1.57)
COMB			-2.377				-1.678
			(2.63)**				(1.77)
OTHER			-1.140				-0.773
			(1.38)				(0.90)
Ctc			-0.704				-0.229
			(0.84)				(0.23)
INCLUDED			-0.118				0.247
			(0.36)				(0.53)
Observations	459	454	459	458	458	459	453
Absolute value of z statistics in parentheses							
* significant at 5%; ** significant at 1%							

Dependent variable is ordered; D1 take the value of -1 if the coefficient of corruption on growth is negative and statistically significant at 01%, 0 if the coefficient is not significant, and +1 if the coefficient is positive and statistically significant at 01%,. Estimation done by ordered probit

Table 17. Meta-regression analysis
the effect of corruption on economic growth (probit model)

	(1)	(2)	(3)
	D1	D2	D3
DF	-0.002	-0.002	-0.002
	(3.60)**	(3.77)**	(3.90)**
authors	0.737	0.529	0.558
	(3.98)**	(3.15)**	(3.16)**
Country(region)	0.028		0.105
	(0.11)		(0.42)
FIXED	-0.704	-0.575	-0.557
	(5.08)**	(4.46)**	(4.05)**
WB	-1.110		
	(3.10)**		
TI (CPI)	-0.626	-0.560	-0.417
	(4.66)**	(4.56)**	(3.13)**
COMB	-0.215	-0.740	-0.763
	(0.63)	(1.94)	(1.82)
OTHERS	0.042	-0.144	-0.501
	(0.24)	(0.84)	(2.70)**
HUMAN	-0.360	-0.382	-0.360
	(2.42)*	(3.00)**	(2.31)*
POLITICAL		0.341	0.546
		(2.34)*	(3.37)**
TRADE			0.224
			(1.51)
INVEST			-0.425
			(2.93)**
Observations	455	455	454
Absolute value of z statistics in parentheses			
* significant at 5%; ** significant at 1%			

Dependent variable is ordered; D1, D2, D3 take the value of -1 if the coefficient of corruption on growth is negative and statistically significant at 1%, 5%, 10% respectively, 0 if the coefficient is not significant, and +1 if the coefficient is positive and statistically significant at 1%, 5%, 10% respectively. Estimation done by ordered probit.

APPENDIX 1: Studies used in this paper

1. Abdiweli, M., 2006. "Institutional differences as sources of growth differences," *Atlantic Economic Journal* 31(4): 348-362, December.

2. Abed, T. and Davoodi, R., 2000. "Corruption, Structural Reforms, and Economic Performance in the Transition Economies," IMF, Washington DC, IMF Working Paper No. 00/132

3. Ahlin, C. and Pang, J., 2007. "Are Financial Development and Corruption Control Substitutes in Promoting Growth," Vanderbilt University, Department of Economics, Working Paper No. 07-W09, May.

4. Aidt, T., Dutta, J. And V. Sena, 2005. "Growth, Governance and Corruption in the Presence of Threshold Effects Theory and Evidence," Cambridge University, Working Papers in Economics 0540, September.

5. Anoruo, E. and Braha, H., 2005. "Corruption and Economic Growth: The African Experience.'' Mimeo.

6. Åslund, A. and Jenish, N., 2006. "The Eurasian Growth Paradox," the Institute for International Economics, Washington DC, Working Paper No. 06-5, June.

7. Barro, B., 1996."Determinants of Economic Growth: A Cross-Country Empirical Study," NBER Working Papers 5698, National Bureau of Economic Research, Inc.

8. Brunnetti, A., Kisunko, G., and Weder, B., 1997. "Credibility of rules and economic growth: evidence from a worldwide survey of the private sector," Policy Research Working Paper Series 1760, The World Bank.

9. Butkiewicz, J. L., and Yanikkaya, H., 2006. "Institutional quality and economic growth: Maintenance of the rule of law or democratic institutions, or both?," *Economic Modelling*, Elsevier, vol. 23(4), pages 648-661, July.

10. Dreher, A. and Herzfeld, T., 2005."The Economic Costs of Corruption: A Survey and New Evidence," Public Economics 0506001, Econ WPA.

11. Drury, A.C., Krieckhaus, J. and Lusztig, M., 2006. Corruption, Democracy, and Economic Growth. *International Political Science Review/ Revue internationale de science politique,* **27**(2), pp. 121-136.

12. Edison, H.J., Levine, R., Ricci, L. and Sløk, T., 2002. International financial integration and economic growth. *Journal of International Money and Finance,* **21**(6), pp. 749-776.

