



Why are small and medium-sized businesses in Africa turning away from the bank credit market?

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Abstract

This paper examines the effect of corruption on the discouragement of SMEs on the credit market in certain African countries. To do so, a sample of 13,635 firms from 26 countries observed over the period 2010–2022 was selected. The results obtained from the OLS, Probit and IV-Probit estimations show that corruption has a positive and significant effect on the discouragement of SMEs. These results are robust to the use of alternative measures of corruption and discouragement. The main economic policy recommendation arising from our study is the introduction and strengthening of anti-corruption measures. These include measures to increase the efficiency of the judicial system, reduce court delays and introduce clear credit-granting procedures to improve the transparency of the process. This will increase firms' confidence in the banking system and make them less reluctant to apply for credit when they need it. More specifically, public authorities can encourage banks to put in place a plan to detect and prevent corruption and influence peddling, based on a set of internal procedures. This involves mapping the risks of corruption, influence peddling and conflicts of interest, and drawing up rules of ethics and good conduct.

Keywords Corruption · Discouraged borrowers · Self-rationing · Africa · IV-Probit regression

JEL Classification D73 · G21 · L25

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Introduction

Small and medium-sized enterprises (SMEs) play an important role in economic growth. According to the report by the World Economic Forum (WEF 2022), they account for around 90% of all businesses. What's more, they are the main source of employment, accounting for 70% of jobs worldwide and around 70% of global GDP. In Africa, SMEs are estimated to contribute 50 and 60% of GDP and employment respectively (Muriithi 2017). All these figures reflect the importance of SMEs in the African ecosystem. However, despite this importance, SMEs face significant obstacles that hinder their development. On a day-to-day basis, these businesses face difficulties related to the environment in which they operate. These difficulties include lack of finance, corruption and political instability. By way of illustration, businesses consider corruption and access to credit to be major obstacles to their development (Beck and Demirgüç-Kunt 2006; Ayyagari et al. 2007; World Bank Enterprise Surveys 2014). In general, around 62% of SMEs in sub-Saharan Africa say they need loans, but only 51.7% say they have received the credit they requested. This limited access to credit is seen by many policymakers and researchers as a major barrier to economic growth (Beck and Demirgüç-Kunt 2006; Banerjee and Duflo 2014). This finding is corroborated by recent statistics on barriers to business development. For example, 35.6% of businesses located in SSA consider access to bank finance to be a major constraint to their expansion, compared with 21.2% for the global average (World Bank Enterprise Surveys 2018). In a debt economy such as Africa, this effect could be more severe. Overall, studies show that limited access to credit prevents companies from exploiting investment opportunities in their sector of activity, slows down the innovation process and reduces the productivity of constrained firms (Demetriades and Fielding 2011; Mertzanis 2019). Thus, improving access to credit is not only beneficial for the expansion of the private sector but is also an essential catalyst for economic growth. This constraint on access to finance may take the form of a rationing of credit supply or demand (Kallandranis and Drakos 2020; Statlink and Vu 2020; Flatnes 2020).

While the issue of credit supply rationing has been analysed at length in the literature (Stiglitz and Weiss 1981; Jaffee and Russell 1976; Kallandranis and Drakos 2020), studies of demand-side rationing are relatively rare and recent (Jappelli 1990; Kon and Storey 2003; Han et al.; Kallandranis and Drakos 2020), studies of demand-side rationing are relatively rare and recent (Jappelli 1990; Kon and Storey 2003; Han et al. 2009; Chakravarty and Xiang 2013; Gama et al. 2017; Wellalage et al. 2018; Rostamkalaei et al. 2020; Statnik and Vu 2020). Indeed, according to Kon and Storey (2003), discouraged borrowers are firms that decide not to engage in the tedious process of applying for bank credit for fear of having their applications rejected. For the latter, the main discouraging factors are selection errors and the application costs inherent in asymmetric information.

Previous work has studied the factors likely to influence firms' demand for loans on the credit market. These include, for example, firm characteristics (firm size, turnover, age), demographic factors (manager's age, gender, experience and

level of education), banking sector concentration, sector of activity (innovation, industry, etc.) (Han et al. 2009; Chakravarty and Xiang 2013; Gama et al. 2017; Mol-Gómez-Vázquez et al. 2021).

In addition to these traditional factors, the institutional framework also plays a crucial role in the functioning of the credit market (Moro et al. 2016). The literature has shown that factors such as the effectiveness of creditor rights protection and the enforcement of court rulings are important for the proper functioning of the credit market (La Porta et al. 1997; Bae and Goyal 2009; Mc Namara et al. 2020; Qian et al. 2017; Qian and Strahan 2007; Djankov et al. 2007; Moro et al. 2016; Galli et al. 2018). Alongside these factors, corruption is considered to be a significant factor that can hinder the development of SMEs and economic growth. According to the World Bank, corruption is considered to be a major obstacle to the development of firms (World Bank Enterprise Surveys 2014; Mauro 1995; Knack and Keefer 1997; Hall and Jones 1999; La Porta et al. 1999; Reinikka and Svensson 2005; Galli et al. 2018). However, there is little research on the effect of corruption on borrower discouragement (Galli et al. 2018; Statnik and Vu 2020; Wellalage et al. 2018; Ullah 2020).

From a theoretical point of view, there are two opposing theories. On the one hand, the *sand in the wheels* thesis postulates that corruption discourages firms from applying for credit. On the other hand, the *grease the wheels* thesis postulates that corruption encourages firms to apply for credit. Indeed, firms with a poor credit rating may resort to corruption to improve their chances of obtaining credit and are therefore less discouraged.

Empirically, the few studies on the link between corruption and borrower discouragement lead to contradictory conclusions. Galli et al. (2018) highlight a positive effect of corruption on firm discouragement. Statnik and Vu (2020) find a negative effect of corruption on borrower discouragement. Furthermore, Wellalage et al. (2018) show that the effect of corruption varies between countries, but also within the same institutional environment, so that firms located in the same country have different perceptions of corruption.

However, the literature is silent when it comes to African countries. This study aims to reduce this gap in the literature. More specifically, it aims to analyse the effect of corruption on firms' self-rationing on the credit market in the few African countries. To do so, we use business survey data collected by the World Bank from 2010 to 2022. Our sample consists of 13,635 firms in 26 African countries. In this study, firms are considered self-rationalised (discouraged borrowers) when they do not apply for a loan for fear of being rejected. The econometric estimation is done by adopting an approach close to that of previous studies including that of Wellalage et al. (2018)¹. It is a Probit model. The choice of this modelling is linked to the dichotomous nature of our variable. Moreover, as in this type of study, we suspect the existence of an endogeneity bias linked to measurement errors. In order to control for this bias, we re-estimate our equation using the instrumental variables method (more precisely IV Probit).

