Does Corruption Explain the Decision to Invest and the Value of Investment? Revisiting Evidence from Sub-Saharan African Firms.

Abstract

This article examines how corruption relates to a firm's decision to invest and the value of investment. We use data from the World Bank Enterprise Survey (WBES) of firms in Sub-Saharan Africa (SSA), surveyed between 2010 and 2017. We adopt an instrumental variable approach to address the endogeneity problem. Our results suggest that lower levels of bribe payments enable firms to circumvent bureaucratic hurdles, thus facilitating investment decisions. However, at higher levels of corruption, the relationship is inverse. Corruption distorts the value of firm investment, especially among small firms, those in the manufacturing sector rather than service, and both young and mature firms. The distortionary effects of corruption are worsened by credit constraints. Our findings reaffirm the importance of SSA countries strengthening their fight against corruption to boost firm investment and economic transformation, especially given the dominance of small firms.

Keywords: Investment, Corruption, Africa.

JEL classification: E22, K42, O55

1. Introduction

Corruption remains one of the major institutional challenges facing developing countries. Globally, it is estimated that one in four people pay bribes for public services, yet governments' efforts to fight corruption continue to fall short (Pring 2017). In Sub-Saharan Africa (SSA), more than one in five people pay bribes for public services, with the vice of corruption being on the rise (Pring 2015). But how does corruption affect the economy? Theoretically, corruption is argued to exert an ambivalent effect on the economy. On one hand, it can serve as a piece-rate pay for bureaucrats, incentivizing more efficient provision of government services. It also offers entrepreneurs a way to bypass inefficient regulations. On the other hand, corruption tends to hinder innovative activities, as innovators rely heavily on government-supplied goods, such as permits and import quotas, ultimately hindering growth (Mo 2001). This duality makes the effect of corruption on economic development an empirical question, especially in regions with weak institutions.

This paper examines how corruption affects the micro-foundations of economic growth and development by addressing the question: How does corruption affect the decision to invest and the value of investment for firms in SSA? For a region characterised by high levels of corruption, with an average Corruption Perception Index (CPI) score below 50, studying the relationship between corruption and investment provides valuable insights into the extent to which institutional constraints, such as corruption, contribute to the region's low level of economic development.

We use the World Bank Enterprise Survey (WBES) data from 28 African countries surveyed between 2010 and 2017 to examine how firm-level bribe payments affect investment decisions and the value of investments. Bribe payment is defined as the percentage of sales paid informally to government bureaucrats. To address potential endogeneity bias, we employ an instrumental variables approach, using the leave-one-out mean: the average bribe payment within a country-sector-size cell, excluding the firm's own response. We include fixed effects to control for country and sector-specific heterogeneity, and we account for firm-level differences by controlling for a range of firm-specific characteristics that may correlate with bribery behavior. Under standard assumptions of instrument exogeneity and relevance, we estimate the causal effect of bribe payments on investment.

Our results show that negligible bribes may increase the likelihood of investing in fixed assets. However, this falls with a higher level of bribes. The initial positive relationship between corruption and investment decisions suggests the existence of a weak institutional environment characterized by regulatory and bureaucratic rigidities and that bribe payment enables firms to circumvent these rigidities, thus facilitating investment decisions. Nonetheless, we find bribe payments to undermine the value of the investment. A one percentage point increase in the share of the firm's sales paid in bribes is associated with a 3 percent reduction in the value of investment. The effect is salient among firms in the manufacturing sector and small ones. We also show that corruption distorts investment more among firms that lack access to credit, suggesting that credit constraint exacerbates the distortionary effect of corruption. These results indicate that the efficiency argument for corruption is easily dissipated at higher levels of corruption, as it chokes investment funds.

This paper builds on broad literature on the relationship between corruption and growth. At the aggregate level, studies have shown that corruption undermines economic growth by lowering investment (Mauro, 1995). This aggregate result has also received support from micro-level studies that have found corruption to undermine investment among firms located in Latin America and Caribbean (LAC) and South Asia Region (SAR) regions (Martins et al, 2020) and transition economies (Asiedu and Freeman, 2009). Similarly, Batra et al. (2003) show that corruption undermines investment among firms from both developing and developed countries. However, corruption is not associated with investment among firms from countries located in Middle East and North Africa (MENA), Eastern Europe and Central Asia (ECA), and East Asia and Pacific (EAP) regions (Martins et al., 2020), SSA (Martins et al., 2020; Asiedu & Freeman 2009), and LAC (Gaviria 2002). The lack of effect of corruption in SSA is puzzling, given perceptions that corruption is pervasive amidst concerns of slow economic progress. A closer inspection is warranted—one that considers firm-level heterogeneity and the institutional context of SSA.

Our contribution to this literature is twofold: First, we re-examine the relationship between corruption and firm investment in SSA, using a larger sample of firms from 28 African countries. We further investigate how the effect of corruption varies based on firm characteristics. While

Birhanu et al. (2016) and Seck (2020) include African countries in their samples, they report the results in aggregate without isolating the effect for Africa. This aggregate analysis obscures heterogeneity in the effect of corruption on investment across different contexts. Asiedu & Freeman (2009) and Martins et al. (2020) address this concern by creating sub-samples for other regions. However, their analysis masks heterogeneity across different categories of firms. In this paper, we document how the effect of corruption on firm investment varies across various sectors, firm sizes, age, and ownership. Secondly, we shed more light on the argument that corruption drains financial resources for investment by demonstrating that it distorts investment more significantly among credit-constrained firms.

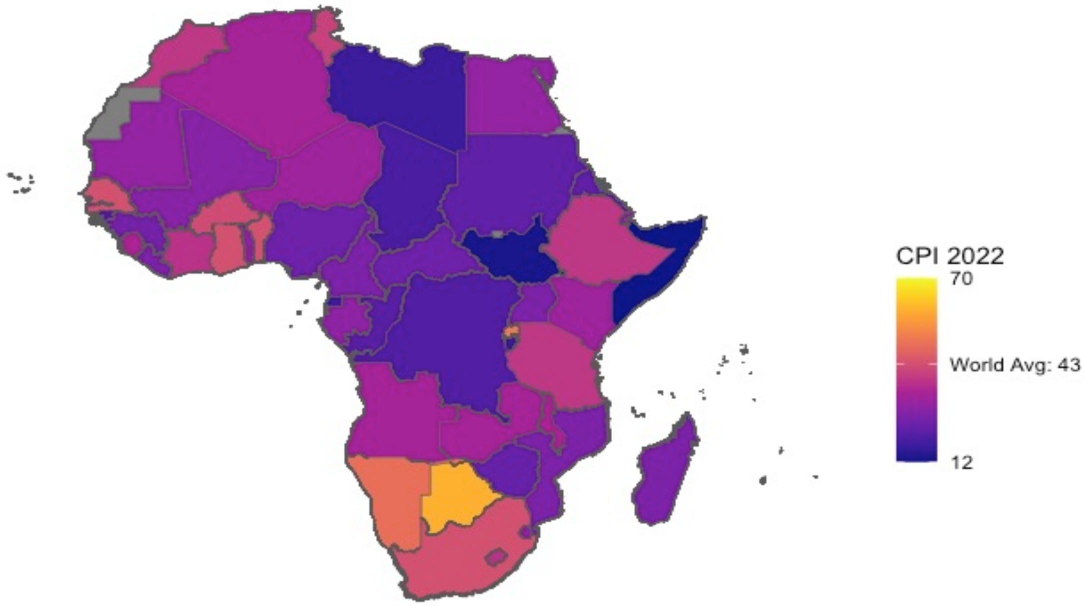
The rest of the paper is organised as follows: Section Two describes the context of the study, Section Three reviews the empirical literature, Section Four presents the data and descriptive evidence, Section Five presents the empirical results and the discussion, and Section 6 presents the conclusion of the paper.