13. Ehrlich, I. and Lui, F.T., 1999. Bureaucratic Corruption and Endogenous Economic Growth. *The Journal of Political Economy,* **107**(6, Part 2: Symposium on the Economic Analysis of Social Behavior in Honor of Gary S. Becker), pp. S270-S293.

14. Fitzsimons, G.V., 2003. “The Hidden Economy and the Growth of Corruption in Transition Economies: causes and consequences.” Athenian Policy Forum (APF) Cambridge conference, Homerton College Cambridge, August.

15. Gyimah-Brempong, K., 2002."Corruption, economic growth, and income inequality in Africa," *Economics of Governance*, Springer, vol. 3(3), pages 183-209, November.

16. Gyimah-Brempong, K. And Gyimah-Brempong, S., 2006. "Corruption, Growth, and Income Distribution: Are there Regional Differences?," *Economics of Governance*, Springer, vol. 7(3), pages 245-269, August.

17. Gupta, S., Davoodi, H. and Alonso-Terme, R., 2002. "Does corruption affect income inequality and poverty?," *Economics of Governance*, Springer, vol. 3(1), pages 23-45, 03.

18. Haile, D. & Abdolkarim Sadrieh, A. & Verbon, H. A. A., 2003. "Self-Serving Dictators and Economic Growth," CESifo Working Paper Series CESifo Working Paper No.1105, December.

19. Hakura, D., 2004."Growth in the Middle East and North Africa," IMF Working Papers 04/56, International Monetary Fund, April.

20. Isham, J., Woolcock, M., Pritchett, L. and Busby, G., 2005. “The Varieties of Resource Experience: Natural Resource Export Structures and the Political Economy of Economic Growth.” *The World Bank Economic Review,* **19**(2), pp. 141-174.

21. Jayasuriya, R. and Wodon, Q., 2005. “Measuring and Explaining the Impact of Productive Efficiency on Economic Development.” *The World Bank Economic Review,* **19**(1), pp. 121-140.

22. Knack, S., 2006. “Governance and Growth,” Mimeo, October.

23. Li. H., Xu, L. C. and Zou, H., 2000. "Corruption, Income Distribution, and Growth," *Economics and Politics*, Blackwell Publishing, vol. 12(2), pages 155-182, 07.

24. Mamoon, D. and Murshed, S.M., 2005. "Are institutions more important than integration?," Working Papers - General Series 416, Institute of Social Studies.

25. Matthew A. Cole, 2007. “Corruption, income and the environment: An empirical analysis,” *Ecological Economics* 62, (3-4): 637-647, May.

26. Mauro, P., 1995. "Corruption and Growth," *The Quarterly Journal of Economics*, MIT Press, vol. 110(3), pages 681-712, August.

27. Mauro, P., 1996. "The Effects of Corruption on Growth, Investment, and Government Expenditure," IMF Working Papers 96/98, International Monetary Fund.

28. Mendez, F. & Sepulveda, F., 2006. "Corruption, growth and political regimes: Cross country evidence," *European Journal of Political Economy*, Elsevier, vol. 22(1), pages 82-98, March.

29. Méon, P. and Sekkat, K., 2005. "Does corruption grease or sand the wheels of growth?," *Public Choice*, Springer, vol. 122(1), pages 69-97, January.

30. Mironov, M., 2005. "Bad Corruption, Good Corruption and Growth" University of Chicago, Graduate School of Business, November.

31. MO, P.H., 2001. "Corruption and Economic Growth," *Journal of Comparative Economics,* **29**(1), pp. 66-79.

32. Neeman, Z., Paserman, D. and Simhon, A., 2003. "Corruption and Openness," CEPR Discussion Papers 4057, C.E.P.R. Discussion Papers.

33. Papyrakis, E. and Gerlagh, R., 2004. "The resource curse hypothesis and its transmission channels," *Journal of Comparative Economics*, Elsevier, vol. 32(1), pages 181-193, March.

34. Pellegrini, L. and Gerlagh, R., 2004. "Corruption's Effect on Growth and its Transmission Channels," Kyklos, Blackwell Publishing, vol. 57(3), pages 429-456, 08.

35. Poirson, H., 1998. "Economic Security, Private Investment, and Growth in Developing Countries," IMF Working Papers 98/4, International Monetary Fund.*

36. Rahman, A., Kisunko, G. and Kapoor, K., 2000."Estimating the effects of corruption - implications for Bangladesh," Policy Research Working Paper Series 2479, The World Bank.

37. Rock, M.T. and Bonnett, H., 2004. "The Comparative Politics of Corruption: Accounting for the East Asian Paradox in Empirical Studies of Corruption, Growth and Investment," *World Development*, Elsevier, vol. 32(6), pages 999-1017, June.

