The Burden of Corruption: How Financial Sources, Female Ownership, and Climate Actions are associated with Firm Perceptions

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Abstract:

Corruption remains a significant obstacle to firm operations, yet not all firms experience it equally. This study investigates how financial arrangements, climate change mitigation actions, and female ownership and leadership relate to firms' perception of corruption. Drawing on a merged dataset of 72,487 firms across 84 countries from 2018 to 2025, combining Round VI of the Business Environment and Enterprise Performance Survey (BEEPS VI), World Bank Enterprise Surveys, and World Bank Open Data, we estimate regression models using STATA software. Several novel findings emerge. First, borrowing from state-owned banks is positively associated with perceived corruption, while broader credit availability is negatively associated with it. This contrast suggests that the source and accessibility of finance shape firms' exposure to governance failures in opposing ways. Second, the percentage of female ownership is consistently and robustly negatively associated with perceived corruption. Third, firms that adopt climate change mitigation actions report higher levels of perceived corruption. Fourth, losses from extreme weather events are strongly positively associated with perceived corruption, indicating an important correlation between climate vulnerability and governance quality. Finally, small and medium enterprises perceive corruption as a more severe obstacle than large firms, while manufacturing firms perceive significantly less corruption than service-sector firms.

Keywords: Corruption; State-owned banks; Credit availability; Climate change mitigation; Female leadership and ownership.

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1. Introduction

Corruption remains one of the most persistent and damaging obstacles to firm operations, particularly in developing and transition economies. For business enterprises, corruption manifests in myriad forms, including informal payments to secure permits, bribes to obtain favorable regulatory decisions, and extortion by public officials. These corrupt practices distort market competition, raise transaction costs, discourage investment, and ultimately constrain economic growth (Fisman & Svensson, 2007; Svensson, 2003). Yet, firms do not experience corruption uniformly. Some enterprises navigate their institutional environments with relative ease, while others report corruption as a severe or even very severe obstacle to their daily operations (Hellman, Jones, & Kaufmann, 2003). Understanding what differentiates these firms

is not merely an academic exercise; it is essential for designing effective anti-corruption policies and improving the business climate.

A growing body of literature has examined firm-level determinants of corruption exposure, including firm size, age, ownership structure, and sector of operation (Clarke & Xu, 2004; Beck, Demirgüç-Kunt, & Maksimovic, 2005). However, several important gaps remain. First, the role of financial institutions and credit arrangements in shaping corruption perceptions has received surprisingly limited attention. While macroeconomic studies have shown that countries with more developed financial systems tend to have lower levels of corruption (Barth, Caprio, & Levine, 2009; Beck, Demirgüç-Kunt, & Levine, 2006), it is unclear whether borrowing from state-owned banks versus private financial institutions differentially affects how individual firms experience corruption. State-owned banks are widely documented to be less efficient, more politically influenced, and more prone to corruption than private banks (La Porta et al., 2002; Shleifer & Vishny, 1994), suggesting that firms relying on them may face additional corrupt demands. Conversely, broader credit availability may reduce firms' reliance on informal payments and connect them to more transparent lending channels (Beck et al., 2005). To date, limited study has simultaneously compared these two dimensions of financial access within a single empirical framework.

Second, the relationship between firms' climate change mitigation actions and their exposure to corruption remains underexplored. Corruption has been shown to undermine environmental policy effectiveness, as bribes can allow firms to evade emissions standards and avoid pollution controls (Fredriksson & Svensson, 2003; Damania, Fredriksson, & List, 2003). In the context of climate change, corruption may impede the adoption of mitigation technologies by increasing the cost and uncertainty of obtaining permits, certifications, and regulatory approvals (Sida, 2015). As businesses increasingly adopt energy management and emissions monitoring practices, understanding whether these actions are associated with greater or lesser corruption vulnerability becomes a timely and policy-relevant question. Yet, very few empirical studies have examined this relationship at the firm level, and this relationship remains underexplored in a large cross-country sample.