2. Corruption in Africa

Corruption in Africa remains widespread and is perceived to be rising. According to a 2015 Afrobarometer survey on corruption, 22 percent of individuals who interacted with public services reported paying bribes—equivalent to approximately 75 million adults. Bribery is often recurrent: 62 percent of those who paid bribes reported doing so multiple times within a year, either for the same service or across different services. Additionally, more than half of respondents (58 percent) believed that corruption had increased in their country (Pring 2015). These sentiments are consistent with Transparency International's Corruption Perceptions Index (CPI) which shows that SSA the lowest-performing region globally, with an average score of 32—significantly below the global average of 43, and lower than regional averages for Asia Pacific (45), the Americas (43), the Middle East and North Africa (38), and Western Europe and the EU (66) (Transparency International, 2023).

Within SSA, 44 out of the 49 countries recorded a CPI score below 50, indicating a widespread perception of public sector corruption. Figure 1 shows the level of corruption in Africa and how it varies across countries, with darker colors indicating higher level of corruption. Whereas there is significant variation across countries, most of the countries rank below the world average. Countries such as Seychelles, Botswana, Cabo Verde, and Rwanda score above 50, reflecting relatively stronger governance and institutional resilience. In stark contrast, Somalia, South Sudan, Libya, Chad, and Burundi score below 20, placing them among the most corrupt countries globally.

Figure 1: Variation in CPI across Africa (2022)



Notes: The map shows the corruption perception scores for African countries in 2022. The darker the color, the more corrupt the country is perceived to be. We also show the world average on the legend for ease of comparison. The grey area represents countries with no corruption data.

While efforts are being made to combat corruption, such as the establishment of specialized anti-corruption agencies in some countries, these measures remain inadequate. More concerning is the fact that anti-corruption efforts in Africa face serious obstacles because those tasked with enforcing the law are often themselves implicated in corrupt practices. According to a 2015 Afrobarometer survey, the police and the courts are ranked as the most corrupt institutions on the continent.

At the firm level, SSA exhibits the highest incidence of corruption among all seven World Bank regions, based on its regional classification. According to the World Bank's enterprise surveys, 16.4% of the firms in SSA experience at least one bribe payment request. In addition, 20.1% of the firms are expected to give gifts to public officials to get things done, while one-third of the firms identify corruption as a major or very severe constraint.[1] Firms report experiencing corruption in several situations that are critical to their operations, including interactions with tax officials, obtaining operating licenses, bidding for government contracts, and securing utilities such as electricity and water.

The burden of corruption in SSA disproportionately falls on small and medium-sized enterprises (SMEs) and low-income individuals, who often lack the resources or influence to navigate around corrupt systems. According to the World Bank Enterprise Survey data, 18.3 percent of small firms (5–19 workers) report at least one bribe request annually, compared to 16.6 percent of medium-sized firms (20–99 workers) and 12.7 percent of large firms (100 or more workers). Similarly, the 2015 Afrobarometer survey on corruption shows the poorest Africans are twice as likely as the most affluent to pay bribes (Pring 2015). For a region dominated by SMEs, account for 60–70% of private sector activity in SSA, with many operating informally (IMF, 2017), the higher incidence of corruption imposes a real threat to economic transformation.

3. Literature Review and Hypothesis Development

Theoretically, the effect of corruption on the economy is ambiguous. Some scholars have argued that corruption can enhance economic growth (Wedeman 2002; Meon & Weil 2010; Urbina & Rodríguez 2021). The underlying mechanism is that corruption can incentivize the efficient provision of government services by serving as a piece-rate pay for bureaucrats. It also offers entrepreneurs a way to bypass inefficient regulations (Leff 1964; Huntington 1968), in which case it facilitates investment. Indeed, Meon & Weill (2010) show that bribe payment enhances economic efficiency among countries characterised by weak institutions. However, it's also argued that corruption "sands the wheels" of economic growth (Mauro 1995; Ades & Di Tella 1997; Meon & Sekkat 2005; Swaleheen 2011; D'Agostino et al., 2016a, 2016b; Cieślik & Goczek, 2018; Gründler & Potrafke, 2019; Urbina & Rodríguez, 2021). The distortionary argument is premised on corruption undermining the transmission mechanism from savings to investment (Pellegrini, 2011; Hodge et al., 2011). Specifically, corruption induces uncertainty in returns on investments

[1] The statistics were obtained from the World Bank Enterprise page: https://www.enterprisesurveys.org/en/data/exploretopics/corruption

and reduces returns on investment, which aggregately undermines firm investment, resulting in low economic growth (Mauro 1995; Wei 2000).

Empirical evidence has produced inconsistent results regarding the relationship between corruption and investment. At the macro level, Woo and Heo (2009) show that corruption harms the attractiveness of FDI in Asia. Habib and Zurawicki (2002) also find a negative relationship between corruption and FDI, arguing that foreign investors generally avoid investing in corrupt business environments due to the operational inefficiencies it creates. Alemu (2012) demonstrates that a 1 percent increase in the level of corruption triggers an approximately 9.1 percentage point decrease in FDI inflows, arguing that greater freedom from corruption enhances a country's ability to build confidence among foreign investors, making it a major destination for FDI. In line with these studies, Zouhaier (2011) also confirms the negative relationship between corruption and FDI in the MENA region. Conversely, Henisz (2000) and Bellos and Subasat (2012) argue that FDI is positively associated with corruption. Furthermore, using data from subnational regions in Russia Zakharov (2019) shows that corruption undermines private investment with a higher effect on foreign-owned investment as opposed to state-owned investment through inducing unpredictability and the undermining of trust in public institutions.

While macro-level studies provide a broad picture of how corruption affects investment in the aggregate, they fall short of accounting for heterogeneous responses to corruption across different types of firms. Measuring corruption at the macro level is also limited in that it implicitly assumes all firms face the same level of corruption, which may not be the case (Asiedu & Freeman, 2009). Analysing corruption at the micro level is therefore advantageous, as it links a firm's experience with corruption directly to its investment decisions (Asiedu & Freeman, 2009).

Notwithstanding these arguments, studies that analyse the relationship between corruption and investment at the firm level are scarce in the empirical literature. The few that exist are rather inconclusive. For example, Batra et al. (2003), using firm-level data from 81 developing and developed countries, found investment growth to be inversely related to corruption. Contrary to Batra et al. (2003), Seck (2020), using the WBES dataset of 46,000 firms from 69 developing countries, shows that the relationship between corruption and investment, measured as expenditure on machinery and equipment, depends on the nature of corruption. Specifically, investment is positively associated with one-off bribe payments,[2] while regular bribe payments undermine investment (Seck, 2020),[3] implying that the relationship between corruption and investment depends on the frequency of bribe payments. Additionally, using a natural experiment from Cambodia, Malesky and Sampharak (2008) show that corruption undermines investment decisions when bribe payment is characterised by unpredictability and arbitrary rent-seeking behaviour. Similarly, Paunov (2016) using a sample of small and large firms from 48 developing countries shows that corruption undermines investment in machinery investments for innovation.

Furthermore, Martins et al. (2020), using the WBES pooled dataset of 21,250 firms from SSA, EAP, ECA, LAC, MENA, and SAR, show that corruption undermines investment. Consistent with Martins et al. (2020), Birhanu et al. (2016), using a WBES pooled panel dataset of 5,250 firms from eight Latin American and five African countries, show that investment is inversely related to corruption. However, a regional disaggregation reveals that corruption undermines investment in SAR and LAC, although it is not associated with investment in MENA, ECA, EAP, and SSA (Martins et al., 2020). This implies that the relationship between corruption and investment is region-specific.