¹ They used business survey data collected by the World Bank on firms located in 5 South Asian countries.

Without being exhaustive, this paper contributes to the economic literature in four ways. First, it allows us to sketch the profile of firms that self-rerate on the credit market in Africa. Indeed, this paper is, to our knowledge, the first empirical study of discouraged borrowers in relation to African firms. Recent research highlights the importance of self-rationing borrowers, who may outnumber firms whose loan applications are rejected (Freel et al. 2012; Gama et al. 2017). For instance, Ferrando and Mulier (2022) found self-discouraged borrowers were twice as prevalent among Eurozone firms. For developing countries, they represent 44% of firms (World Bank 2013). Furthermore, Ferrando and Mulier (2022) highlight a negative effect of self-rationing on investment and employment within companies. Consequently, it is essential to understand this form of credit market failure and to find solutions. This is all the more important given that in these countries, bank credit is the main source of financing (Qi and Nguyen 2021). Secondly, it contributes to the literature by analysing the effect of corruption on the discouragement of African firms on the credit market. Indeed, despite the fact that the literature on discouraged borrowers is still scarce, there is some work on the link between corruption and borrower discouragement in other regions of the world, including East Asia, the Pacific and South Asia (Statnik and Vu 2020; Wellalage et al. 2018) and the euro area (Galli et al. 2018). Given that African countries have relatively poorer quality institutions than the rest of the world and that, moreover, corruption in Africa is described as endemic with an overwhelming majority of the continent's countries ranked among the most corrupt countries in the world (Mbaku 2008; Habib et al. 2020), it would be interesting to analyse the role of corruption in explaining the discouragement of firms on the credit market in Africa. Thirdly, it controls the endogeneity problem. Indeed, Galli et al. (2018) Statnik and Vu (2020) did not take into account the existence of an endogeneity bias and ignoring such a problem during the estimations will result in biased and inconsistent coefficients. Fourthly, our contribution concerns the size of our sample. Most studies have been based on one country or a limited number of countries. For example, Levenson and Willard (2000) on American firms (USA), Brown et al. (2022) on firms located in UK, Statnik and Vu (2020) on firms from East Asia, the Pacific and South Asia or Galli et al. (2018) on firms from 11 countries in the euro zone. To the best of our knowledge, this article is the first empirical study to address the issue of discouraged borrowers in Africa using a fairly large sample of firms from several countries.

The remainder of the paper is structured around five additional sections. The second presents some stylised facts that motivate the interest of our study. The third presents a selective review of the literature. The fourth outlines the empirical strategy. The fifth discusses the results. Finally, the sixth concludes with policy recommendations.

A few stylised facts

In this section, we present two stylised facts that emerge from firm managers' perceptions of the obstacles to their development and corruption in the world. On the one hand, firms consider corruption and access to credit to be major obstacles to

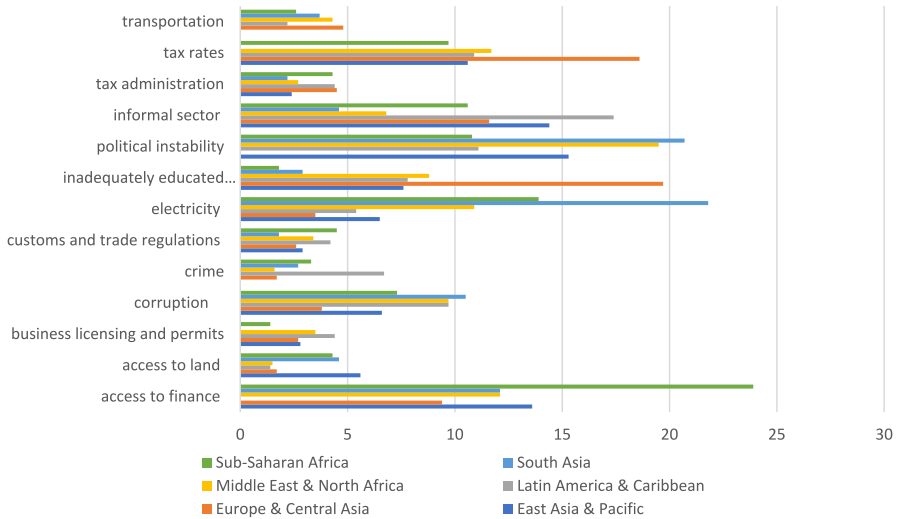


Fig. 1 Main obstacles to business activity. Source: World Bank enterprise surveys (2014)

their development (World Bank Enterprise Surveys 2014). Secondly, the quality of institutions in Africa is relatively lower than in the rest of the world.

Major obstacles to firm development

Figure 1 shows the major obstacles to business development as perceived by business leaders. These obstacles can be grouped into institutional, infrastructural and financing constraints. Figure 1 shows that African firms consider corruption and access to credit to be major obstacles to their development. These stylised facts confirm the finding by Fowowe (2017)² that access to credit is a major problem in African countries.

The state of corruption worldwide

Figure 2 shows a comparative analysis of the level of corruption in the world based on data collected by CPI over the period 2012–2022. The corruption index used in this study ranges from 0 to 100. Higher values reflect lower levels of corruption. This shows that Africa is the most corrupt region in the world. Over the period 2012–2022, corruption has increased despite the efforts made to combat it in these countries. By way of illustration, the score for sub-Saharan Africa fell from 33.35 in 2012 to 32.39 in 2022.

² To reach this conclusion, he used survey data collected from a sample of 26 countries.