Third, while gender diversity has been linked to ethical decision-making and corporate governance (Adams & Funk, 2012; Croson & Gneezy, 2009), the association between female ownership and leadership and firm-level corruption perceptions has not been systematically examined across a large cross-country sample. Studies have found that women in leadership positions tend to be more risk-averse, less tolerant of unethical behavior, and more committed to corporate social responsibility than their male counterparts (Bernardi & Arnold, 1997; Cumming, Leung, & Rui, 2015). Extending this logic to corruption, several studies have found that firms with female leaders or higher female representation in ownership report lower levels of bribery and corruption (Swamy et al., 2001; Dollar et al., 2001). However, existing studies have typically focused on female top managers, with less attention paid to continuous measures of female ownership percentage. Our study contributes to this literature by examining that.

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This study addresses these gaps by investigating three central research questions. The first question is “Does borrowing from state-owned banks versus having broader credit availability relate differentially to firms' perception of corruption as an obstacle?” The second is “Are firms that adopt climate change mitigation actions more or less likely to perceive corruption as a severe obstacle?”. The third is “Is female ownership or female top managerial leadership associated with lower perceived corruption?”

Our analysis yields several novel and policy-relevant findings. First, obtaining loans from state-owned banks correlates positively with perceived corruption, whereas greater access to credit in general correlates negatively with it. This divergence implies that the origin and availability of financing influence firms' encounter with governance shortcomings in opposite directions. Second, across every model specification, a higher share of female ownership is reliably and strongly associated with lower perceived corruption, making this one of the most consistent results in the study. Third, firms that implement climate change mitigation measures tend to report elevated levels of perceived corruption. Fourth, experiencing financial losses due to extreme weather events is strongly linked to higher perceived corruption, revealing a notable connection between climate-related vulnerability and institutional quality. Finally, micro, small, and medium-sized firms (SMEs) view corruption as a more serious operational obstacle compared to large firms, while manufacturing firms report substantially lower perceived corruption than those operating in service sectors. This paper makes several contributions to the existing literature.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature and develops the theoretical framework. Section 3 describes the methodology, data sources, and variable construction. Section 4 presents the main results. Section 5 discusses and Section 6 concludes with important implications.

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2. Literature review

This study draws on and contributes to three distinct strands of literature: the economics of corruption and its firm-level determinants, the relationship between financial institutions and governance, and the emerging intersection of climate change mitigation and corruption perceptions. Additionally, we engage with the literature on gender diversity and organizational ethics. Below, we review each of these areas and identify the gaps that motivate our empirical analysis.

2.1. Corruption as an Obstacle to Firm Operations

A substantial body of research has documented the damaging effects of corruption on firm performance, investment decisions, and economic growth. Corruption has been shown to act as a regressive tax on business operations, disproportionately harming smaller and younger firms that lack the resources and networks to navigate corrupt bureaucracies (Fisman & Svensson, 2007; Svensson, 2003). Firms operating in corrupt environments tend to underreport sales, conceal

employment, and limit their expansion to avoid attracting attention from rent-seeking officials (Johnson, Kaufmann, & Zoido-Lobatón, 1998). Cross-country studies using World Bank Enterprise Survey data have consistently found that corruption ranks among the most frequently cited obstacles to firm operations, particularly in low-income and transition economies (Beck, Demirgüç-Kunt, & Maksimovic, 2005; Hallward-Driemeier, Khun-Jush, & Pritchett, 2010).

However, the literature has also recognized that corruption perceptions are not uniform across firms. Firm size, age, ownership structure, sector, and export status have all been shown to correlate with how severely managers perceive corruption as an obstacle (Clarke & Xu, 2004; Hellman, Jones, & Kaufmann, 2003). For example, manufacturing firms often report lower corruption obstacles than service-sector firms, possibly due to greater formalization and visibility (Batra, Kaufmann, & Stone, 2003). Similarly, exporting firms may face different corruption pressures than domestically oriented firms, as they are subject to international standards and customs procedures (Bernard & Jensen, 2004). Despite this rich literature, the role of specific financial arrangements, particularly the distinction between state-owned and private bank borrowing, has received comparatively little attention. Most existing studies treat access to finance as a binary variable or a simple measure of credit constraints, without differentiating between lender types. This represents an important gap, as state-owned banks operate under different incentive structures, governance arrangements, and political pressures than private financial institutions (La Porta et al., 2002).

