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The Effect of Corruption on Investment Growth: Evidence from Firms in Latin America, Sub-Saharan Africa, and Transition Countries*

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Abstract

Most of the empirical studies that analyze the impact of corruption on investment have three common features: they employ country-level data on investment, corruption is measured at the country level, and data for countries from several regions are pooled together. This paper uses firm-level data on investment and measures corruption at the firm and country level, and allows the effect of corruption to vary by region. Our dependent variable is firms' investment growth and we employ six measures of corruption from four different sources—two firm-level measures and four country-level measures. We find that the effect of corruption on investments varies significantly across regions: corruption has a negative and significant effect on investment growth for firms in Transition countries but has no significant impact for firms in Latin America and Sub-Saharan Africa. Furthermore, for Transition countries, corruption is the most important determinant of investment.

1. Introduction

There is a vast empirical literature on the effect of corruption on investment. However, most of the studies use *country-level* (aggregate) data on investments for their analysis—our literature review revealed only three papers that have analyzed the effect of corruption on *firm-level* investments (Gaviria, 2002; Smarzynska and Wei, 2002; Batra et al., 2003). The paucity of research on how corruption affects firm behavior is noted in Svensson (2003, p. 209) who writes that "despite more than two decades of research, however, economic studies on corruption at the firm level are rather limited." Wei (2001, p. 11) conducts an extensive review of the corruption–investment literature and concludes that "firm-level studies are generally rare, for the obvious reason that firm-level data are more difficult to assemble." Analyzing how corruption affects firm-level investment is important because reports from several surveys suggest that corruption affects firm performance. For example, about 74% of the firms that participated in the *World Business Environment Survey* (WBES) conducted by the World Bank (described in detail in section 5) reported that corruption was an obstacle to the operation and growth of their business.

This paper contributes to the literature by examining the impact of corruption on firm-level investment growth. Another contribution of the paper is that we run separate regressions for firms in three regions: Transition countries, Sub-Saharan Africa (SSA), and Latin America and the Caribbean (LAC). Our approach contrasts with most

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studies that pool data from several regions into one sample. Indeed, if the underlying relationship between corruption and investment is different for the various regions (as we find in this paper), then an analysis based on a pooled sample may produce misleading results.

We find that the effect of corruption on firms' investment growth varies significantly by region: corruption has a negative effect on firm investments for Transition countries but has no significant impact for LAC and SSA. Furthermore, for Transition countries, corruption is the most important determinant of investment growth—more important than firm size, firm ownership, trade orientation, industry, GDP growth, inflation, and openness to trade.

2. Investment and Corruption

The theoretical impact of corruption on firm-level investment is inconclusive. On the one hand, corruption raises operational cost, creates uncertainty, and thereby deters investment (Shleifer and Vishny, 1993). However, the negative effect of corruption can be neutralized or offset in situations where corruption greases the wheels of business—e.g. creates opportunities for private *illicit* gains to firms, such as "paying cash for contracts." The issue of cash for contract is well articulated by Rose-Ackerman (1996, p. 1) who notes that "when the government is a buyer or a contractor, . . . a corrupt firm may pay to be included in the list of qualified bidders, to have officials structure the bidding specifications so that it is the only qualified supplier, or to be selected as the winning contractor. And once selected, it may pay for the opportunity to charge inflated prices or to skimp on quality." Thus, all else equal, firms that benefit from corruption may expand their activities by increasing investments. This suggests that the overall theoretical impact of corruption on firm-level investment is unclear: it can be negative, positive, or neutral, depending on which of the two opposing effects dominate. Thus, the effect of corruption on firm-level investment is an empirical issue.

3. Measures of Corruption

For convenience, we classify the measures of corruption that have been employed in previous studies into three categories: *internal*, *external*, and *hybrid*. Internal measures of corruption are based on the perceptions of firms that operate *within* the country. The typical procedure is to survey firms in a country about their perceptions and experiences of corrupt practices. One advantage of using internal measures is that they reflect firms' perception of investment risks, which happens to be one of the most relevant factors that shape firms' operational and investment decisions. However, internal measures have several limitations. First, the firms that provide the corruption ratings operate in different countries and therefore face different policy environments and economic settings. As a consequence, their point of reference is likely to be different and thus the data may not be easily comparable across countries. The second limitation is that the data are likely to be influenced by firm-specific attributes, such as firm size. For example, corruption ratings provided by large firms may be different from the ratings provided by smaller firms. This suggests that countries with the same level of corruption but different composition of firms with regards to size (large versus small) may have different internal corruption ratings. The third disadvantage is that corruption may be underreported, as respondents may be reticent about providing answers to sensitive questions such as corruption. It is also possible that government censorship may preclude surveys from asking questions on corruption.