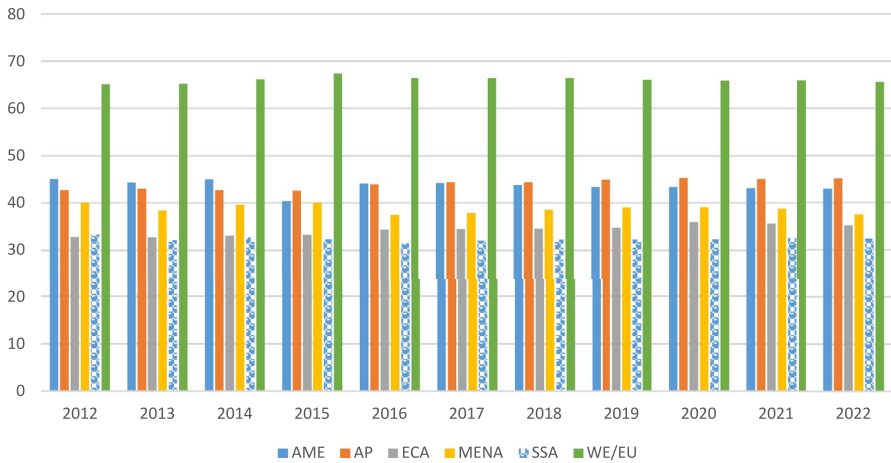


Fig. 2 Comparative analysis of corruption around the world. Source: Authors, based on data from the Corruption Perceptions Index (Transparency International)

Related literature and theoretical framework

Self-rationing: underlying factors

Based on the existing literature although it is embryonic, we can group the factors likely to influence the loan demand of firms into two groups. These are microeconomic factors and macro-institutional factors. Since applying for a bank loan or not is at the manager's discretion, this may also be affected by his or her own characteristics. The literature has analyzed the effect of microeconomic factors (sex of the manager, his age, his level of education and his experience, the size of the firm) on the discouragement of borrowers (Chakravarty and Yilmazer 2009; Fraser 2014; Gama and al. 2017; Statnik et al. 2022). For example, Gama et al. (2017) found that firms led by a man are less discouraged from applying for credit compared to firms whose main manager is a woman. As an explanation for this result, Coleman (2000), Treichel and Scott (2006) argue that women have less self-confidence, more risk aversion and want to maintain control of their business. They feel that applying for loans will create more risk. However, other studies conclude that there is no gender bias (Statnik and Vu 2020). Regarding the level of education of the manager, a certain number of studies have highlighted a positive relationship between the level of education and the availability of credits (Krasniqi 2010; Nguyen et al. (2020). As illustration, Chakravarty and Yilmazer (2009) found that if the senior managers of the company have a university level education, the firm is less discouraged from applying for bank credit. Another important microeconomic characteristic is the experience of the manager. Indeed, the managers of firms that self-ration generally have less professional experience in the sector of activity. For example, Fastenbauer and Robson (2014) show that the experience of managers has an impact on the probability of apply for a loan. Statnik and Vu (2020) highlight the existence of a

negative effect of experience in the sector of activity on the discouragement of borrowers. Regarding macroeconomic factors, Chakravarty and Yilmazer (2009) find a negative correlation between growth rate and discouragement. Along the same lines, Gama et al. (2017) observe that businesses are less likely to self-ration in countries with high GDP per capita. The legal framework³ is another external characteristic that affects the credit market. Demirgüç-Kunt and Maksimovic (1998) and Hernández-Cánovas and Koëter-Kant (2011) show that the effectiveness of the legal environment has a positive effect on the demand for business loans. However, Gama et al. (2017) highlight a counterintuitive result. Greater protection will increase the number of discouraged borrowers. Indeed, stricter legal protections lead to higher collateral requirements and therefore increase the number of discouraged borrowers. Other studies have examined the effect of the structure of the banking system on borrower discouragement (Mol-Gómez-Vázquez et al. 2018, 2021). For example, Mol-Gómez-Vázquez et al. (2018) analyze the effect of banking concentration on borrower discouragement. They show that the market power of banks increases the probability of firms' self-rationing but this relationship is not linear.

Corruption and the discouragement of firms on the credit market: a selective review of the literature

Work on the link between corruption and discouragement is based on studies of the impact of corruption on economic activity (Mauro 1995; Shleifer and Vishny 1993). On the one hand, the literature puts forward the '*sand in the wheels*' hypothesis of economic activity. Rose-Ackerman (1978) posits that corruption at first glance might appear to promote growth in certain industries (fields), but once it is allowed to exist and persist, there will be a contagion effect leading to a spread to other sectors and then it will gradually spread to the entire system. Therefore, the entire economy will experience stagnation due to corruption or more precisely due to the absence of corruption. Indeed, in order to raise the stakes and get more bribes, officials voluntarily slow down the processing of files. Based on the public choice theory of rent seeking, it can be demonstrated that corruption negatively affects development (Krueger 1974). Rent seeking refers to the use of privileges and decision-making power over an activity by their holders to obtain rents (Tullock et al. 2002; Congleton and Hillman 2015; Choi and Storr 2019). Thus, the property over which the latter exercise their authority is allocated based on less than objective criteria. In the credit market, due to information asymmetry, bank managers have decision-making power over credit conditions. They decide on the interest rate of the credit, the maturity but also the type of guarantee (Barth et al. 2009). Given this power, the latter may on the one hand be exposed to attempts at corruption by companies and on the other hand they may be encouraged to take advantage of them by formulating more complex and less attractive credit conditions, which leads companies to increase their

³ Several studies have supported the argument that the size of credit markets in a country depends on the degree of creditor protection. Thus, the more creditors enjoy strong legal protection, the more the credit market develops (Djankov et al. 2007; Haselmann and Wachtel 2010).

bribes to avoid these conditions (Guriev 2004). Furthermore, corruption acts as an additional tax for the borrower. It adds to the real costs of credit for firms.

On the other hand, the *grease the wheels hypothesis* postulates that corruption has a positive effect on economic activity (Leff 1964; Leys 1965). According to the proponents of this hypothesis, corruption influences economic activity. The argument put forward to explain the positive role of corruption is to consider it as an accelerator which makes it possible to reduce the delays in transporting files to administrative offices and to reduce long queues for public services (Leff 1964; Leys 1965; Bardhan 1997) argues that when there is an inefficient regulatory framework, corruption can actually improve efficiency and help economies grow because it introduces additional distortions that can lead to a profit gain. Well-being in a second-order equilibrium situation. Furthermore, officials who accept bribes work even harder to increase their “earnings”. Lui (1985) derives corruption functions in which the amount of the bribe is related to opportunity costs in terms of time. It shows that we arrive at a non-cooperative Nash equilibrium which will minimize the costs linked to queuing, thus reducing the inefficiency of public administration (Bardhan 1997). In cases where regulations are excessive, officials, when receiving a bribe, will implement schemes to speed up the process and therefore economic activity. The most efficient firms are more willing to pay more for less bureaucracy. In the credit market, corruption allows firms to obtain loans. Indeed, borrowers can offer bank officials a bribe in exchange for credit. Bank officials can profit from their role in extending credit and therefore corruption allows firms to overcome bureaucratic processes and unclear or complex regulations (Agrawal and Knoeber 2001).