38. Shaw, P., Katsaiti, M. and Jurgilas, M., 2006. "Corruption and Growth Under Weak Identification," Working papers 2006-17, University of Connecticut, Department of Economics, revised Mar 2007.

39. Tanzi, V. and Davoodi, H.R., 2000. "Corruption, Growth, and Public Finances," IMF Working Papers 00/182, International Monetary Fund.

40. Toatu, T., 2004. "Corruption, Public Investment and Economic Growth: Evidence from Pacific Island Countries**,"** University of the South Pacific, Suva, Fiji, PIAS-DG Governance Program Working Paper, October.

41. Welsch, H., 2004. "Corruption, growth, and the environment: a cross-country analysis," *Environment and Development Economics*, Cambridge University Press, vol. 9(05), pages 663-693, October.

APPENDIX 2 Sensitivity for individual estimations

Table A 1 Within-study meta-analysis of corruption effect on economic growth

STUDY	COEFFICIENTS		HO: NO EFFECT (P-VALUE)	NUMBER OF ESTIMATES	HETEROGENEITY (P-VALUE)
1	Fixed	0.520	0.003	6	0.392
	Random	0.486	0.009		
2	Fixed	-0.143	0.000	6	0.000
	Random	-0.154	0.000		
3	Fixed	-0.251	0.002	9	0.592
	Random	0.251	0.002		
4	Fixed	-0.026	0.000	5	0.365
	Random	-0.027	0.001		
5	Fixed	-0.165	0.001	17	0.000
	Random	0.064	0.544		
6	Fixed	-0.393	0.000	14	0.000
	Random	-0.402	0.000		
7	Fixed	0.000	0.000	64	0.000
	Random	-0.000	0.098		
8	Fixed	-0.176	0.000	20	0.795
	Random	-0.176	0.000		
9	Fixed	-0.36	0.003	1	-
	Random	-0.36	0.003		
10	Fixed	-0.061	0.001	5	0.000
	Random	-1.685	0.019		
11	Fixed	-0.494	0.000	14	0.265
	Random	-0.470	0.001		
12	Fixed	-1.632	0.000	4	0.479
	Random	-1.632	0.000		
13	Fixed	-0.282	0.000	9	0.050
	Random	-0.268	0.000		
14	Fixed	-0.012	0.019	2	0.017
	Random	-0.020	0.198		
15	Fixed	-0.801	0.000	2	0.902
	Random	-0.801	0.000		
16	Fixed	-0.589	0.000	5	0.997
	Random	-0.589	0.000		
17	Fixed	0.125	0.117	16	0.000
	Random	0.039	0.823		
18	Fixed	-0.537	0.002	4	0.002
	Random	-0.581	0.358		
19	Fixed	-0.003	0.000	5	0.160

	Random	-0.004	0.000		
20	Fixed	-0.008	0.024	2	1.000
	Random	-0.008	0.024		
21	Fixed	-1.197	0.000	5	0.189
	Random	-1.86	0.000		
22	Fixed	-1.133	0.000	3	0.983
	Random	-1.133	0.000		
23	Fixed	-0.086	0.000	5	0.000
	Random	-0.121	0.046		
24	Fixed	-0.008	0.000	78	0.000
	Random	-0.007	0.000		
25	Fixed	-0.001	0.046	34	0.000
	Random	0.001	0.198		
26	Fixed	-0.001	0.227	12	0.001
	Random	0.002	0.199		
27	Fixed	-0.346	0.000	9	0.010
	Random	-0.301	004		
28	Fixed	0.028	0.000	4	0.982
	Random	0.028	0.000		
29	Fixed	-0.028	0.000	16	0.038
	Random	-0.033	0.000		
30	Fixed	1.799	0.000	12	0.000
	Random	2.501	0.000		
31	Fixed	-1.316	0.000	2	0.653
	Random	-1.316	0.000		
32	Fixed	-0.783	0.000	8	0.438
	Random	-0.783	0.000		
33	Fixed	-0.000	0.799	35	0.000
	Random	-0.001	0.001		
34	Fixed	0.001	0.333	7	0.693
	Random	0.001	0.333		
35	Fixed	-0.009	0.000	5	0.281
	Random	-0.009	0.000		
36	Fixed	-0.099	0.365	4	0.831
	Random	-0.099	0.365		
37	Fixed	-0.406	0.821	2	0.706
	Random	-0.406	0.821		
38	Fixed	-0.205	0.000	6	0.314
	Random	-0.208	0.000		
39	Fixed	1.043	0.001	3	0.581
	Random	1.043	0.001		
40	Fixed	-0.236	0.001	2	0.015
	Random	-0.038	0.897		
41	Fixed	-0.036	0.030	2	0.415
	Random	-0.036	0.030		