The second type of corruption measure, external, is based on the assessment of risk analysts who typically reside *outside* a country. These corruption data are generally provided by private risk-rating agencies and are targeted toward foreign investors. One advantage of external measures is that unlike internal measures, countries are rated by the same set of entities (i.e. risk analysts) and therefore the data are generally consistent and less prone to measurement errors. However, external measures also have several limitations. First, the data tend to have limited coverage and are generally not available for small or poor countries, or for countries that receive little foreign investment. Thus, using external corruption measures will automatically exclude several developing countries from the empirical analysis, in particular the countries that are in most need of investments.

Another disadvantage of external measures is that the evaluations of the (foreign) risk analysts are generally not based on personal experience, but often inferred from media reports. As a result, the levels of corruption reported by these "experts" may not accurately reflect the levels of corruption that prevail in a country. Indeed, several studies have found that risk assessments by private rating agencies tend to be biased against poor countries or smaller countries (Ferri, 2004). Furthermore, the bias is particularly large for countries with an "image" problem, in particular countries in SSA. For example, according to the World Investment Report (2000), 56% of large multinational corporations that participated in a survey reported that the actual business environment in SSA was better than the continent's image would suggest. This view is also consistent with the empirical results of Haque et al. (2000) who find that commercial risk-rating agencies often rate African countries as riskier than warranted by the fundamentals. This caveat of external corruption measures is particularly relevant to our work because our analysis includes several African countries. Finally, external measures of corruption are more relevant at the initial stage of a firm's investment decision process when the firm is deciding whether or not to invest in a country. Once a firm locates in a country, the subsequent operational decisions, such as how much to increase investments, will be shaped by the firm's experience from operating in that environment.[1]

The third corruption measure, the hybrid, combines corruption data from different sources into a composite index. Note that by combining all types of corruption data (including internal and external measures of corruption), hybrid measures by their nature mitigate the problems associated with the other two measures of corruption. One disadvantage, however, is that since the data are a composite measure, they do not differentiate among various forms of corruption, such as nepotism, embezzlement of public funds, or bribery. This could be problematic if different types of corruption have different effects on investment.

Bearing in mind the caveats of the available corruption measures, we employ corruption measures from all three categories for our empirical analysis. Specifically, we use six measures of corruption from four different sources—three internal measures, one external measure, and two hybrid measures. Our internal measures are derived from the WBES and they reflect the size of bribe payments by firms to public officials. Our external measure is the *International Country Risk Guide* corruption index, which captures corruption within the political system, including suspiciously close ties between politics and business. Our hybrid measures are the Corruption Perception Index published by Transparency International and the Corruption Index compiled by Kaufmann et al. (2005). These two hybrid measures are the most widely utilized measures of corruption. Using measures of corruption from several sources and from all three categories of corruption serves as a robustness check and also increases the credibility of our results.

4. Brief Literature Review

For discussion purposes, we will categorize the empirical literature on corruption and investment into three groups, namely, micro, semi-micro, and macro studies. Micro studies are based on firm-level data on investment and firm-level data on corruption. Firm-level data on corruption are obtained from surveys of firms operating within a country, and therefore fall under the category of internal measures of corruption. These measures are idiosyncratic to a firm and they reflect a specific firm's perception of the level of corruption prevailing in the country in which the firm operates. An advantage of a micro analysis is that it links a firm's perception of corruption to the firm's investment decision. This is important because investment decisions are to a large extent shaped by investor perception and not by "actual" events.

Micro analysis has at least two disadvantages. First, the data for the dependent variable, investment, and the data for corruption are both derived from the same source (i.e. the same firm)—this raises a potential endogeneity problem. The second disadvantage is that firm-level measures of corruption fall under the category of internal measures, and therefore the analyses suffer from the caveats of internal measures of corruption described above. Our literature review revealed only two micro studies: Gaviria (2002) and Batra et al. (2003). Both studies use corruption and investment data from the WBES, which is also our primary source of data. Batra et al. (2003) pool data for firms in 81 developing and developed countries and find that corruption has a negative and significant impact on investment growth. Gaviria (2002), on the other hand, restricts his analysis to countries in Latin America and the Caribbean and finds no significant relationship between corruption and firm-level investment growth.