Using the WBES dataset of 10,032 firms from LAC, SSA, and transition countries, Asiedu and Freeman (2009) provide further evidence that the relationship between corruption and investment is region-specific. Specifically, investment growth is inversely related to corruption in transition countries, although the relationship is insignificant among firms from LAC and SSA countries (Asiedu & Freeman, 2009). Similarly, Gaviria (2002), using a sample of 2,671 firms from 29 LAC countries, found no significant relationship between corruption and firm-level investment growth. Evidently, Gaviria (2002) and Asiedu and Freeman (2009) agree that investment is not associated with corruption among firms from LAC. However, Martins et al. (2020) show that corruption undermines investment among firms from LAC. Even so, both Asiedu and Freeman (2009) and Martins et al. (2020) argue that investment is not associated with corruption among a sub-sample of firms from SSA.

[2] This refers to illegal payments made by newly created firms and those in an expansion phase, and it pertains to construction permits, operating licenses, and connection to electricity/water/telephone.
[3] Refers to payments made during regular transactions, namely, during inspections by tax officials, cross-border Trading, or when contracting with government officials.

Furthermore, Martins et al. (2020) show that the distortionary effect of corruption on investment is significant among small and medium firms, non-exporting firms and firms that face a competitive market. However, the relationship is insignificant among large firms, exporting firms and firms that experience a less competitive market (Martins et al., 2020). Implying that large and exporting firms dampen the distortionary effect of corruption on investment. At the same time, less market competition gives a firm more leverage to minimise the distortionary effect of corruption on investment.

The theoretical and empirical literature above suggests that the relationship between corruption and investment remains a subject of debate. The empirical literature indicates that this relationship can vary greatly depending on the region. In SSA, existing evidence suggests that investment is not significantly associated with corruption. This finding is particularly puzzling, given that low levels of investment characterise SSA amidst concerns over rising corruption.

This article further explores the relationship between corruption and investment, addressing potential biases arising from endogeneity, using rich data from the WBES for 28 countries across SSA. Based on the observation that SSA countries continue to experience low economic development and high levels of corruption, as well as the theoretical arguments and empirical literature discussed above, our hypothesis is as follows:

Primary Hypothesis: Corruption undermines the decision to invest in SSA and the value of investment.

This article further explores whether the relationship between corruption and investment is conditional on ownership structure (domestic or foreign), firm size, and firm age. Given the stark differences across these categories of firms, the impact of corruption on investment is likely to be highly heterogeneous. For instance, foreign-owned firms are likely to have substantial capital, allowing them to pay bribes without significantly undermining their investible funds. Similarly, large firms are likely to have more financial resources and political connections, enabling them to leverage bribe payments to facilitate investment. Lastly, older firms are likely to have more experience dealing with corrupt bureaucrats and possess more information. These firms may only pay bribes when it is productive for them to do so, thereby minimising the negative impact of such payments. Given these observations, we propose the following secondary hypotheses:

i. *Foreign ownership ameliorates the impact of corruption on firm investment.*
ii. *Being a large firm ameliorates the impact of corruption on firm investment.*
iii. *Being an old firm ameliorates the impact of corruption on firm investment.*

Lastly, we examine whether corruption interacts with other business environment constraints, particularly access to credit, to undermine investment. To the extent that corruption chokes investible funds, firms that are credit-constrained are likely to be more adversely affected than those with access to credit. In this case, we hypothesise that:

iv. *Access to credit ameliorates the distortionary effects of corruption on firm investment*

4. Data and Descriptive Analysis

4.1 Data source

We use data from the WBES, which are nationally representative firm-level surveys with top managers and owners of businesses in over 150 economies. The surveys cover formal firms in manufacturing, retail, and other services with at least five employees. The surveys cover various business environment topics, including access to finance, corruption, infrastructure, crime, competition, and performance measures. The surveys use stratified random sampling to ensure the sample is representative. Stratification is conducted using three criteria: sector of activity, firm size, and geographical location. Stratification by sector of activity is done using two-digit ISIC (revision 3.1), which categorises firms into Manufacturing, Retail and Other services. Stratification by firm size divides the population of firms into three strata: small firms (5-19 employees), medium firms (20-99 employees), and large firms (100 or more employees). In the survey, geographical distribution is defined to reflect the distribution of the country's non-agricultural economic activity, which, in essence, leads to the inclusion of main urban centres since non-agricultural activities are concentrated in urban centres.

The surveys are conducted in different countries at different times. For this study, we pool the most recent waves in the 28 African countries. Our data set covers a cross-section of firms surveyed between 2010 and 2017, as shown in Table 1. Nigeria has the highest number of firms in our sample, accounting for 19 percent of the sample. In contrast, Mauritania has the least number, accounting for only 0.9 percent of the firms in the sample.

4.2 Variable construction and definitions

The outcome variables of interest are the *decision to invest* and *value of investment*. *Decision to invest* is a binary variable equal to '1' if the firm reports any investment in fixed assets (e.g., machinery, land, vehicles, buildings) over the previous fiscal year; '0' otherwise. This indicator captures the extensive margin of investment. *Value of investment* is a continuous variable measuring the total expenditure on equipment and machinery (in constant 2010 US dollars). This reflects the intensive margin of investment and allows us to test how corruption distorts investment magnitude.

The main independent variable is *bribe payment,* measured as the percentage of sales paid informally to government officials (to "get things done" for example obtaining licenses, securing contracts, clearing customs) that are unaudited and unreported (also referred to as bribe tax). This variable directly reflects firm-level exposure to bureaucratic corruption and is widely used in WBES-based empirical studies (Birhanu et al., 2016; Seck, 2020).

Other variables used as controls include: *Gender of the top manager*, which is a dummy variable coded "1" if the top manager is female and "0" if the top manager is male; *Power outage*, which is used as a proxy for the quality of public physical infrastructural services, is measured as the number of outages in a typical month;[4] *Access to credit*, measured as a dummy variable coded "1" if the firm has a line of credit, "0" otherwise; *Managerial experience*, measured as the number of years a firm's manager has spent in that line of operation; *Firm ownership*, defined in terms of ownership of shares (foreign-owned if more than 50 percent of a firm's shares are owned by a foreigner, otherwise domestically owned); *Export status*, a dummy variable taking "1" if the percentage of sales exported (both directly and indirectly) is greater than zero, otherwise '0'; *Certification*, which is a categorical variable taking a value of "1" if a firm possesses an internationally recognised certification, "0" otherwise; *Informal competition*, a dummy variable capturing whether the firm faces competition from unregistered or informal firms; *Firm age* which is defined as the difference between the year of the survey and the year the firm commenced operations. We also control for *firm size*, measured by the number of employees. Following the

[4] This is neither from months in which outages are most frequent nor from months where outages are most infrequent.

World Bank's enterprise, we categorise firms as small, medium, and large if they employ 5 to 19, 20 to 99, and greater than 99 employees, respectively. All the data for these variables comes from the WBES.

4.3 Descriptive statistics.

Table 2a provides complete descriptive statistics for the variables of interest and all other variables used in the analysis; however, we limit our narrative discussion in this sub-section to the dependent variables and the main explanatory variable—informal payments (% of sales)[5]. Table 2a, show that 39 percent of the firms invested in the purchase of fixed assets while the value of investment in the purchase of equipment and fixed assets averages US$ 324,110 (constant 2010). Firms that invested the least had US$ 0.00038, while the highest level of investment stood at US$ 987,000,000 (Table 2a). Firms in Ghana had the highest level of investment, averaging US$ 2,222,799, while those in Sudan had the lowest, averaging US$ 3,005. Regarding corruption, on average, firms paid 1.3 percent of their sale informally to government bureaucrats. On average, the incidence of bribe payments is lowest in Rwanda at 0.1 percent of sales and highest in Niger at 6.9 percent (Table 2b). However, this cross-country comparison should be interpreted with caution, as the countries were surveyed in different years. In the regression analysis, we include country fixed effects to account for these differences in survey timing.