However, we note that empirical studies relating to the effect of corruption on borrower discouragement are rare (Statnik and Vu 2020). This gap in the literature is partly explained by the fact that the phenomenon of demand-side credit rationing is relatively recent⁴. The first studies date back to the 1990s (Jappelli 1990; Levenson and Willard 2000). Moreover, these few studies have produced contradictory results. Using data from the World Bank’s East Asia, Pacific and South Asia Business Survey for the period 2012–2016, Statnik and Vu (2020) analyze the effect of corruption on borrower discouragement. To do so, these authors classify the countries in the sample into two groups: upper-middle-income countries and lower-middle-income countries. They highlight the existence of a mixed effect of corruption on firms’ demand for loans. This effect is linked to the level of economic development of the countries. Specifically, these authors show that firms located in lower-middle income countries are less inclined to self-finance when corruption is high. Contrary to firms located in lower-middle income countries, those operating in upper-middle income countries are more inclined to self-rationalize when corruption is high. According to the authors, this mixed effect of corruption on bank credit demand behavior can be explained by the quality of regulation, which differs between these two groups. Weill (2011) has shown that corruption can reduce the constraints faced by firms in accessing credit.

⁴ The first surveys to capture this type of borrower were introduced in 1993 for the United States (SSBF) and since 2002 for the World Bank surveys (WBES).

Furthermore, using data collected on Chinese firms, Chen et al. (2013) show a positive effect between the bribe paid by the firm and access to a loan.

Galli et al. (2018) examined corruption's effect on small firms' bank credit demand using a sample of 68,115 firms across 11 euro area countries from 2009 to 2014, finding that corruption levels impacted small firms' credit demand. More specifically, they show that small firms located in countries with a very high corruption index have a high probability of self-rating compared to those located in countries with little corruption. Similarly, Wellalage et al. (2018) use business survey data collected by the World Bank on firms in South Asian countries. They show that corruption increases SME credit constraints by 7.63%. This is consistent with the *sand in the wheels* argument.

In short, the few existing empirical studies focus on developing countries without paying particular attention to African countries. Extending the conclusions of their findings to these countries would bias the analysis, given the socio-cultural differences between these regions and the quality of the data. This article aims to address some of these shortcomings in the literature by focusing specifically on certain African countries.

Empirical methodology

Data and description of the sample

The data used in this study comes from the World Bank Enterprise Survey (WBES). This is a World Bank programme designed to collect information on companies and their perceptions of the environment in which they operate. Since its launch, the programme has collected information on nearly 155,000 companies in 148 countries across 5 continents. In addition, the questionnaire administered is identical for 139 countries and uses stratified sampling by size, sector and region to collect the sample of companies in each country. The data includes information on infrastructure and services, sales and supplies, degree of competition, finance and workforce. Three criteria were used to construct the strata. These are the sector of activity, the size of the establishment and the geographical location. The sector of activity criterion covers manufacturing industry and the service sector (retail trade). The size stratification was defined as follows: small (1–19 employees), medium (20–99 employees) and large (more than 99 employees).

The firms included in the sample are selected as follows. We have, depending on the study period, listed the countries in which the survey was carried out. Then we selected for each country all the firms interviewed. For example, the survey was carried out in Cameroon in 2006, 2009 and 2016. Given that our study covers the period 2010 to 2022, we only retain the firms interviewed during the 2016 survey. On the basis of these criteria, we obtain a sample consisting of 13,635 firms from 26 African countries. The complete list of countries and the definitions of all the variables used in this study are presented in the appendix (Tables A1, A2).

Variables

Our dependent variable (*Discouraged*) is a dichotomous variable. To construct this variable, we divide the companies into two groups based on the following question: have you made a loan request during the last fiscal year? (See question K16 of the WBES business survey questionnaire). Subsequently, in the event of a negative response, firms are asked the following question: "What is the main reason why this establishment did not request a line of credit or loan?". To this question, the questionnaire offers a set of reasons: (a) no need for a loan; (b) the application procedures were complex; (c) interest rates were not favorable; (d) the collateral requirements were too high; (e) the amount and duration of the loan were insufficient; (f) did not think it would be approved; (g) others. On this basis, any company that provides all but (a) as a reason is considered to be rationed. On this basis, the dependent variable takes the value 1 if the company is considered a discouraged borrower based on the answers it provided to the questions above and takes the value 0 if the company has made a request loan. This measure of discouragement is applied by numerous previous research (Chakravarty and Yilmazer 2009; Chakravarty and Xiang 2013; Galli et al. 2018; Gama et al. 2017). This measure of discouragement is used in numerous previous studies (Chakravarty and Yilmazer 2009; Chakravarty and Xiang 2013; Galli et al. 2018; Statnik and Vu 2020). Furthermore, based on the conclusions of previous studies (notably those of Ferrando and Mulier⁵ 2022; World Bank 2013), we believe that discouraged borrowers constitute a segment of the credit market that deserves greater attention.

Our independent variable is *Corruption* is captured by an indicator variable that reflects firms' perception of the impact of corruption on their business. To construct our independent variable, we draw inspiration from Statnik and Vu (2020). Like them, we construct this variable based on the following question taken from the company Survey questionnaire: is corruption an obstacle? The level of obstacle varies from 0 to 4, 0 being "no obstacle" and 4 "very serious obstacle". Thus, corruption in the context of our study takes the value 1 if companies perceive corruption as a major or very serious obstacle and 0 for "no obstacle", "minor obstacle" or "moderate obstacle". However, using this variable can cause problems when comparing countries. Tolerance of corruption can vary from one country to another (Cameron et al. 2005), so that two countries with the same corruption perception value may have different levels of corruption. Nevertheless, we believed, based on the findings of the work of Escresa and Picci (2017) that perception data are, in certain contexts (such as this one), an adequate approximation of actual levels of corruption. Because they do not focus on a specific, isolated type of corruption, but rather reflect companies' overall perception of corruption.