The second strand of the literature, semi-micro studies, employ firm-level data on investment and country-level data on corruption. Country-level measures of corruption capture the pervasiveness of corruption within a country and they may mitigate some of the measurement errors and biases associated with using firm-level measures. However, by using such data, one is implicitly assuming that all firms within a country face the same levels of corruption. With regard to the literature, we found only one semi-micro study, Smarzynska and Wei (2002). The authors analyze how corruption measured at the country level affects a firm's investment decisions. They employ two measures of corruption—data from the World Bank's *World Development Report* survey, which is an internal measure, and the Corruption Perception Index, compiled by Transparency International, which is a hybrid measure. Their analysis focuses on foreign-owned firms in Transition countries and they find that corruption has an adverse effect on investment.

The vast majority of the papers fall under the third category, macro studies, where the analyses employ country-level data on investment and country-level data on corruption.[2] Thus, macro-level studies generally examine the extent to which cross-country variations in aggregate investments can be explained by differences in cross-country corruption. The general finding is that corruption deters aggregate investments.

This paper employs firm-level and country-level measures of corruption to examine how corruption affects firms' investment growth. Thus, we carry out a micro and a semi-micro analysis. There are two main reasons for taking a micro approach. As pointed out earlier, most of the studies on the investment–corruption relationship are macro-level studies—very few studies employ firm-level investment data. The second reason is that there are several advantages to using firm-level data on investment. First, using firm-level investment data permits one to analyze how corruption affects the behavior of the agents that make the investment decisions—i.e. the firm. Another

advantage is that it allows one to identify firm characteristics that affect investment decisions. Such an analysis has important policy implications. For example, our analysis suggests that investment growth is higher for firms in the service sector than for firms in other sectors. Thus, a country that seeks investments may want to pursue policies that will attract more service sector firms. A third advantage of using firm-level data on investment is that it mitigates some of the econometric problems associated with country-level analysis. For example, most of the macro studies use GDP growth rate as a determinant of investment. This is problematic because causality may run from investment to GDP growth, giving rise to an endogeneity bias. Note that the potential endogeneity problem is less of a concern when using firm-level data because the investment of an individual firm is less likely to have a significant effect on GDP growth.

This paper extends the literature on corruption and investment in several ways. First, by utilizing measures of corruption from different sources and from different categories, we provide a comprehensive analysis of the effect of corruption on investment growth. Secondly, unlike previous studies, we run regressions for the pooled sample, as well as for countries in LAC, SSA, and Transition countries. Indeed, to the best of our knowledge, this is the first study that analyzes the effect of corruption on firm-level investment in SSA.[3] Such an analysis is important because SSA is perceived to be the most corrupt region and is also the region in most need of investment.

5. The Data and Variables

Our main source of data is the World Business Environment Survey (WBES) conducted by the World Bank in 1999/2000. The purpose of the survey was to identify the factors that constrain business activities in various countries.[4] The survey covered 10,032 firms in 81 countries and at least 100 firms were surveyed in each country.[5] The dependent variable is the percentage growth in a firm's investment over the period 1996–98 (i.e. three years prior to the survey). Using data on the amount of investments would have been preferable; however, respondents were asked to indicate only the growth in investments and not the actual amounts of investments.

Firm-Level Measures of Corruption

We use two firm-level measures of corruption based on firms' response to the question: "On the average, what percent of revenues do firms like yours typically pay per annum in unofficial payments to public officials? (1) 0%; (2) 1–1.99%; (3) 2–9.99%; (4) 10–12%; (5) 13–25%; (6) Over 25%."

We define the variable, *Bribe_Index* such that it corresponds to the six responses—*Bribe_Index* takes on value 1 to 6 where a higher number implies more corruption. The second measure, *Bribe_Dummy*, is a binary variable which takes on value 1 if a firm reported that at least 2% of its revenue was paid to government officials as bribes and 0 otherwise. Thus, *Bribe_Dummy* is equal to 1 if firms' response is "3," "4," "5," or "6"; and 0 otherwise.