While the regression analysis in the subsequent sections relies entirely on micro-level data, this section also provides descriptive evidence on corruption and investment at the macro level. Using data on corruption perceptions from Transparency International and gross capital formation from the World Development Indicators by the World Bank, we construct correlation plots between corruption and gross fixed capital formation. As shown in Figure 2, there is a negative relationship between corruption and gross fixed capital formation (as a percentage of GDP), both in aggregate (Figure 2(a)) and private sector (Figure 2(b)). The slopes in both cases are economically

[5] We acknowledge the importance of providing a comprehensive discussion of the descriptive statistics for all covariates included in the empirical specification. However, given journal-imposed space limitations and the need to maintain a focused narrative, we limit our descriptive analysis in the main text to the dependent variable and the key explanatory variable—informal payments (% of sales)—which are directly tied to our identification strategy and central hypothesis. Summary statistics for all control variables, including firm size, age, ownership structure, and sectoral dummies, are fully reported in Table 2a and can be referenced for a complete view of the data landscape underlying our estimations.

meaningful in magnitude and statistically significant. This descriptive evidence suggests that corruption undermines the process of capital formation. Given that capital formation happens through investment, this evidence also suggests the negative relationship between corruption and investment[6].

In Figure 3, we take this descriptive analysis to the micro level by exploring the relationship between bribe payment and expenditure on equipment and fixed assets at the firm level. Like the macro data, there is a negative relationship between bribe payment (as a percentage of sales) and expenditure on equipment and fixed assets. In the following section, we investigate whether this relationship is causal by addressing the potential endogeneity arising from different sources of biases.

5. Empirical Strategy

To address the question of interest, we regress firm investment (both the decision to invest and the value of investment) on bribe payment. In the regression specification, we also control for several firm-level characteristics to account for differences across firms that might correlate with investment. We also include sector and country fixed effects to absorb variations due to sector and country differences. The baseline specification is given by;

$$y_{icj} = \alpha + \psi Bribe_{icj} + \beta' X_{icj} + \eta_j + \mu_c + \varepsilon_{icj} \quad (1),$$

where $\boldsymbol{y_{icj}}$ is the outcome variable for firm i, in country c, sector j. As earlier mentioned, we consider two outcomes: the decision to invest which is binary outcome, and the value of investment measured as the log of expenditure on machinery and equipment. $\boldsymbol{Bribe_{icj}}$ is the firm's bribe payment, measured as the percentage of sales paid informally to government officials that are unaudited and unreported (also referred to as bribe tax). $\boldsymbol{X}$ is a vector of firm-level characteristics. $\boldsymbol{\eta_j}$ is sector fixed effects to account for unobserved heterogeneity across sectors, $\boldsymbol{\mu_c}$ is country

[6] Note that Figure 2 (a and b) uses the CPI solely for illustrative purposes. While our empirical analysis relies on a firm-level measure of corruption—informal payments as a percentage of sales—which offers granular and context-specific variation, the CPI provides a globally recognized, country-level benchmark that helps visualize broader cross-country patterns between perceived corruption and capital formation. These figures are intended to motivate the research question rather than serve as causal evidence. Importantly, similar patterns emerge when we use our primary corruption variable, as shown in Figure 3, affirming the robustness of the visual narrative.

fixed effect to account for unobserved heterogeneity across countries, and $\boldsymbol{\varepsilon_{ijc}}$ is the idiosyncratic error term, which is assumed to be independently distributed with $E\left(\varepsilon_{icj}\right) = 0$. The coefficient of interest is ψ, which captures how bribe payment affects a firm's investment.

The coefficient estimates for $\boldsymbol{\psi}$ are likely biased and inconsistent due to endogeneity arising from both simultaneity and selection biases. Simultaneity bias may arise since firms that have higher investments are likely to have higher opportunity costs of bureaucratic delays and, therefore, may be more likely to pay bribes to circumvent these barriers. In this case, factors influencing firms' investment will also drive bribe payments, leading to biased estimates. Selection bias may also arise if firms that have non-zero bribe payments are systematically different in an unobserved way from those with zero bribe payments, leading to biased estimates.

To circumvent the challenges of endogeneity, we adopt an instrumental variable approach. This approach requires identifying an instrument strongly correlated with the endogenous variable (bribe payment) but uncorrelated with the error term, implying it only relates to the outcome variable through the endogenous covariate. Following Aterido et al. (2011), Mawejje & Okumu (2016), Mawejje & Okumu (2018) and Okumu & Mawejje (2020), we instrument for bribe payment of firm i with the country-sector-size averages of bribe payment (excluding the firm's own response), commonly known as leave-one-out mean. The intuition behind this type of instrument is that the firm's bribe payment is composed of the element that is influenced by the firm's characteristics and the component that is influenced by country-sector-size bribe payment behaviour. Assuming additive separability, bribe payment of firm i, operating in sector j, and country c can be expressed as $B_{ijc} = \eta B_i + \kappa \overline{B_{-\imath\jmath c}}$, where $\overline{B_{-\imath\jmath c}}$ represents country-sector-size averages (excluding firm $i's$ response).[7] We use $\overline{B_{-\imath\jmath c}}$ as the instrument for firm $i's$ bribe payment behavior. The first stage equation is given by:

$$Bribe_{icj} = \alpha + \gamma \overline{Br\imath be_{-\imath c\jmath}} + \beta' x_{icj} + \eta_j + \mu_c + \varepsilon_{icj} \qquad (2),$$

Where $\overline{Br\imath be_{-\imath c\jmath}}$ is the industry-sector-size average bribe payment, excluding firm $i's$ response, the rest of the variables are as defined before.

[7] $-i$ indicates that firm i is not included. The assumption of additive separability is just for simplicity. Even with different functional forms, the intuition still holds.

For the instrument to be valid, it has to meet two conditions: relevance and exclusion restriction. Relevance requires that the instrument is sufficiently correlated with the endogenous covariate. Our instrument meets this condition since it is thought that in an environment characterised by bribe payment, one is better off adopting the practice. Therefore, the bribe payment behavior of firm i is likely to be highly correlated with the average bribe payment behavior of the industry-sector-size it belongs. Exclusion restriction requires that the instrument only relates to the outcome variable (investment in this case) via the endogenous covariate. By construction, our instrument meets this condition since bribes paid by other firms in the industry do not directly affect investible funds available to the firm but only do so if corruption of other firms leads the firm to follow their behaviour. With these properties, the instrument $\overline{B_{-\iota jc}}$ has been used in studies such as Aterido et al. (2011), Mawejje & Okumu (2016), Mawejje & Okumu (2018), and Okumu & Mawejje (2020), making it a better instrument for bribe payment. We also test for the strength of our instrument using Craigg-Donald. Under the assumptions of exogeneity and relevance of the instrument, we interpret $\boldsymbol{\psi}$ as the causal effect of bribe payment on investment.

While using this instrument, one must be cautious of the cell size as the approach may indeed result in smaller cell sizes, especially when dealing with data that has missing values. This may reduce the power of the instrument. For instance, if the cell size is 1, the instrument will clearly have no value for such a firm given the setup, which requires excluding the firm's own response. This, however, does not invalidate the instrument since it has been shown that replacing country-sector-size averages with country-size averages for the small cell sizes maintains the power of the instrument, especially when the firms in that category are few (Aterido et al., 2011; and Okumu & Mawejje, 2020). Accordingly, in our analysis, we restricted the minimum cell size to four and replaced the instrument for all the firms in cell sizes below four with country-size averages.

However, the strengths of any instrumental variable approach depend on whether the regressor thought to be endogenous is indeed endogenous and the strength of the instrument being used. This, therefore, calls for the test for exogeneity. In the literature, Durbin and Wu-Hausman tests have been used for this purpose. Accordingly, we apply the same tests to ascertain whether bribe payment is endogenous. Craigg-Donald test is also applied to determine the strength of the instruments. Under the assumptions of exogeneity and relevance of the instrument, we interpret $\boldsymbol{\psi}$ as the causal effect of bribe payment on investment.