A substantial body of research highlights persistent measurement challenges in firm-level corruption research. Corruption is inherently multidimensional and clandestine, meaning that standard indicators such as self-reported perceptions, experienced bribery events, and proxy institutional measures, capture different facets of the phenomenon and often produce systematically different estimates of its prevalence and effects (Kaufmann et al., 2011; Olken, 2009). Perception-based measures, in particular, are known to reflect broader normative beliefs, media exposure, and local expectations rather than transaction-level reality, which can lead to poor concordance with firms' direct experiences and to biased inference when used in isolation (Treisman, 2007; Mauro, 1995). These concerns are especially acute in widely used datasets such as the World Bank Enterprise Survey (WBES), where social desirability bias, recall problems, and question-wording issues may reduce construct validity (Gehlbach & Keefer, 2011; Malesky & Schuler, 2011; Harrison, 2014). Importantly, measurement error in corruption is nonrandom: smaller and informal firms systematically report different incidence and severity of corrupt solicitations than larger or formal firms, implying that bias may interact with firm characteristics to produce misleading heterogeneity results (Fisman & Svensson, 2007; Dabla-Norris et al., 2015). Moreover, informal institutions, including social norms, patronage networks, and relational governance, mediate how formal rules are interpreted and enforced, shaping firms' actual corruption exposure in ways that standard survey questions may fail to capture (Helmke & Levitsky, 2004; Gambetta, 1993; North, 1990). Together, these critiques underscore that no single corruption indicator is definitive; triangulating perception-based measures with

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experience-based modules, vignette elicitations, or administrative records improves construct validity and strengthens causal inference (Reinikka & Svensson, 2005; Olken & Barron, 2007).

2.2. Financial Institution Ownership and Corruption Exposure

The relationship between financial sector development and corruption has been examined primarily at the macroeconomic level. Countries with more developed financial systems tend to have lower levels of corruption, possibly because competitive banking sectors reduce opportunities for rent-seeking and because financial deepening enables market-based allocation of credit rather than discretionary, relationship-based lending (Barth, Caprio, & Levine, 2009; Beck, Demirgüç-Kunt, & Levine, 2006). However, the micro-level relationship between individual firms' borrowing arrangements and their corruption experiences remains underexplored.

State-owned banks present a particularly interesting case. While state-owned banks are often established to promote development objectives, expand credit access, and correct market failures, they are also widely documented to be less efficient, more politically influenced, and more prone to corruption than private banks (Shleifer & Vishny, 1994; La Porta et al., 2002). Politicians may direct credit to favored constituents, demand bribes for loan approvals, or use state banks as vehicles for patronage distribution (Dinc, 2005; Khwaja & Mian, 2005). Firms borrowing from state-owned banks may therefore face additional corrupt demands beyond those encountered in the normal course of business. Alternatively, firms that are already embedded in corrupt networks may self-select into state bank borrowing, creating a spurious correlation. Disentangling these possibilities is difficult with cross-sectional data, but documenting the basic association is a necessary first step.

By contrast, broader credit availability, measured as the ease with which firms can access loans from private commercial banks and other financial institutions, is generally associated with more transparent and competitive lending processes (Beck et al., 2005). Firms with better credit access may be less reliant on informal payments to secure financing, and they may also operate in institutional environments where corruption is generally lower. Our study contributes to this literature by simultaneously examining both state-owned bank borrowing and general credit availability within the same empirical framework, allowing us to contrast their respective associations with perceived corruption.

2.3. Climate Change Mitigation and Corruption

An emerging but still limited literature examines the intersection of climate change, environmental management, and corruption. Corruption has been shown to undermine environmental policy effectiveness, as bribes can allow firms to evade emissions standards, avoid pollution controls, and illegally extract natural resources (Fredriksson & Svensson, 2003; Damania, Fredriksson, & List, 2003). In the context of climate change, corruption may impede the adoption of mitigation technologies by increasing the cost and uncertainty of obtaining

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permits, certifications, and regulatory approvals (Sida, 2015). Conversely, firms that invest in energy management and emissions monitoring may become more visible to regulators and environmental inspectors, potentially increasing their exposure to corrupt demands.