Country-Level Measures of Corruption

We employ four country-level measures of corruption: one internal, one external and two hybrid measures. The internal measure, *Bribe_Percent*, is derived from firms'

Table 1. Correlation Matrix of Measures of Corruption

	Bribe_Index	*Bribe_Dummy*	*Bribe_Percent*	*ICRG*	*KKM*
Bribe_Dummy	0.843***				
	(0.000)				
Bribe_Percent	0.477***	0.335***			
	(0.000)	(0.000)			
ICRG	0.248***	0.181***	0.442***		
	(0.000)	(0.000)	(0.000)		
KKM	0.243***	0.177***	0.482***	0.425***	
	(0.000)	(0.000)	(0.000)	(0.000)	
TI	0.225***	0.165***	0.425***	0.421***	0.945***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Notes: *p*-values are in parentheses; *** significance at 1%, ** significance at 5%, * significance at 10%.

response to the bribery question and it is the percentage of firms in a country that reported that they paid at least 2% of their revenue to government officials as bribes. The external measure, ICRG, is obtained from the *International Country Risk Guide*, published by Political Risk Services. The variable *ICRG* ranges from 1 to 6, with a higher number implying more corruption.[6] The first hybrid measure, *KKM*, is derived from Kaufmann et al. (2005) and it ranges from 0 to 5, with a higher number indicating more corruption.[7] The second hybrid measure, *TI*, is the Corruption Perception Index, published by Transparency International and it ranges from 1 to 10, where a higher number implies more corruption.[8] Since our dependent variable is investment growth over the period 1996–98, we averaged the corruption measures over the period 1995–98 to roughly correspond with the time period when investment decisions were made.

Table 1 shows the correlation matrix for the corruption variables. One noticeable point is that although the measures are taken from different sources, the correlation coefficients are all significant at the 1% level. This suggests that the variables capture similar attributes, specifically, corruption.

Control Variables

For firm characteristics, we employ the following dummy variables that take on values 1 or 0: *Firm_Small* takes on value 1 if the number of employees is less than 50; *Firm_Medium* takes on value 1 if the number of employees is greater than 50 and less than 500; *Exporter* takes on value 1 if a firm is an exporter; *Service* equals 1 if the firm is in the service industry; *Foreign_Owned* equals 1 if a foreign company has a financial stake in the ownership of the firm; and *Govt_Owned* equals 1 if the government has a financial stake in the ownership of the firm.[9]

The country control variables are real GDP growth rate (a measure of growth prospects in host countries), inflation rate (a measure of macroeconomic instability), and trade as a share of GDP (a measure of openness to trade). We hypothesize that firm investment growth is positively related to GDP growth and openness to trade and negatively related to inflation. The data for the country control variables are obtained from the *World Development Indicators* published by the World Bank. Similar to the corruption measures, we averaged the country control variables over the period 1995–98. The summary statistics of the variables are reported in Table 2.

Table 2. Summary Statistics

	Full sample		*Transition countries*		*Latin America and Caribbean*		*Sub-Saharan Africa*	
Variable	*Mean*	*Std. dev.*	*Mean*	*Std. dev.*	*Mean*	*Std. dev.*	*Mean*	*Std. dev.*
Bribe_Index	2.51	1.48	3.20	1.30	1.90	1.36	NA	NA
Bribe_Dummy	0.26	0.44	0.37	0.48	0.16	0.37	NA	NA
Bribe_Percent	26.81	13.41	33.58	9.61	17.31	12.19	NA	NA
ICRG	3.35	1.26	3.75	1.57	2.91	0.73	3.15	0.74
KKM	2.74	0.57	2.73	0.59	2.68	0.55	2.88	0.50
TI	6.39	1.32	6.44	1.27	6.29	1.29	6.44	1.49
Investment Growth (%)	19.20	41.04	16.08	44.94	20.51	38.24	24.17	35.16
Firm_Small	0.37	0.48	0.48	0.50	0.24	0.43	0.35	0.48
Firm_Medium	0.42	0.49	0.44	0.50	0.41	0.49	0.39	0.49
Service	0.42	0.49	0.46	0.50	0.46	0.50	0.26	0.44
Exporter	0.41	0.49	0.34	0.48	0.41	0.49	0.55	0.50
Govt_Owned	0.12	0.33	0.20	0.40	0.03	0.17	0.08	0.28
Foreign_Owned	0.19	0.39	0.08	0.28	0.27	0.44	0.31	0.46
GDP Growth	1.97	2.51	2.31	3.19	1.66	1.71	1.69	1.55
100 * Trade/GDP	71.88	31.78	88.29	31.18	53.35	26.41	64.59	19.62
Log(1 + Inflation)	2.82	1.19	3.45	1.12	2.22	1.05	2.38	0.84

6. Estimation Results

Our dataset may be problematic in two respects. First, survey data typically tend to have outlier observations due to coding mistakes and/or measurement errors. Secondly, since most of the data are derived from surveys of firms operating within the same country, it is reasonable to expect the error terms to be correlated within countries. To handle these potential problems, we employ two types of estimation procedures for our analysis. The first is ordinary least squares (OLS) with heteroskedastic-robust standard errors that allows for clustering within country.[10] The second estimation method is the iteratively reweighted least squares (IRLS). Each of the two procedures has advantages and drawbacks. The main advantage of the OLS procedure with the clustering option is that it is robust to heteroskedasticity as well as correlation among the error terms within clusters. One caveat, however, is that OLS produces inefficient estimates when data have significant outliers. Unlike OLS, IRLS produces robust estimates when a dataset has outlier observations. The disadvantage, however, is that IRLS assumes independent and identically distributed errors.[11] Thus, none of the two estimation procedures completely addresses the data problems discussed above. However, using the two procedures increases the credibility of inferences made from our analysis.