6. Empirical Results and Discussion

6.1 Corruption and Firm Investment

Before delving to the discussion of the effect of corruption on investment, we first present the results from the first-stage regression. We estimate the relationship between a firm's bribe payment and the country-industry-sector average bribe payment, excluding the firm's own response. The results in Table 3 demonstrate that the instrument strongly predicts individual firm's bribe payment behaviour. Specifically, a one-percentage-point increase in the country-industry-sector average bribe payment is associated with a significant and proportionate increase in the bribe payment of the excluded firm. This relationship holds for the entire sample and across sub-samples disaggregated by sectors, underscoring the robustness of the instrument's predictive power. This evidence supports our earlier claim about the relevance of this instrument.

Having established a strong first-stage, we now turn to discussing the effect of bribe payment on investment. The IV results are the preferred specification, but we also present the OLS results for comparison purposes. First, we estimate the relationship in the entire sample and then create sub-samples based on the sector of operation to test whether the relationship between corruption and investment varies significantly across sectors.[8]

Decision to invest: Given that investment is a process that begins with the decision to invest, we start by estimating the relationship between corruption and the decision to invest. Results in Table 4 show that the relationship between a firm's likelihood of investing and bribe payment mimics an inverted-U shape. The coefficient of bribe tax is positive while that of its squared term is negative. At lower levels of bribes, a one percentage point increase in the share of sales paid in bribes increases the likelihood of investing in fixed assets by 2 percentage points (Table 4, Model 4). This implies that negligible bribe payment increases the possibility of investing in fixed assets. However, when bribe payment exceeds a certain percentage of a firm's sales, the likelihood of investing falls with extra bribes. At this point, bribes are thought to reduce investible funds, thus either delaying the decision to invest or choking off investment. The IV results suggest that endogeneity biases the OLS results downwards. The coefficients are more than double when we

[8] We restrict ourselves to categorisation of service and manufacturing since classification of manufacturing, retail, and other services results in smaller sub-Samples particularly for retail, thus limiting convergence in the estimated models.

control for endogeneity but less significant in subsamples of services and manufacturing. One plausible explanation for the inverted-U shaped relationship between corruption and the decision to invest is that when bribe payment is one-off and negligible (towards, for example, company registration, water connection, electricity connection, and tax registration, among others), it can enable firms to overcome bureaucratic hurdles but when bribe payment involves multiple payments, besides being persistent (towards for example tax officials during tax audits; to win government contracts, and clearing goods at customs), it eats up investable funds. Indeed, Seck (2020) shows that investment is positively associated with one-off bribe payments, while regular bribe payments undermine investment.

Value of investment: We further analyse how corruption affects the value of investment (Table 5). As earlier anticipated, the p-values for the Durbin and Wu-Hausman tests indicate that bribe payment is endogenous in the overall model and manufacturing sectors, which biases the OLS results downwards. As such, we focus our interpretation on the IV results. The results indicate that corruption adversely affects the value of investment. Overall, for every one percentage point of a firm's sales paid in bribes, the value of investment reduces by 3.1 percent, other factors held constant (Table 5, Model 4). Our results are consistent with prior work that showed corruption undermines investment among firms in different contexts. Such evidence has been found in samples of firms from developing and emerging countries (Martins et al., 2020 and Paunov 2016), Latin America and South Asia (Martins et al., 2020), transition economies (Asiedu & Freeman 2009), SSA and Latin America (Birhanu et al, 2016), Russia (Zakharov 2019), developing and developed economies (Batra et al., 2003). While we cannot measure the extent of predictability of corruption given the dataset, our results are also consistent with Malesky & Sampharak (2008), who show that corruption undermines firm investment because of unpredictability.

The overall negative relationship between corruption and the value of investment could be attributed to bribe payments draining a firm's resources. Our results could be explained by the substitution effect between corruption and investment value (Birhanu et al., 2016). To that extent, bribe payments reduce the available investment resources.

Our findings are, however, inconsistent with Gaviria (2002), Asiedu & Freeman (2009), Martins et al. (2020) and Seck (2020). Specifically, using a sub-sample of firms from SSA, Martins et al. (2020) show that firm investment is not associated with corruption. Similarly, Asiedu & Freeman

(2009) show that investment is not associated with corruption in sub-samples of firms from LAC and SSA. Furthermore, Gaviria (2002), using a pooled dataset of firms from LAC, shows that investment growth is not associated with corruption. As such, our study provides the first evidence using a cross-country dataset of firms from SSA showing that corruption is distortionary to investment.

Unlike previous studies such as Malesky & Sampharak (2008), Asiedu & Freeman (2009), Birhanu et al (2016) and Seck (2020), we proceed to assess how the effect of corruption on investment varies based on different firm characteristics, as discussed in the subsequent section.

6.3 Heterogeneity in the impact of corruption across firm categories

Heterogeneity by sector of operation: We categorise firms into service and manufacturing sectors following standard industrial classification and assess the effect of corruption varies across these sectors. Our results indicate the effect of corruption is higher in magnitude and significant only among firms in the manufacturing sector. Table 4 (Model 6) shows that, at lower levels of bribes, a one percentage point increase in the share of sales paid in bribes increases the likelihood of investing in fixed assets among manufacturing firms by 3.4 percentage points, which is significant. The effect among firms in the services sector is smaller and not significant. Regarding the value of investment, corruption is more distortionary among manufacturing firms. Specifically, a one percentage point increase in the share of sales paid in bribes is associated with a 4.3 percent reduction in the value of investment among manufacturing firms (Table 5, Model 6). The higher distortionary effect of corruption among manufacturing firms and not the service sector could possibly be due to the high capital requirement for investment in manufacturing. As such, bribe payments drain the available resources, constraining potential investible funds among manufacturing firms.

Heterogeneity by firm size: Across different firm sizes, the IV results show that the inverted U-shaped relationship between corruption and the decision to invest holds only among small and medium-sized firms, and is statistically significant only for medium-sized firms (Table 6, Model 5). In addition to not benefiting from the 'greasing' effect of corruption on investment decisions, the value of investment among small firms is adversely affected by corruption (Table 7, Model 4). Overall, a one percentage point increase in the share of sales paid in bribes is associated with a 2.7 percent reduction in investment value among small firms. The higher distortionary effect of corruption on small firms suggests that corruption exacerbates pre-existing capital constraints among these firms. The results, however, show that large firms may be able to leverage bribe payment (Table 7, Model 6), although the coefficient is insignificant, possibly due to the smaller sample size for this category of firms. This result is consistent with Mendoza et al. (2015), who argue that large firms perform better than small and medium firms in a corrupt environment.

Several mechanisms underpin this finding. First, large firms are better positioned to absorb the fixed costs associated with corruption because they can spread these costs over a wider revenue base. In contrast, small firms face disproportionately higher relative costs, which undermine their competitiveness and may even push them into informality (Fisman & Svensson, 2007). Second, large firms tend to be more politically connected, which affords them greater influence over regulatory design and implementation. These connections enable them to secure preferential access to public institutions, extract rents, suppress competition, and circumvent bureaucratic constraints (Hellman & Schankerman, 2000; Hellman, Jones, & Kaufmann, 2000; Khwaja & Mian, 2005). Finally, large firms often possess superior administrative capacity and legal resources, allowing them to navigate complex or distorted regulatory environments more effectively than smaller firms (Svensson, 2005). These advantages, taken together, help explain why large firms may be more resilient—if not opportunistic—while small firms are more likely to suffer under conditions of pervasive corruption.

Heterogeneity by firm ownership: Given the differences between domestic and foreign-owned firms in terms of capital and technology, it is important to understand whether the effect of corruption varies based on ownership status. Table 8 (IV results) shows that corruption has a higher distortionary effect among foreign-owned firms, although it is insignificant. The insignificant result is likely due to a smaller sample size. Among domestically owned firms, the effect is significant but just half the magnitude for foreign-owned firms. The higher magnitude on foreign owned firms suggests that corruption not only chokes investable funds but may also induce capital outflow to less corrupt environments.