In addition to the above variables, based on economic theory and previous studies (Cowling et al. 2016; Freel et al. 2012; Chakravarty and Yilmazer 2009; Chakravarty and Xiang 2013; Galli et al. 2018; Mac an Bhaird et al. 2016; Brown et al. 2022;

⁵ These authors have shown, based on data collected on companies in the Euro zone that firms that become discouraged are approximately twice as numerous as those have that have seen their requests rejected. For developing countries, they represent 44% of firms (World Bank 2013).

Statnik and Vu 2020; Gama et al. 2017), the model controls for certain variables that may influence the decision to self-ration in the credit market. These variables include the characteristics of the firm, its sector of activity and the characteristics of the manager. In addition, we also control for country and year fixed effects.

Empirical strategy

We follow Statnik and Vu (2020) to examine corruption's effect on self-rationing using the following equation:

$$\begin{aligned} Discouraged_{ik} = & \beta_0 + \beta_1 Corr_{ik} + \beta_2 Access_Fin + \beta_3 Firm\ Charact_{ik} \\ & + \beta_4 Entrepreneur\ Charact_{ik} + Industries\ dummy + fe(Year, Country) + \epsilon_{ik} \end{aligned}$$

where *Discouraged* denotes the dependent variable; *Corr* denotes corruption; *Access_Fin* captures the firm's perception of access to finance; *Firm Charact* is a generic variable that aggregates firm size; *Entrepreneur Charact* captures the gender and experience of the firm's manager; Index *ik* denotes firm *i* in country *k*; ϵ the error term.

Given the dichotomous nature of the dependent variable, probit regression is the most appropriate methodology for estimating our equation. Indeed, the Probit regression technique is more suitable than the linear model⁶ (Wooldridge 2016). This type of model is often useful for assessing business characteristics associated with credit application decisions. Moreover, as in this type of study, we suspect the existence of an endogeneity bias linked to measurement errors. Several factors can contribute to measurement errors. These include the reliability of the information collected by the statistical agencies and the discrepancy between the variables specified in the theory and those collected in practice.

The coefficients derived from the estimates of the Probit model are not consistent in the event of an endogeneity problem. In fact, they may be either underestimated or overestimated. To correct this bias, we will re-estimate our equation using the instrumental variables method (more precisely IV Probit). According to Greene (2008), a good instrument should be highly correlated with the endogenous variable but should not have an unobservable relationship with the dependent variable.

Based on the literature, a natural instrument for corruption may be economic agents' perception of the integrity of the judicial system. Indeed, in a judicial system, fairness and how it could affect business is an instrument for corruption. By way of illustration, Wellalage et al. (2018)⁷, Wellalage et al. (2019) use the judicial system as an instrument for corruption. Accordingly, consistent with the argument that the level of corruption affects the integrity of the judiciary, we use the variable *Judiciary* as an instrument.

⁶ The literature has shown that the probit model and the logit model give approximately the same results Gujarati (1995). Thus, we can deduce that the probit model constitutes a robust and acceptable estimate.

⁷ They used business survey data collected by the World Bank on firms located in 5 South Asian countries.

To construct our instrument, we will use the response to question *h7a* of the business survey that the judicial system is fair, impartial and not corrupt. *Judiciary* takes 1 if the firm's manager disagrees or tends to disagree with this statement and 0 otherwise. To be valid, the instruments must satisfy two conditions. First, they must be uncorrelated with the error term (ε). Secondly, they must be correlated with suspected endogenous variables (Greene 2008).

Presentation and interpretation of results

Statistical analysis

Table 1 presents the results of the descriptive analysis of the variables used in this study. It shows that on average 44.06% of the firms in our sample refrain from applying for credit when they need it. When we look at corruption, an average of 34.17% of firms state that it is an obstacle. Taking into account the characteristics of managers, our analyses show that on average 18.39% of managers are women. We also found that, on average, company directors have around 15 years experience in their sector of activity. When we look at the size of the companies, the analysis reveals that small companies represent more than half of our sample, i.e. 57.71%, and large companies represent an average of 12.85%. In addition, over 40.20% of firms are in the manufacturing sector.

Table A3 (see appendix) presents the results of the correlation analysis between the variables selected. It shows that corruption is weakly correlated with discouragement. Access to credit, gender, small business and manufacturing are positively correlated with our dependent variable. On the other hand, there is a negative correlation between medium-sized enterprises and firms operating in the transport, hotel and restaurant sector. The table also shows that there is no multi-collinearity between

Table 1 Descriptive statistics

Variable	Obs	Mean	Std. dev	Min	Max
Discouraged	10,643	0.4406652	0.4964902	0	1
Corruption	13,100	0.3416794	0.4742908	0	1
Access finance	13,314	0.3191377	0.46616	0	1
Female_Manager	13,561	0.1839097	0.3874249	0	1
Experience_Manager	13,204	15.38197	10.44665	0	72
Small	13,635	0.5771177	0.4940352	0	1
Medium	13,635	0.2943161	0.4557514	0	1
Large	13,635	0.1285662	0.3347314	0	1
Manufacturing	13,635	0.4020535	0.4903306	0	1
Transport	13,635	0.0539054	0.2258392	0	1
Hotels_restoration	13,635	0.110011	0.3129149	0	1
Wholesale_retrail	13,635	0.3471214	0.4760722	0	1
Constructions	13,635	0.0572791	0.2323836	0	1

Source: Authors

the variables used in this paper. Indeed, the highest correlation coefficient observed in this study is -0.78 . This value is well below the threshold of 0.80 , beyond which multi-colinearity becomes a problem that can render the coefficients of our estimates inconsistent (Damodar 2004).

Main estimations

Table 2 presents the results of the main estimates. Column (1) reproduces the results of the ordinary least squares (OLS) regression. Column (2) presents the results of the Probit regression, column (3) the marginal effects. Column (4) presents the IV-Probit results using Judiciary as the instrumental variable for corruption. In all regressions, we have also controlled for country and time specific effects.

In columns (1), (2) and (3) of Table 2, the corruption coefficients are positive and significant at 1%. The more firms are confronted with a high level of corruption, the more they are discouraged from applying for credit. Regarding the economic impact, the marginal effects show that corruption has a positive effect on discouragement. More precisely, we find that corruption increases the probability of firms' self-rationing by 5.29%. Moreover, in the case of the IV Probit, corruption increases borrower discouragement by 2.38 standard deviations. This is economically of significance, given that the average self-rationing ratio on the credit market is 51.03%.