The Effect of Firm-Level Measures of Corruption on Firms' Investment Growth

We start with estimations using firm-level corruption and investment data. Here, the relevant measures of corruption are *Bribe_Index* and *Bribe_Dummy*. We begin our analysis by estimating equation (1) for the pooled sample, which consists of Transition countries and LAC (firm-level corruption data are not available for SSA):

$$INV\_GROWTH_{ij} = \alpha + \beta CORRUPT_{ij} + \theta FIRM_{ij} + \gamma COUNTRY_j + \varepsilon_{ij}, \quad (1)$$

where i and j represent firm and country, respectively, $CORRUPT_{ij}$ is the firm-level measure of corruption; $FIRM_{ij}$ is a vector of firm attributes; $COUNTRY_j$ is vector of country variables (or country dummy variables for the fixed effects model); and ε_{ij} is the error term.

Table 3 shows that corruption has a negative and significant effect on investment growth for the pooled sample. Furthermore, the results for the two procedures are qualitatively similar, although IRLS estimates are slightly higher and have a better level of significance. With regard to the firm-level control variables, investment growth is higher for firms in the service industry and firms that export, but is lower for small firms and firms that have some government ownership. Firm ownership (domestic versus foreign) does not have a significant effect on investment growth. For the country variables, openness to trade has a positive and significant effect on investment growth. In contrast, inflation and GDP growth do not have a significant impact.

The estimations for the pooled sample assume that the effect of corruption and the other explanatory variables on investment growth is similar for LAC and Transition countries. To examine this issue, we run separate regressions for the two sample groups. In order to conserve space we report only the estimated coefficients of the corruption variables in Table 4. Two points stand out from Table 4. First, corruption has a negative and significant effect on investment growth for Transition countries but does not have a significant effect for LAC. The second noticeable point is that the magnitudes of the estimated coefficients of the corruption variables are lower for the pooled sample than for the Transition countries sample. Thus our analysis suggests that the estimates based on the pooled sample underestimates the effect for Transition countries and overestimates the effect for LAC. Thus, our results suggest that pooling data can produce misleading results.

The Effect of Country-Level Measures of Corruption on Firm Investment Growth

The firm-level corruption measures employed in the previous regressions are advantageous in that they permit us to examine how a firm's perception of corruption affects the firm's investment decisions. However, the analysis has several drawbacks. First, the measures of corruption reflect only one type of corruption, i.e. bribery of government officials. In addition, countries in SSA are excluded because the data on bribery are not available for SSA. This is problematic because, as pointed out earlier, SSA is generally perceived to be the most corrupt region and also a region that could benefit greatly from an increase in private investment. Another disadvantage is that the estimations have excluded firms that provided information about their investments and other relevant firm attributes but did not answer the question on corruption. The missing bribery data raise a concern about possible selection bias. The third drawback is that the firm-level measures of corruption are internal measures and are thus subject to the limitations of internal measures, such as endogeneity problems, discussed in section 3.

To mitigate these potential problems, we re-estimate equation (1) using country-level measures of corruption. Note that the sample size rises substantially. For example, the number of observations for Transition countries increases from 673 to 1278, an increase of about 90%. Another appealing feature of this approach is that by analyzing the effect of different types of corruption (bribery, embezzlement of funds, nepotism) and also employing measures of corruption from different sources (World Bank, PRS, KKM, and TI) and different categories (internal, external, and hybrid) we are able to

Table 3. The Impact of Firm-Level Measures of Corruption on Firm-Level Investment Growth for the Pooled Sample