Heterogeneity by firm age: The longer the firm exists, the more it's likely to become resilient to regulatory inefficiencies. Firms that have existed for a long time also tend to learn the regulatory environment and how to maneuver it. It is, therefore, important to understand how corruption affects firms of different ages. For this purpose, we group firms into three categories based on the years of existence: young (0 to 5 years in existence), mature (6 to 15 years in existence), and old (more than 15 years in existence). The results in Table 9 show that the distortionary effect of corruption is highest among mature firms, followed by younger firms (although not significant among younger firms). Whereas old firms also experience distortionary effects, this is 1.4 percentage points lower than the effect among mature firms (Model 5 – Model 6). Given that young and mature firms tend to be small,[9] the higher distortionary effect of corruption among young and mature firms corroborates the earlier results that corruption exacerbates the capital constraint among small firms. This result could also be due to the absence of a rapport between these categories of firms and public officials, making the bribe negotiation process cumbersome and time-consuming. The results on firm age also suggest that the older a firm is, the better it gets at dealing with corruption, thereby ameliorating its distortionary effect on the value of investment. This could partly be on account of learning by doing to the extent that bribes are priced in the firm's operations, mitigating the unpredictability of corruption. Also, the potential of a rapport with government officials makes the bribe payment negotiation process smooth and saves time for investment decisions.

Heterogeneity by the level of credit constraint: If corruption drains investable resources, its impact will likely differ significantly depending on whether the firm has access to credit. We investigate this by testing the effect separately in sub-samples of firms with and without lines of credit. Results in Table 10 show that the distortionary effect of corruption is concentrated among firms without lines of credit, and there is no significant effect among firms with lines of credit. Specifically, a one percentage point increase in the share of sales paid in bribes reduces the value of investment by 5.3 percent among firms without lines of credit (Table 10, Model 3). Compared to the results in Table 5, the results in Table 10 suggest that lack of access to credit exacerbates the distortionary effects of corruption by 2.2 percentage points. This result supports the claim that bribe payment chokes investment funds, which are not replaced through credit. This result suggests that the interaction of business environment constraints (in this case, corruption and credit constraints) can have dire consequences for firm investment, ultimately undermining firm growth. The results in Table 10 also suggest that access to credit ameliorates the distortionary effects of corruption by a factor of 2.8 (Comparing the result in Table 10, Model 4 to Table 5, Model 4). Access to credit

[9] In our sample, three-quarters of the young firms are small and two-thirds of the mature firms are small.

mitigates the impact of corruption on firms of all ages, but its effect is more pronounced among mature firms.

7. Conclusion

This article examines how corruption affects the decision to invest and the value of investment. The article provides the first firm-level, cross-country evidence from SSA showing that corruption significantly distorts firm investment, both in terms of the decision to invest and the value of investment. Our analysis reveals that small bribes may increase the likelihood of investing in fixed assets, but as bribe levels rise, this effect diminishes and eventually turns negative. This pattern suggests that firms initially view bribery as bypassing bureaucratic inefficiencies and rigid regulations, making corruption an informal mechanism for facilitating investment decisions. This phenomenon reflects what we refer to as a "distorted business environment"—one where corruption serves as a compensatory mechanism in response to weak institutions. In such settings, firms do not operate under a fully efficient (first-best) business environment where regulatory processes are transparent and predictable. Instead, they navigate a suboptimal (second-best) environment, where bribery becomes a de facto cost of doing business. However, our results indicate that this second-best equilibrium is inherently unstable and unsustainable. As bribe demands increase, the cost of engaging in corrupt transactions outweighs any short-term benefits, deterring investment. This highlights the urgent need for institutional reforms that reduce firms' reliance on bribery to facilitate investment decisions. A well-functioning business environment—characterised by transparent regulations and reduced bureaucratic inefficiencies—ensures that firms focus on productive investment decisions rather than navigating corruption-related costs.

Importantly, we also show that the effect of corruption on firm investment is highly heterogeneous—not only across sectors and firm sizes, but also across other firm-level characteristics. Small firms which typically face tighter financial constraints experience the most severe reduction in investment value due to corruption. This underscores how bribery exacerbates liquidity and credit constraints, limiting their ability to expand. In contrast, we find suggestive evidence that large firms are better positioned to mitigate or, in some cases, dampen the adverse effects of corruption.

Furthermore, the study highlights that firm age, ownership structure, and access to credit are critical mediators in the relationship between corruption and value of investment. For example, the analysis reveals that the distortionary effects of corruption are exacerbated by credit constraints. Firms with limited access to external financing face heightened vulnerability, as bribe payment deplete already scarce resources, constraining their ability to invest. In contrast, firms with better credit access can buffer against these financial pressures, allowing them to sustain investment despite corruption-related costs. Implying that access to credit significantly ameliorates the distortionary effects of corruption. Also, mature firms—those with some operational experience but without the institutional embeddedness of older firms—appear especially vulnerable to the distortionary effects of corruption, while older firms may have developed the capacity to manage such risks more effectively. Regarding ownership, while foreign-owned firms are typically more capitalized, they face higher magnitudes of distortion from corruption—likely due to risk aversion or capital flight in response to unpredictability.

In a nutshell, this article underscores the need to improve the institutional environment among SSA countries. This is because the article shows that any short-term gains from bribery are outweighed by its longer-term economic costs, especially when institutions are weak. Corruption not only distorts firm-level investment decisions but also erodes the overall efficiency of capital allocation in SSA economies. This carries broader implications for employment, productivity, and structural transformation especially for a region struggling to propagate robust economic growth to induce its transition from low economic development to at least the middle-income status. It is pertinent to strengthen institutional development by prioritising strengthening anti-corruption frameworks and improving the transparency of bureaucratic processes to boost firm investment. Such reforms create a predictable rules-based investment climate which is partly central to unlocking the region's private sector potential and thus enabling the transition toward socio-economic transformation..

Conflict of interest statement.

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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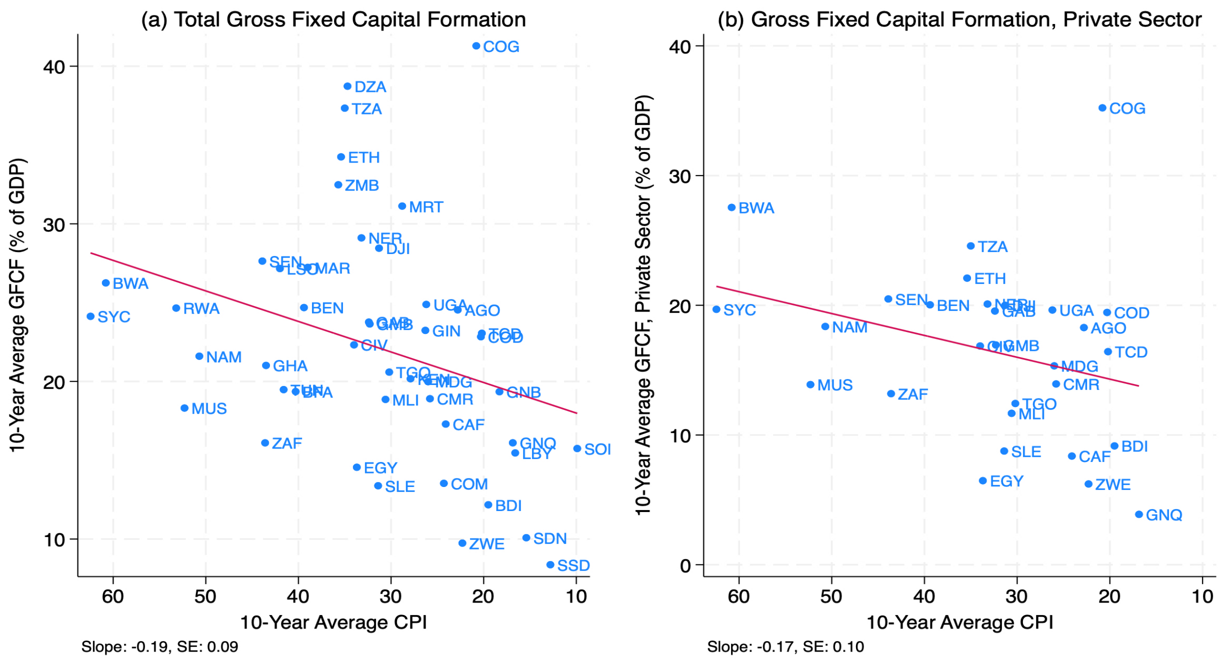
APPENDIX