The direction of the relationship is theoretically ambiguous. On one hand, corruption could discourage climate action by raising the transaction costs associated with green investments. Firms may avoid energy efficiency projects if they anticipate needing to bribe officials for building permits, equipment certifications, or grid connections. On the other hand, climate-active firms may be systematically different from non-adopting firms in ways that also affect corruption perceptions. For example, firms with better management quality, stronger corporate governance, or greater transparency may be both more likely to adopt energy management and more likely to recognize and report corruption. Alternatively, in highly corrupt environments, climate action might only be feasible for firms that are already adept at navigating corrupt systems, creating a positive correlation between energy management and corruption perception. Very few empirical studies have examined this relationship at the firm level, and little has done so using a cross-country sample as large and diverse as the one we employ.

2.4. Female Ownership, Leadership, and Corruption

A substantial body of research has examined the relationship between gender diversity and organizational ethics, transparency, and governance. Studies consistently show that women in leadership positions tend to be more risk-averse, less tolerant of unethical behavior, and more committed to corporate social responsibility than their male counterparts (Adams & Funk, 2012; Croson & Gneezy, 2009). Female executives and board members have also been associated with lower incidences of fraud, fewer regulatory violations, and higher financial reporting quality (Bernardi & Arnold, 1997; Cumming, Leung, & Rui, 2015).

Extending this logic to corruption, prior work has found that firms with female leaders or higher female ownership shares tend to report lower levels of bribery and corruption (Dollar et al., 2001; Swamy et al., 2001). However, firm-level evidence using World Bank Enterprise Survey data remains mixed: some studies document a negative association between female management and bribery payments (Jha & Sarangi, 2017), while others detect no significant relationship (Jensen et al., 2017). Moreover, existing research has largely focused on female top managers, paying less attention to continuous measures of female ownership percentage. This study contributes to the literature by examining both a binary indicator for female top management and a continuous measure of female ownership share, allowing us to assess whether corruption perceptions are more strongly associated with leadership or ownership structure.

Recent cross-country firm-level research has further illuminated how gender-related characteristics interact with other organizational attributes to shape performance expectations, financing conditions, and climate-related decisions. In a sample of 21,729 enterprises across 28 countries from 2018 to 2020, Vu (2026) finds that female leadership is positively associated with revenue growth expectations, whereas a higher share of female ownership is linked to lower

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growth expectations. The same study also reports that firms adopting climate change mitigation actions are significantly more likely to expect revenue growth, while perceived corruption and inflation are associated with reduced growth expectations. Regarding access to finance, Vu (2026) shows that larger firms, those with more experienced top managers, and firms operating in less corrupt environments perceive easier access to finance. Conversely, firms that monitor CO□ emissions and those that have experienced weather-related losses report significantly greater financing obstacles. These findings suggest that climate mitigation efforts are positively correlated with managerial optimism about future revenue, yet such efforts, particularly emissions monitoring, may signal risks to financiers, while climate-related physical shocks further constrain perceived access to capital. Complementing these findings, Goodhart and Vu (2025) find that female ownership is positively associated with both the adoption of climate mitigation measures and the ability to secure credit. In contrast, the presence of female top managers is associated with a lower likelihood of engaging in mitigation activities or obtaining finance. This divergence suggests that female ownership and female leadership may operate through distinct mechanisms: female owners may drive strategic long-term investments such as mitigation and credit access, while female managers may face different institutional constraints or decision-making environments that shape their firms' financing and environmental strategies. Together, these results underscore the importance of disaggregating gender-related firm characteristics rather than treating them as a monolithic construct.

Extending this logic to corruption, several studies have found that firms with female leaders or higher female representation in ownership report lower levels of bribery and corruption (Swamy et al., 2001; Dollar et al., 2001). However, most of this evidence comes from country-level aggregates or small samples. Firm-level studies using World Bank Enterprise Survey data have produced mixed results, with some finding a negative association between female management and bribery payments (Jha & Sarangi, 2017) and others finding no significant relationship (Jensen et al., 2017). Moreover, existing studies have typically focused on female top managers, with less attention paid to female ownership percentages. Our study contributes to this literature by examining both a dummy variable for female top management and a continuous measure of female ownership percentage, allowing us to assess whether the association with corruption perceptions is driven by leadership or by ownership structure.