	Ordinary least squares (OLS)				*Iteratively reweighted least squares (IRLS)*			
	Bribe_ Index		*Bribe_ Dummy*		*Bribe-Index*		*Bribe-Dummy*	
Variables	*Country fixed effects (1)*	*Include country controls (2)*	*Country fixed effects (3)*	*Include country controls (4)*	*Country fixed effects (5)*	*Include country controls (6)*	*Country fixed effects (7)*	*Include country controls (8)*
Bribe_Index	–2.230**	–2.034**			–2.237***	–2.127***	NA	NA
	(0.863)	(0.970)			(0.836)	(0.781)		
Bribe_Dummy			–5.445**	–5.599*			–5.954**	–5.753**
			(2.552)	(2.981)			(2.559)	(2.505)
Firm_Small	–8.271**	–8.054***	–8.735**	–8.757***	–5.684	–5.988*	–6.007*	–6.679**
	(3.380)	(2.942)	(3.420)	(2.910)	(3.480)	(3.349)	(3.468)	(3.318)
Firm_Medium	–4.944*	–4.316*	–5.270**	–4.773*	–4.297	–4.070	–4.500	–4.556
	(2.488)	(2.534)	(2.493)	(2.462)	(3.052)	(2.993)	(3.045)	(2.980)
Service	11.316***	10.035***	11.123***	9.859***	10.677***	9.779***	10.571***	9.669***
	(2.342)	(2.386)	(2.366)	(2.421)	(2.242)	(2.238)	(2.241)	(2.238)
Exporter	7.837**	8.302***	7.780**	8.273***	7.109***	7.792***	6.991***	7.710***
	(2.985)	(2.912)	(2.978)	(2.894)	(2.519)	(2.483)	(2.519)	(2.486)
Govt_Owned	–16.766***	–16.798***	–16.547***	–16.955***	–15.547***	–14.703***	–15.308***	–14.798***
	(4.524)	(4.728)	(4.510)	(4.688)	(4.124)	(4.057)	(4.123)	(4.059)
Foreign_Owned	4.562	4.602	4.706	4.817	3.788	3.987	3.819	4.156
	(3.653)	(3.437)	(3.696)	(3.480)	(2.970)	(2.961)	(2.968)	(2.960)
GDP Growth		0.675		0.653		0.805		0.781
		(1.000)		(0.992)		(0.493)		(0.495)
100 * Trade/GDP		0.108**		0.103**		0.079**		0.074**
		(0.050)		(0.048)		(0.037)		(0.036)
Log(1 + Inflation)		–0.607		–0.951		–0.952		–1.302
		(1.497)		(1.533)		(1.021)		(1.008)
Constant	21.298***	13.966**	17.490***	12.207**	14.875**	15.535***	12.186*	13.631***
	(3.679)	(5.150)	(2.765)	(4.740)	(7.391)	(4.401)	(7.246)	(4.326)
No. of firms	1434	1434	1434	1434	1434	1434	1434	1434
No. of countries	37	37	37	37	37	37	37	37

Notes: Standard errors are in parentheses; *** significance at 1%, ** significance at 5%, * significance at 10%.

Table 4. The Effect of Firm-Level Measures of Corruption on Firm-Level Investment Growth

Corruption variables	*Country fixed effects?*	*Pooled sample*		*Transition countries*		*Latin America*	
		OLS	*IRLS*	*OLS*	*IRLS*	*OLS*	*IRLS*
Bribe_Index	Yes	–2.230**	–2.237***	–3.148**	–3.335**	–1.485	–1.174
		(0.863)	(0.836)	(1.472)	(1.324)	(1.030)	(1.060)
Bribe_Dummy	Yes	–5.445**	–5.954**	–7.415*	–8.775**	–3.341	–2.366
		(2.552)	(2.559)	(3.631)	(3.507)	(3.703)	(3.853)
Bribe_Index	No	–2.034**	–2.127***	–4.144**	–4.561***	–0.776	–0.477
		(0.970)	(0.781)	(1.807)	(1.353)	(1.004)	(0.987)
Bribe_Dummy	No	–5.599*	–5.753**	–9.270**	–10.618***	–1.374	–0.341
		(2.981)	(2.505)	(4.264)	(3.614)	(3.409)	(3.642)

Notes: Standard errors are in parentheses; *** significance at 1%, ** significance at 5%, * significance at 10%.

provide a more comprehensive analysis of the effect of corruption on investment growth. Finally, the estimations serve as a robustness check of our previous results.

The results, displayed in Table 5, are consistent with the previous results: the effect of corruption varies by region. Corruption has a negative and significant impact on investment growth for Transition countries but has no significant effect for LAC and SSA. In addition, the effect of corruption on investment seems to be consistent across the different corruption measures (with the exception of ICRG, which is a little lower than the rest). For example, the OLS estimations indicate that for Transition countries, a one-standard-deviation increase in corruption will decrease investment growth by about 11.19% for the corruption measure *Bribe_Percent*, by 9.71% for KKM, by about 10.52% for TI, and by about 3% for ICRG. This clearly suggests that our main results are robust.