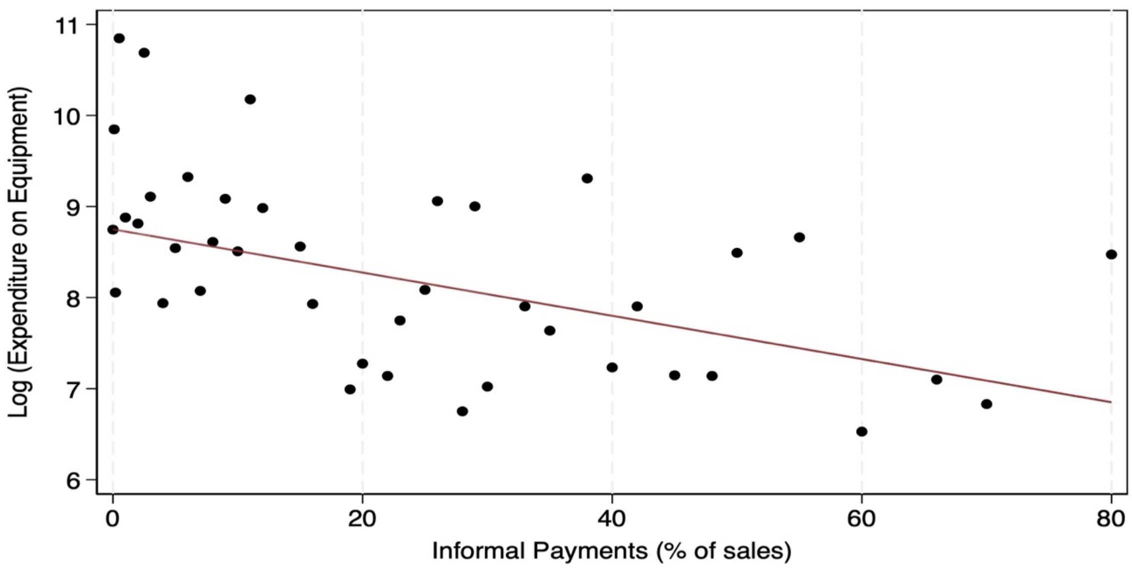
Appendix A: Figures

Figure 2: Correlation Between Gross Fixed Capital Formation and Corruption in Africa



Notes: Figure 2 shows the correlation between Gross Fixed Capital Formation (GFCF) and the Corruption Perception Index (CPI). For ease of interpretation, the axis for CPI has been reversed since higher index values represent less corruption. Each dot represents a country. The straight line is the line of best fit. Plot (a) shows the relationship between total GFCF and corruption, while Plot (b) shows the relation between corruption and private sector gross fixed capital formation. The slopes and standard errors are shown below each Plot. The figure was constructed using data from World Development Indicators and Transparency International.

Figure 3: Correlation between the value of investment and bribe payment



Notes: Figure 3 shows a bins scatter plot showing the relationship between expenditure on equipment and machinery and bribe payment (measured as the percentage of sales paid in bribes). The straight line is the line of best fit. The figure was constructed using firm-level data from the World Bank Enterprise Survey.

Appendix B: Tables

Table 1: List of countries in the sample

Country	Year of Survey	Frequency	Percent	Cum.
Angola	2010	223	1.600	1.600
Benin	2016	145	1.040	2.650
Botswana	2010	266	1.910	4.560
Burundi	2014	153	1.100	5.660
Cameroon	2016	353	2.540	8.200
Cotedivoire	2016	349	2.510	10.71
DRC	2013	502	3.610	14.32
Djibouti	2013	227	1.630	15.95
Ethiopia	2015	837	6.020	21.97
Ghana	2013	694	4.990	26.97
Guinea	2016	138	0.990	27.96
Kenya	2013	760	5.470	33.42
Lesotho	2016	149	1.070	34.50
Madagascar	2013	494	3.550	38.05
Malawi	2014	512	3.680	41.73
Mali	2016	178	1.280	43.01
Mauritania	2014	121	0.870	43.88
Namibia	2014	555	3.990	47.87
Niger	2017	144	1.040	48.91
Nigeria	2014	2,653	19.08	67.99
Rwanda	2011	231	1.660	69.65
Senegal	2014	559	4.020	73.67
Sudan	2014	633	4.550	78.23
Tanzania	2013	806	5.800	84.03
Togo	2016	147	1.060	85.08
Uganda	2013	759	5.460	90.54
Zambia	2013	716	5.150	95.69
Zimbabwe	2016	599	4.310	100
Total		13,903	100	

Table 2a: Descriptive statistics

Variable	Observations	Mean	Std.Dev.	Min	Max
Value of investment (in constant 2010 US dollars)	13,641	324,110	12,900,000	0.000388	987,000,000
Decision to invest (1=Yes)	13,536	0.394	0.489	0	1
Bribe tax (% of sales)	13,878	1.324	6.500	0	100
Number of power outages	13,895	16.46	61.47	0	2000
Gender (1=Female)	13,799	0.141	0.349	0	1
Credit access (1=Yes)	13,111	0.214	0.410	0	1
Manager's experience	13,903	15.31	9.851	0	72
Domestically owned (1=Yes)	12,319	0.854	0.353	0	1
Foreign-owned (1=Yes)	12,319	0.146	0.353	0	1
Export status (1=Yes)	13,903	0.247	0.431	0	1
Certification (1=Yes)	13,053	0.134	0.340	0	1
Firm age	13,903	16.52	13.82	1	168
Informal competition (1=Yes)	13,086	0.649	0.477	0	1
Service sector (1=YES)	13,903	0.549	0.498	0	1
Manufacturing (1=Yes)	13,903	0.451	0.498	0	1
Small firms (1=Yes)	13,903	0.600	0.490	0	1

Medium firms (1=Yes)	13,903	0.288	0.453	0	1
Large firms (1=Yes)	13,903	0.112	0.315	0	1

Notes: Expenditure on equipment is in USD constant 2015. Firm age is computed as the difference between the year of the survey and the year the establishment started operations. Bribe tax is the informal payments, as a percentage of sales made by firms to government bureaucrats.