A possible explanation for this result is that corruption is perceived by borrowers as an additional cost on top of other credit-related costs (Fungáčová et al. 2015). The latter increases the cost of credit, thereby increasing the debt burden. In addition, a high level of corruption grips the enforcement of court rulings in case of loan default which leads banks to demand high interest rates or large collateral (Wellalage et al. 2018). The final effect is to reduce the profitability of investments made by firms and consequently self-rating becomes a rational choice. This thesis is consistent with that of *sand in the wheels*. These results are in line with those highlighted by Galli et al. (2018) and diverge from those of Statnik and Vu (2020). Indeed, Galli et al. (2018) find that firms located in countries with a very high corruption index have a high probability of self-rating compared to those located in countries with low corruption. In addition, Wellalage et al. (2018)⁸ show that corruption increases SMEs' credit constraints by 7.63%. However, it should be noted that despite the similarities with the results of Galli et al. (2018), there is a difference in the samples. Indeed, this study is conducted on a sample of firms from African countries unlike Galli⁹ et al. (2018).

In column (4), the coefficient on Judiciary (the instrumental variable for corruption) is positive and significant at 1%. Specifically, an increase in Judiciary increases borrower discouragement by 2.382 percentage points.

The estimates show that the perception of access to finance has a positive and significant effect on the probability of firms being discouraged from applying

⁸ They used business survey data collected by the World Bank on firms located in 5 South Asian countries.

⁹ Their sample is essentially made up of firms from 11 Eurozone countries.

Table 2 Effect of corruption on the discouragement of borrowers

Variables	OLS	Probit	Marg.Probit	IV-Probit ^a
Corruption	0.0535*** (0.00986)	0.167*** (0.0303)	0.0529*** (0.00953)	2.382*** (0.470)
Instrument_Judiciary				0.462*** (0.0961)
Access_finance	0.321*** (0.0103)	0.903*** (0.0315)	0.285*** (0.00872)	0.0681 (0.0481)
Female_manager	0.0117 (0.0116)	0.0341 (0.0369)	0.0108 (0.0117)	
Experience_manager	-0.000253 (0.000434)	-0.000758 (0.00137)	-0.000239 (0.000434)	-0.00441** (0.00186)
Small	0.192*** (0.0149)	0.614*** (0.0491)	0.194*** (0.0152)	0.601*** (0.0622)
Medium	0.109*** (0.0155)	0.353*** (0.0512)	0.112*** (0.0161)	0.301*** (0.0656)
Manufacturing	0.0531* (0.0274)	0.174** (0.0859)	0.0549** (0.0271)	0.169 (0.110)
Transport	-0.00977 (0.0323)	-0.0132 (0.101)	-0.00416 (0.0320)	-0.142 (0.134)
Hotels_restaurants	-0.0363 (0.0295)	-0.0905 (0.0929)	-0.0286 (0.0294)	-0.157 (0.120)
Wholesale_retail	0.0259 (0.0274)	0.0822 (0.0859)	0.0260 (0.0272)	0.0381 (0.111)
Constructions	-0.0112 (0.0319)	-0.0440 (0.102)	-0.0139 (0.0322)	-0.0797 (0.131)
Constant	0.199*** (0.0418)	-0.924*** (0.130)		-2.288*** (0.337)
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	10,150	10,150	10,150	9,279
R-squared	0.233			
Wald test of exogeneity				
AR test				
Cragg-Donald F statistic				
				33.75***
				34.41***
				67.65***

Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. AR stands for weak instrumental tests. Source: Authors
Source: Authors

^aThis is IV-Probit twostep. It should also be noted that this estimation technique does not calculate marginal effects

for a loan. This result is not surprising, since a firm which has stated that access to credit is an obstacle or which has preconceived ideas along these lines has a high probability of being discouraged and therefore of refraining from applying for bank credit, unlike a firm which perceives that access to finance is a minor problem. This result is identical to that of Statnik and Vu (2020), Statnik et al. (2022). According to these authors, access to finance has a positive and significant effect on the probability of firms becoming discouraged.

Unlike the case of models with continuous dependent variables, there is no instrument validity test for models with limited dependent variables. We will attempt to build an econometric foundation by relying first on the test results provided by the two-stage least squares (2SLS) method. Consequently, the test results reported in this section should be interpreted with caution given that our dependent variable is dichotomous and that these tests were originally developed for continuous variables. The Cragg-Donald F statistic is 67.64, which is well above the threshold of significance. This is well above the threshold of 10. Stock and Yogo (2002) argue that when the transformed F-test for the joint significance of the identification instruments in the first-stage regression exceeds 10, the selected instruments are valid. We conclude that the Judiciary variable (the instrumental variable for corruption) used in the IV-Probit model is appropriate. Furthermore, the Wald exogeneity test allows us to reject the hypothesis that the error term in the first step is not correlated with the error term in the second step of the regression. The result of the Wald test indicates that endogeneity is a serious concern in the case of our study. This result supports our choice to use the IV probit model. Furthermore, the Anderson-Rubin (AR) test leads us to reject the null hypothesis. This indicates that there is no weak instrument problem.

When we look at the firm's sector of activity, the estimates show that firms operating in the manufacturing sectors have a high probability of being discouraged from applying for credit. Specifically, we find that these firms have a 5.49% chance of being discouraged from applying for credit. In terms of firm size, we find that small and medium-sized firms have a high probability of refraining from applying for credit. More precisely, small and medium-sized firms have respectively a probability of 19.4% and 11.2% of self-rationing. This is consistent with the results established by Galli et al. (2018); Kallandranis and Drakos (2020); Statnik and Vu, (2020) and Statnik et al. (2022). For example, Kallandranis and Drakos (2020) showed, using data from the European Business Access to Finance Survey collected between 2009 and 2018, that small firms are more likely to be discouraged and less likely to apply for a loan than larger firms.

Robustness checks

In this section, we present the results of the robustness test. In order to assess the sensitivity of the results of our baseline estimates, two sets of tests are performed. First, we use alternative measures of corruption and discouragement. Following Statnik et al. (2022), we redefine the corruption variable. Two alternative variables

are considered. The first, Corruption1, is an indicator variable that takes 1 if firms perceive corruption as a moderate, major or very severe obstacle and zero if they perceive corruption as a minor obstacle or not an obstacle at all. The second, Corruption2, measures corruption at different levels. It varies from 1 to 5, with 1 for no obstacle and 5 for a very severe obstacle. With regard to discouragement, we will draw on the distinction made by Chakravarty and Xiang (2013) and Bertrand and Perrin (2022) to create a new variable, namely rational discouragement. This variable takes the value 1 if firms cite as reasons the complexity of the application procedure; unfavourable interest rates; collateral requirements were too high; the amount and duration of the loan insufficient, 0 otherwise.