Having ascertained that corruption has a significant effect on investment for Transition countries, we next investigate the relative importance of corruption *vis-à-vis* other explanatory variables in determining investment growth in the region. We accomplish this by comparing the estimated beta coefficients of the regressions. Beta coefficients measure the effect of a variable in standard deviations and are therefore unit-free. Thus, for each regression, the (absolute) magnitude of the beta coefficient determines the relative importance of the variable *vis-à-vis* other explanatory variables included in the regression. The results, reported in Table 6, show that the corruption variables have the highest beta coefficient, suggesting that among the explanatory variables, corruption is the most important determinant of firm-level investment growth.

Discussion and Robustness Checks

The insignificant effect of corruption on investments, particularly for SSA, is puzzling and counterintuitive. In this section we attempt to provide plausible explanations for our results. We investigated the possibility that the insignificance of corruption may be explained by a lack of variation in the corruption measures for LAC and SSA. We found that the coefficient of variation for the corruption measures are significantly higher for LAC and SSA countries than for Transition countries. Another possible explanation could be functional form misspecification. Specifically, it is possible that the

Table 5. The Effect of Country-Level Measures of Corruption on Firm-Level Investment Growth

Corruption variables	*Pooled sample*		*Transition countries*		*Latin America*		*Sub-Saharan Africa*	
	OLS	*IRLS*	*OLS*	*IRLS*	*OLS*	*IRLS*	*OLS*	*IRLS*
Bribe_Percent	–0.146	–0.180**	–0.918**	–1.018***	0.150	0.146	NA	NA
	(0.165)	(0.079)	(0.408)	(0.174)	(0.096)	(0.103)	NA	NA
ICRG	–3.499**	–3.677***	–4.158**	–4.468***	–1.483	–1.622	1.403	0.910
	(1.487)	(0.611)	(1.870)	(0.838)	(2.089)	(2.277)	(1.741)	(1.414)
KKM	–5.226	–4.872***	–17.649***	–18.664***	4.160*	4.473*	–0.612	–0.567
	(3.393)	(1.542)	(5.404)	(2.920)	(2.134)	(2.615)	(2.195)	(2.222)
TI	–2.998**	–2.784***	–8.158***	–8.759***	2.346*	2.419	–0.033	–0.197
	(1.443)	(0.739)	(2.166)	(1.352)	(1.221)	(2.201)	(0.835)	(0.846)

Notes: Standard errors are in parentheses; *** significance at 1%, ** significance at 5%, * significance at 10%.

Table 6. The Impact of Corruption on Investment Growth for Transition Countries: Estimated Standardized (Beta) Coefficients

Variables	*Bribe_Percent*	*ICRG*	*KKM*	*TI*
Corruption	**–0.196**	**–0.146**	**–0.233**	**–0.231**
Firm_Small	0.115	0.092	0.091	0.087
Firm_Medium	0.055	0.058	0.044	0.039
Service	0.088	0.082	0.084	0.083
Exporter	0.140	0.142	0.126	0.124
Govt_Owned	–0.062	–0.057	–0.058	–0.056
Foreign_Owned	–0.131	–0.005	–0.003	–0.007
GDP Growth	0.002	0.006	–0.033	–0.045
100 * Trade/GDP	0.002	0.030	–0.072	–0.104
Log(1+ Inflation)	–0.125	–0.064	0.022	–0.022

Table 7. The Effect of Country-Level (Quadratic) Measures of Corruption on Firm-Level Investment Growth

	Transition countries	*Latin America and Caribbean*	*Sub-Saharan Africa*
Bribe_Percent	–1.156	0.142	NA
	(0.722)	(0.385)	
*Bribe_Percent * Bribe_Percent*	0.003	–0.006	NA
	(0.011)	(0.008)	
ICRG	–0.178	–12.320	–24.919
	(5.000)	(9.737)	(17.428)
*ICRG * ICRG*	–2.960***	2.134	4.634
	(1.117)	(3.897)	(2.895)
KKM	–16.851***	4.828	7.635
	(3.002)	(6.297)	(7.762)
*KKM * KKM*	11.470**	2.134	–5.375
	(5.326)	(3.897)	(8.323)
TI	–17.883	9.355	–11.598
	(13.701)	(9.002)	(15.761)
*TI * TI*	0.880	–0.694	0.970
	(1.139)	(0.819)	(1.168)

Notes: Standard errors are in parentheses; *** significance at 1%, ** significance at 5%, * significance at 10%.

relationship between corruption and investment is nonlinear. We re-estimated equation (1) where we included the quadratic term of the corruption variable. We also performed a test for joint significance for the corruption measures. The results, which are reported in Table 7, show that the estimated coefficient of the quadratic term is generally not significant. Furthermore, in 10 out of the 12 regressions, we fail to reject the hypothesis that the coefficients of the linear and quadratic terms are not jointly significant. We however note that it is possible that the effect of corruption depends on other factors, such as GDP per capita.