Table 2b: Average bribe payment (% of sales) in each of the countries in the sample

	Mean	Std. Err.	[95% conf.	interval]
Rwanda	0.121	0.056	0.012	0.230
Djibouti	0.154	0.074	0.008	0.300
Senegal	0.188	0.062	0.067	0.308
Ethiopia	0.200	0.054	0.094	0.305
Madagascar	0.284	0.095	0.098	0.469
Togo	0.295	0.211	-0.119	0.709
Sudan	0.305	0.081	0.146	0.464
Lesotho	0.309	0.157	0.001	0.616
Zimbabwe	0.381	0.109	0.166	0.595
Botswana	0.425	0.164	0.102	0.747
Namibia	0.427	0.051	0.328	0.526
Burundi	0.771	0.258	0.266	1.277
Tanzania	0.773	0.243	0.296	1.250
Zambia	0.820	0.238	0.353	1.286
Malawi	0.861	0.244	0.383	1.340
Guinea	0.884	0.417	0.066	1.702
Mauritania	1.125	0.312	0.513	1.737
Kenya	1.293	0.233	0.838	1.749
Ghana	1.644	0.334	0.989	2.299
Cotedivoire	1.682	0.298	1.097	2.267
Benin	1.697	0.454	0.808	2.586
Cameroon	1.738	0.329	1.093	2.382
Uganda	2.246	0.321	1.617	2.876
DRC	2.267	0.310	1.659	2.875
Nigeria	2.423	0.166	2.098	2.747
Angola	2.547	0.381	1.800	3.295
Mali	3.427	0.383	2.676	4.178
Niger	6.944	1.751	3.512	10.376

Table 3: First stage regression

	All (1)	Services (2)	Manufacturing (3)
Country-Industry-Size Average (Excl. Firm's Response)	1.000***	1.084***	0.868***
	(0.075)	(0.063)	(0.107)
N	10195	5429	4766
Additional Controls	Yes	Yes	Yes
Sector FE	Yes	No	No
Country FE	Yes	Yes	Yes
R^2	0.093	0.115	0.070
F-statistic	29.457	89.621	10.168

Notes: The table presents results from the regression of the firm's own bribe payment on the country-industry-sector average (excluding the firm's own response) bribe payment. All models include control variables and country-fixed effects. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Bribe tax and decision to invest in fixed assets

	OLS			IV-2SLS		
	(1) Overall	(2) Services	(3) Manufacturing	(4) Overall	(5) Services	(6) Manufacturing
Bribe tax	0.010***	0.010***	0.010***	0.020**	0.026	0.034*
	(0.002)	(0.002)	(0.002)	(0.010)	(0.017)	(0.018)
Bribe tax squared	-0.012***	-0.012***	-0.012***	-0.030**	-0.037	-0.053
	(0.003)	(0.003)	(0.004)	(0.015)	(0.023)	(0.037)
N	10056	5362	4694	10056	5362	4694
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	No	No	Yes	No	No
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.111	0.135	0.098	0.105	0.125	0.067
Cragg-Donald F-statistic				148.5	59.9	26.8

Notes: In all the models, the dependent variable is a dummy variable, taking 1 if the firm invested in the purchase of fixed assets and 0 otherwise. All models are estimated with standard errors adjusted using the unique firm identifier. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Bribe tax and the value of firm investment

	OLS			IV-2SLS		
	(1) Overall	(2) Service	(3) Manufacturing	(4) Overall	(5) Service	(6) Manufacturing
Bribe tax	-0.006**	-0.003	-0.008*	-0.031***	-0.016	-0.043**
	(0.003)	(0.003)	(0.004)	(0.010)	(0.010)	(0.019)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	No	No	Yes	No	No
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	9982	5282	4700	9982	5282	4700
R^2	0.578	0.540	0.636	0.572	0.538	0.626
Durbin (P-value)	-	-	-	0.003	0.230	0.024
Wu-Hausman (P-value)	-	-	-	0.003	0.232	0.025
Cragg-Donald	-	-	-	621.029	383.144	192.014

Notes: In all the models, the dependent variable is the log of the firm's expenditure on equipment purchases. Bribe tax is the percentage of a firm's sales paid in bribes. All models are estimated with standard errors adjusted using the unique firm identifier. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Bribe tax and the decision to invest in fixed assets: By firm size

	OLS			IV-2SLS		
	(1) Small	(2) Medium	(3) Large	(4) Small	(5) Medium	(6) Large
Bribe tax	0.011***	0.010**	0.013	0.015	0.035**	-0.372
	(0.002)	(0.004)	(0.011)	(0.019)	(0.015)	(0.792)
Bribe tax squared	-0.011***	-0.015**	-0.030	-0.018	-0.060*	2.156
	(0.003)	(0.006)	(0.049)	(0.025)	(0.032)	(4.447)
N	6105	2799	1152	6105	2799	1152
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.075	0.088	0.159	0.074	0.061	-1.014
Cragg-Donald F-statistic				34.348	78.148	0.169

Notes: In all the models, the dependent variable is a dummy variable, taking 1 if the firm invested in the purchase of fixed assets and 0 otherwise. All models are estimated with standard errors adjusted using a unique firm identifier. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Bribe tax and the value of firm investment: By firm size

	OLS			IV-2SLS		
	(1) Small	(2) Medium	(3) Large	(4) Small	(5) Medium	(6) Large
Bribe tax	-0.004	-0.005	0.003	-0.027**	-0.013	0.014
	(0.003)	(0.004)	(0.014)	(0.012)	(0.014)	(0.065)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	6070	2777	1135	6070	2777	1135
R^2	0.472	0.407	0.496	0.451	0.406	0.496
Durbin (p-value)	-	-	-	0.017	0.658	0.851
Wu-Hausman (p-value)	-	-	-	0.018	0.660	0.853
Cragg-Donald	-	-	-	311.495	190.602	75.278

Notes: In all the models, the dependent variable is the log of the firm's expenditure on equipment purchases. Bribe tax is the percentage of a firm's sales paid in bribes. All models are estimated with standard errors adjusted using a unique firm identifier. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Bribe tax, firm ownership, and firm investment

	OLS		IV-2SLS	
	(1) Domestic	(2) Foreign	(3) Domestic	(4) Foreign
Bribe tax	-0.006**	-0.003	-0.027***	-0.047
	(0.003)	(0.008)	(0.010)	(0.030)
Additional Controls	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
N	8672	1310	8672	1310
R^2	0.565	0.613	0.561	0.598
Durbin (p-value)	-	-	0.019	0.116
Wu-Hausman (p-value)	-	-	0.020	0.121
Cragg-Donald	-	-	553.561	62.409

Notes: In all the models, the dependent variable is the log of the firm's expenditure on equipment purchases. Columns 1 and 3 present results for domestically owned firms, while columns 2 and 4 present results for foreign-owned firms. Bribe tax is the percentage of a firm's sales paid in bribes. All models are estimated with standard errors adjusted using a unique firm identifier. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Bribe tax and firm investment: By firm age

	OLS			IV-2SLS		
	(1) Young	(2) Mature	(3) Old	(4) Young	(5) Mature	(6) Old
Bribe tax	-0.002	-0.010**	-0.001	-0.031	-0.043***	-0.028*
	(0.005)	(0.004)	(0.004)	(0.026)	(0.016)	(0.015)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1404	4603	3977	1404	4603	3977
R^2	0.538	0.557	0.585	0.530	0.546	0.579
Durbin (p-value)	-	-	-	0.205	0.010	0.053
Wu-Hausman (p-value)	-	-	-	0.211	0.010	0.054
Cragg-Donald	-	-	-	84.442	263.763	261.780

Notes: In all the models, the dependent variable is the log of the firm's expenditure on equipment purchases. The column labels represent the different sub-samples based on firm age. Bribe tax is defined as the percentage of a firm's sales paid in bribes. All models are estimated with standard errors adjusted using a unique firm identifier. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Bribe tax, access to credit, and firm investment

	OLS		IV-2SLS	
	(1) Has No Line of Credit	(2) Has a Line of Credit	(3) Has No Line of Credit	(4) Has a Line of Credit
Bribe tax	-0.005	-0.005	-0.053***	-0.011
	(0.003)	(0.004)	(0.017)	(0.010)
Additional Controls	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
N	7773	2209	7773	2389
R^2	0.555	0.542	0.534	0.535
Durbin (P-value)	-	-	0.002	0.795
Wu-Hausman (P-value)	-	-	0.002	0.797
Cragg-Donald	-	-	217.767	378.358

Notes: In all the models, the dependent variable is the log of the firm's expenditure on equipment purchases. Bribe tax is the percentage of a firm's sales paid in bribes. The column labels represent the different sub-samples based on access to credit. All models are estimated with standard errors adjusted using a unique firm identifier. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.