Secondly, we will re-estimate our equation by excluding Nigeria¹⁰ from our sample. The aim is to assess the effect of sampling fluctuations on the results obtained in estimating our model. The results of the various sensitivity tests are reported in Tables 3, 4, 5 and 6.

Columns (1), (2) and (3) of Tables 3 and 4 present the results of the estimates of the effect of corruption on the self-rationing of credit. They confirm the positive effect obtained in the estimates of the basic model. More specifically, Corruption1 and Corruption2 have a positive and significant effect on the probability that firms will be discouraged from applying for credit. In other words, firms are more discouraged when corruption is high.

With regard to the variable that captures the perception of access to finance, the results from Tables 3, 4, 5 and 6 show that it positively affects the probability that firms will be discouraged from borrowing. This result is identical to that found in the baseline estimation. With regard to firm size, we find that small firms have a high probability of becoming discouraged. The results for firm size are similar to those obtained in the baseline model.

For the alternative measure of discouragement, the results of the sensitivity test are reported in columns (1), (2) and (3) of Table 5. This shows that corruption has a positive and significant effect on firm discouragement when we use an alternative measure of discouragement. In terms of marginal effects, we find that corruption increases the probability of firms rationing themselves on the credit market by 5.63 percentage points.

Furthermore, the coefficients of the control variables are almost identical to those obtained in our baseline estimation. We can therefore conclude that our results are not sensitive to either the measurement or the definition of the variables used.

The final sensitivity test consists of excluding Nigeria from our sample. The idea is to find out whether the results obtained above are influenced by this country. Columns (1), (2) and (3) of Table 6 present the results of the estimates of the effect of corruption on self-rationing on the credit market without Nigeria. This confirms the positive effect obtained in the estimates of the basic model. Thus, we can state that our results are not equally alternated by sampling fluctuations.

¹⁰ This country alone represents more than a quarter of our sample, i.e. approximately 25.64%. Given this proportion, we can envisage the hypothesis that our basic results are linked to firms' perceptions of the level of corruption in this country.

Table 3 Effect of corruption on borrower discouragement

Variables	OLS	Probit	Marg-probit	IV-Probit
Corruption1	0.0569*** (0.00945)	0.177*** (0.0292)	0.0560*** (0.00916)	0.0779*** (0.00976)
Instrument_Judiciary				0.341*** (0.0997)
Access_finance	0.321*** (0.0103)	0.903*** (0.0315)	0.285*** (0.00868)	0.0456 (0.0337)
Female_manager	0.0119 (0.0116)	0.0337 (0.0369)	0.0106 (0.0117)	-0.00364*** (0.00127)
Experience_manager	-0.000272 (0.000434)	-0.000798 (0.00137)	-0.000252 (0.000434)	0.444*** (0.0642)
Small	0.193*** (0.0149)	0.616*** (0.0491)	0.194*** (0.0152)	0.234*** (0.0544)
Medium	0.109*** (0.0155)	0.356*** (0.0512)	0.112*** (0.0161)	0.0948 (0.0805)
Manufacturing	0.0521* (0.0273)	0.170** (0.0859)	0.0538** (0.0271)	-0.120 (0.0935)
Transport	-0.0109 (0.0322)	-0.0169 (0.101)	-0.00535 (0.0320)	-0.134 (0.0852)
Hotels_restaurants	-0.0372 (0.0295)	-0.0930 (0.0929)	-0.0294 (0.0294)	-0.00517 (0.0804)
Wholesale_retail	0.0245 (0.0274)	0.0777 (0.0860)	0.0245 (0.0272)	-0.0841 (0.0928)
Constructions	-0.0127 (0.0319)	-0.0484 (0.102)	-0.0153 (0.0322)	-0.791*** (0.00734)
Constant	0.188*** (0.0420)	-0.958*** (0.130)		YES
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	10,150	10,150	10,150	9,279
R-squared	0.233			
Wald test of exogeneity				
AR test				
Cragg-Donald F statistic				33.99***
				34.41***
				63.35***

Note: Standard errors in parentheses ***p < 0.01, **p < 0.05, *p < 0.1. AR stands for weak instrumental tests. Source: Authors

Table 4 Effect of corruption on borrower discouragement

Variables	OLS	Probit	Marg.-probit	IV-Probit
Corruption2	0.0230*** (0.00339)	0.0724*** (0.0105)	0.0228*** (0.00329)	0.290*** (0.0271)
Instrument_Judiciary				0.430*** (0.0893)
Access_finance	0.318*** (0.0103)	0.894*** (0.0316)	0.282*** (0.00874)	0.0593* (0.0355)
Female_manager	0.0127 (0.0116)	0.0364 (0.0370)	0.0115 (0.0117)	-0.00346*** (0.00133)
Experience_manager	-0.000279 (0.000433)	-0.000795 (0.00137)	-0.000251 (0.000434)	0.491*** (0.0590)
Small	0.192*** (0.0149)	0.615*** (0.0491)	0.194*** (0.0152)	0.268*** (0.0535)
Medium	0.109*** (0.0155)	0.355*** (0.0513)	0.112*** (0.0161)	0.113 (0.0837)
Manufacturing	0.0521* (0.0273)	0.171** (0.0860)	0.0539** (0.0271)	-0.106 (0.0980)
Transport	-0.0114 (0.0322)	-0.0184 (0.101)	-0.00582 (0.0320)	-0.153* (0.0894)
Hotels_restaurants	-0.0380 (0.0295)	-0.0943 (0.0930)	-0.0298 (0.0294)	0.0200 (0.0837)
Wholesale_retail	0.0246 (0.0274)	0.0782 (0.0860)	0.0247 (0.0272)	-0.0828 (0.0975)
Constructions	-0.0128 (0.0319)	-0.0489 (0.102)	-0.0154 (0.0322)	-1.988*** (0.161)
Constant	0.173*** (0.0423)	-1.010*** (0.132)		YES
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	10,150	10,150	10,150	9,279
R-squared	0.234			
Wald test of exogeneity				31.49***
AR test				34.41***
Cragg-Donald F statistic				113.81***

Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. AR stands for weak instrumental tests. Source: Authors