In summary, our analyses suggest that the insignificance of corruption for LAC and SSA may be explained by factors other than data problems or functional-form

misspecification. We now provide two plausible explanations for our results. First, based on the discussion in section 2, we conjecture that in LAC and SSA, corruption generates private gains to firms and that these gains neutralize the adverse effects of corruption on investment that may result from uncertainty or increased operational cost. The second plausible explanation is that our sample includes firms that are already operating within the country. It is possible that these firms may have factored in the adverse effect of corruption prior to starting their businesses. As a consequence, changes in corruption may have very little effect on the firms' investment decisions.

7. Conclusion

Although a number of studies have examined the impact of corruption on aggregate investments, very few have analyzed the effect of corruption on firm-level investments. This paper analyzes the impact of corruption on firm-level investment growth. We find that corruption has an adverse effect on investment growth for Transition countries, but has no significant effect for Latin America and the Caribbean and Sub-Saharan Africa. Furthermore, among the variables included in the regressions (firm size, firm ownership, trade orientation, industry, GDP growth, inflation, and openness to trade) corruption is the most important determinant of investment growth for Transition countries.

Our finding that corruption has no significant effect on investment in Latin America and Sub-Saharan Africa does not imply that corruption is less of a concern in these two regions. A plausible explanation is that corruption provides private rents to firms. However, these private gains may not translate into social gains. In fact, a number of studies have demonstrated that corruption impedes investments and economic growth (e.g. Mauro, 1995). Another important point is that our analysis pertains only to firms that are already operating within the country. It is likely that high levels of corruption may prevent many firms from operating in these regions in the first place. However, this loss of potential investments resulting from corruption is not captured by our model. Thus, although corruption does not have a significant effect on investment growth, it is possible, and indeed likely, that it might deter the entry of firms. As a consequence, the overall effect of corruption on investment (which includes the loss of potential investments) may be negative.

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Notes

1. The point is that external measures of corruption are more relevant for firms that have no experience or first-hand knowledge about the countries in which they wish to invest. Thus, these measures are not helpful when evaluating the effect of corruption on investment decisions by firms that are already operating in a country.
2. See Rock and Bonnett (2004) for a survey of the literature.
3. We are aware of only two studies that have examined the effect of corruption on firm performance in SSA. Fisman and Svensson (2007) analyze the impact of bribery *vis-à-vis* taxes on sales growth for firms in Uganda and conclude that bribery is negatively correlated with sales growth and that bribery is more damaging than taxation. McArthur and Teal (2002) employ data for 27 African countries and find that corruption has a significant and negative effect on output per worker.
4. The WBES data are available at http://info.worldbank.org/governance/wbes/.
5. The countries included in our analysis were determined by the availability of data. Specifically, data on investment and/or corruption as well as data for some of the firm attributes included in the regressions were not available for several of the firms in East Asia, Southeast Asia, and the Middle East and North Africa. As a result, we restricted our analysis to LAC, SSA, and Transition countries.
6. The original data ranged from 1 to 6, where a higher number implies less corruption. To facilitate the interpretation of the results, we rescaled the data by subtracting the original score from 7, so that a higher number implies more corruption. For more information about the data see http://www.prsgroup.com/icrg/icrg.html.
7. The original data from KKM ranged from –2.5 to 2.5, where a higher number implies less corruption. We rescaled the variable by subtracting the original KKM score from 2.5, so that a higher number implies more corruption. The data are available at www.worldbank.org/wbi/governance/govdata/.
8. The Transparency International corruption perception index is available at http://www.transparency.org/.

9. We used dummy variables to capture firms' trade orientation and foreign ownership because data on the percentage of exports and the percentage of firm ownership were missing for most of the firms in our sample. With regard to firm size, data on assets and sales were also not available for many firms.
10. Our main results hold even when we do not allow for clustering and simply run a standard OLS under the assumption of independent error terms.
11. See Hamilton (2004) for a discussion on the advantages and disadvantages of IRLS.