Table A2 Sensitivity of meta-analysis for individual mean estimates studies (fixed effect)

STUDY OMITTED	COEFFICIENT	95% CI, LOWER	95% CI, UPPER
1	-.00483037	-.00702889	-.00263185
2	-.00482134	-.00701981	-.00262287
3	-.00462171	-.00693431	-.00230912
4	-.00695478	-.00976262	-.00414693
5	-.00480999	-.00700848	-.00261151
6	-.0049632	-.00716616	-.00276024
7	-.00454366	-.00676066	-.00232666
8	-.00482609	-.00702456	-.00262762
9	-.00481878	-.00701728	-.00262028
10	-.00481436	-.00701284	-.00261588
11	-.00393773	-.00614269	-.00173277
12	-.00493378	-.00730454	-.00256302
13	-.00483011	-.00702858	-.00263164
14	-.00464247	-.00684667	-.00243828
15	-.00482635	-.00702488	-.00262783
16	-.00481313	-.00701161	-.00261464
17	-.00447617	-.00674774	-.0022046
18	-.0048249	-.00702337	-.00262643
19	-.0048301	-.00702857	-.00263163
20	-.00482378	-.00702227	-.00262528
21	-.00479204	-.00699054	-.00259354
22	-.00479377	-.00699239	-.00259514
23	-.00481138	-.00700988	-.00261289
24	-.00482608	-.00702455	-.00262761
25	-.00482121	-.00701968	-.00262274
26	-.00476129	-.00696127	-.00256132
27	-.00459114	-.00690427	-.00227801
28	-.00588353	-.00823714	-.00352992
29	-.00482192	-.0070204	-.00262344
30	-.0048051	-.00700367	-.00260653
31	-.00480614	-.00700469	-.00260758
32	-.00482579	-.00702426	-.00262732
33	-.00481718	-.00701566	-.00261869
34	-.0048902	-.00709421	-.0026862
35	-.00479494	-.0069935	-.00259637
36	-.00481365	-.00701212	-.00261518
37	-.00482588	-.00702435	-.00262741
38	-.00482093	-.0070194	-.00262246
39	-.00482671	-.00702518	-.00262823
40	-.00465777	-.00691374	-.0024018

Table A3 Sensitivity of meta-analysis for individual median estimates studies (fixed effect)

STUDY OMITTED	COEFFICIENT	95% CI, LOWER	95% CI, UPPER
1	-.00287017	-.0042592	-.00148115
2	-.00286687	-.00425589	-.00147786
3	-.00256523	-.00399469	-.00113576
4	-.00340231	-.00502427	-.00178034
5	-.00286114	-.00425016	-.00147213
6	-.00292168	-.00431184	-.00153152
7	-.0027438	-.00413745	-.00135015
8	-.00286836	-.00425738	-.00147935
9	-.0028619	-.00425093	-.00147288
10	-.00286381	-.00425282	-.00147479
11	-.00253338	-.00392401	-.00114275
12	-.0033888	-.00498557	-.00179203
13	-.00287035	-.00425936	-.00148133
14	-.00280842	-.00419856	-.00141829
15	-.00286856	-.00425759	-.00147954
16	-.00286232	-.00425134	-.00147331
17	-.00272349	-.00412882	-.00131815
18	-.00286781	-.00425682	-.0014788
19	-.00287011	-.00425912	-.0014811
20	-.00286744	-.00425646	-.00147842
21	-.00285489	-.00424391	-.00146587
22	-.00284147	-.00423057	-.00145237
23	-.00283196	-.00422103	-.00144289
24	-.00286847	-.00425749	-.00147946
25	-.00286698	-.00425599	-.00147797
26	-.00282488	-.00421501	-.00143476
27	-.00254314	-.00415656	-.00092972
28	-.00325177	-.00469443	-.00180911
29	-.00286692	-.00425594	-.00147791
30	-.00285952	-.00424856	-.00147048
31	-.00285487	-.00424391	-.00146583
32	-.00286833	-.00425735	-.00147932
33	-.00286457	-.00425359	-.00147555
34	-.0032353	-.00465632	-.00181428
35	-.002856	-.00424503	-.00146696
36	-.00280025	-.00418957	-.00141092
37	-.00286842	-.00425743	-.0014794
38	-.00286658	-.00425559	-.00147756
39	-.00286952	-.00425854	-.00148051
40	-.00276325	-.00416643	-.00136007