Table 5 Effect of corruption on borrower discouragement

Variables	OLS	Probit	Marg Probit	IV-Probit
Corruption	0.0571*** (0.00994)	0.175*** (0.0300)	0.0563*** (0.00958)	1.962*** (0.441)
Instrument_Judiciary				0.432*** (0.0899)
Access_finance	0.286*** (0.0104)	0.788*** (0.0309)	0.253*** (0.00892)	0.0620 (0.0451)
Female_manager	0.00965 (0.0117)	0.0288 (0.0367)	0.00923 (0.0118)	-0.00372** (0.00175)
Experience_manager	-9.85e-05 (0.000437)	-0.000367 (0.00137)	-0.000118 (0.000439)	0.564*** (0.0591)
Small	0.179*** (0.0150)	0.575*** (0.0494)	0.185*** (0.0156)	0.311*** (0.0623)
Medium	0.107*** (0.0156)	0.353*** (0.0516)	0.113*** (0.0165)	0.113 (0.104)
Manufacturing	0.0313 (0.0276)	0.104 (0.0859)	0.0334 (0.0275)	-0.167 (0.126)
Transport	-0.0275 (0.0325)	-0.0681 (0.101)	-0.0219 (0.0325)	-0.177 (0.113)
Hotels_restaurants	-0.0507* (0.0298)	-0.133 (0.0930)	-0.0425 (0.0298)	0.00132
Wholesale_retail	0.00669 (0.0276)	0.0249 (0.0859)	0.00798 (0.0276)	(0.105)
Constructions	-0.0189 (0.0322)	-0.0642 (0.102)	-0.0206 (0.0327)	-0.0880 (0.123)
Constant	0.226*** (0.0422)	-0.839*** (0.129)		-1.943*** (0.316)
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	10,150	10,150	10,150	9,279
R-squared	0.202			
Wald test of exogeneity				22.31***
AR test				22.56***
Cragg-Donald F statistic				67.65***

Note: Standard errors in parentheses ***p < 0.01, **p < 0.05, *p < 0.1. AR stands for weak instrumental tests. Source: Authors

Table 6 Effect of corruption on the discouragement of borrowers without Nigeria

Variables	OLS	Probit	Marg Probit	IV-Probit
Corruption	0.0457*** (0.0112)	(0.0356)	0.0467*** (0.0108)	1.476*** (0.371)
Instrument_Judiciary				0.590*** (0.0899)
Access_finance	0.326*** (0.0113)	0.920*** (0.0353)	0.279*** (0.00931)	0.0250 (0.0461)
Female_manager	0.00702 (0.0122)	0.0197 (0.0406)	0.00599 (0.0123)	-0.00410** (0.00181)
Experience_manager	-0.000620 (0.000470)	-0.00188 (0.00155)	-0.000570 (0.000470)	0.629*** (0.0599)
Small	0.187*** (0.0156)	0.612*** (0.0532)	0.186*** (0.0158)	0.293*** (0.0627)
Medium	0.0957*** (0.0162)	0.315*** (0.0552)	0.0955*** (0.0167)	0.151 (0.103)
Manufacturing	0.0408 (0.0283)	0.146 (0.0916)	0.0442 (0.0278)	0.0206 (0.124)
Transport	0.00902 (0.0336)	0.0474 (0.109)	0.0144 (0.0330)	-0.164 (0.114)
Hotels_restaurants	-0.0397 (0.0307)	-0.102 (0.0995)	-0.0309 (0.0302)	0.0357 (0.104)
Wholesale_retail	0.0137 (0.0283)	0.0457 (0.0913)	0.0139 (0.0277)	-0.0514 (0.121)
Constructions	-0.0178 (0.0327)	-0.0638 (0.107)	-0.0193 (0.0325)	-1.665*** (0.271)
Constant	0.224*** (0.0422)	-0.868*** (0.135)		YES
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	8096	8096	8096	7361
R-squared	0.263			
Wald test of exogeneity				15.09*
AR test				14.80***
Cragg-Donald F statistic				94.58***

Note: Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. AR stands for weak instrumental tests. Source: Authors

Conclusion, recommendations, and future research directions

The objective of this article is to empirically analyse the effect of corruption on the discouragement of SMEs on the credit market in Africa over the period 2010 to 2022. For this purpose, we selected a sample of 13,635 SMEs in 26 countries. The estimates are based on non-linear probabilistic models of the Probit type and, in order to account for the endogeneity problem, we also used the instrumental variables technique (IV-Probit). We find that corruption has a positive and significant effect on business discouragement. Specifically, the higher the level of corruption faced by firms, the more they are discouraged from applying for credit. This shows that in Africa, the sand in the wheels thesis prevails. Our results are robust to alternative measures of corruption and discouragement and to sampling fluctuations.

Our results justify authorities strengthening anti-corruption efforts, improving transparency and reducing information asymmetries to combat corruption. More specifically, the public authorities can encourage banks to put in place a plan to detect and prevent corruption and influence peddling, based on a set of internal procedures. This involves mapping the risks of corruption, influence peddling and conflicts of interest, as well as drawing up rules of ethics and good conduct. These measures can play an important role in restoring borrowers' confidence and increasing their ability to negotiate with banks, ultimately making them less reluctant to apply for credit. Another possible solution is to set up a credit incident bureau to record any behaviour or attitude that suggests a request for a bribe. This register, modelled on existing credit bureaus, would be managed by an external organization. Moreover, the regulator can also monitor the level of interest rates on loans and changes in interest rate spreads. These indicators can encourage corruption, as they create a situation of credit rationing.

Furthermore, our results clearly provide a factual argument for continuing the fight against corruption in Africa in order to achieve target 16.5 of the SDGs, i.e. a substantial reduction in corruption and bribery by 2030. Loosening the stranglehold of corruption would help to increase the participation of business in achieving the other SDGs (directly for SDG2 or ending poverty in all its forms everywhere, SDG4 or SDG8 and indirectly for the other goals).

Although we have made every effort, our research may have some limitations. Our results may suffer from selection bias because our sample was not selected at random. Companies are selected only from the subset of companies that require bank financing. Our estimates do not take into account the data generation process.

Future research could look at the effect of informal institutions such as culture, religion and ethnicity as factors in explaining borrower discouragement. The intuition is that companies whose directors are Muslims will tend to refrain from applying for credit for religious reasons. Future research could also examine the existence of a differential effect in attitudes to corruption between male and female-owned SMEs on the credit market. The intuition is that female-owned SMEs may have a high probability of self-rationing.

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