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2.5. Firm-Level and Country-Level Controls

Our empirical models incorporate a range of standard firm-level control variables drawn from the existing literature. Firm size, often measured by revenue or employment, has been shown to correlate negatively with corruption perceptions in some studies (smaller firms face greater obstacles) but positively in others (larger firms are more frequent targets of bribe requests) (Clarke & Xu, 2004). Firm age may reduce corruption exposure as older firms develop networks and learn to navigate bureaucratic systems (Hellman et al., 2003). Publicly listed firms face greater regulatory scrutiny and may therefore perceive less corruption, or alternatively may be subject to different types of corrupt demands. The manufacturing sector has been shown to

encounter different corruption patterns than services, possibly due to greater government regulation of manufacturing activities (Batra et al., 2003). External audits may reduce corruption exposure by increasing financial transparency and accountability (Beck et al., 2005). Weather-related losses have been included in corruption models only recently, with evidence suggesting that natural disasters can exacerbate corruption as firms compete for scarce relief and reconstruction resources (Leeson & Sobel, 2008). Finally, country-level macroeconomic conditions, including GDP and inflation, shape the overall business environment and may influence both corruption levels and firms' willingness to report it (Treisman, 2000).

2.6. Research Gaps and Contributions

In summary, the existing literature has established that corruption is a significant obstacle for many firms, that financial development generally reduces corruption, that climate action may be both cause and consequence of governance quality, and that female leadership may be associated with lower corruption. However, several important gaps remain. First, no study has simultaneously compared the associations of state-owned bank borrowing and general credit availability with firm-level corruption perceptions within a single empirical framework. Second, the relationship between climate mitigation actions such as energy management and emissions monitoring and perceived corruption has not been systematically examined across a large cross-country sample. Third, while female leadership has received some attention, the role of continuous female ownership percentage has been underexplored. Fourth, previous studies have typically used smaller samples or fewer control variables than our analysis. By drawing on a sample of over 72,000 firms across 84 countries, including both BEEPS VI and World Bank Enterprise Survey, and by estimating models with geographical country rather than country and year fixed effects and comprehensive controls, we aim to provide more robust and generalizable evidence on these relationships. Our study thus contributes new empirical findings to the literature on corruption, finance, climate action, and gender diversity, and offers policy-relevant insights for reducing corruption as an obstacle to firm operations.

3. Methodology and Data description

3.1. Methodology

To examine the correlates of perceived corruption, we estimate the following baseline regression models. Given the multi-country survey structure, standard errors in this study are clustered at the country level.

$$\text{CORRUPT}_i = \alpha + \beta_1 \text{SBANK}_i + \beta_2 \text{CLACTION}_i + \beta_3 \text{FEMALE_TMANAGER}_i + \beta_4 \text{FEMALE_OWNER}_i + \beta_5 \text{FIRM}_i + \beta_6 \text{COUNTRY}_i + \mu_i + \text{FE (Country)} + \text{FE (Year)} \quad (1)$$

$$\text{CORRUPT}_i = \alpha + \beta_1 \text{CREDITAVAIL}_i + \beta_2 \text{CLACTION}_i + \beta_3 \text{FEMALE_TMANAGER}_i + \beta_4 \text{FEMALE_OWNER}_i + \beta_5 \text{FIRM}_i + \beta_6 \text{COUNTRY}_i + \mu_i + \text{FE (Country)} + \text{FE (Year)} \quad (2)$$

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where

- $CORRUPT_i$ denotes the perceived level of corruption as an obstacle to operations for firm i.
- $SBANK_i$ is a binary indicator equal to 1 if the firm's most recent loan or line of credit was granted by a state-owned bank or government agency.
- $CREDITAVAIL_i$ is a binary indicator of credit availability, coded 1 if the firm applied for a loan and received full or partial approval.
- $CLACTION_i$ represents climate change mitigation actions, including emissions monitoring and energy management measures.
- F_OWNER_i captures the percentage of the firm owned by females.
- F_TMAGER_i is a binary indicator equal to 1 if the firm's top manager is female.
- $FIRM_i$ is a vector of firm-level control variables, including size, age, legal status, sector, audit status, weather-related losses, and government ownership.
- $COUNTRY_i$ is a vector of country-level macroeconomic controls, including five-year average GDP growth rates and inflation rates.
- $FE(Country)$ and $FE(Year)$ denote the country and year fixed effects, respectively, accounting for unobserved heterogeneity across country and time periods.
- μ_i is the error term.

3.2 Data description

This study draws on two complementary sources: Round VI of the Business Environment and Enterprise Performance Survey (BEEPS VI), conducted by the European Bank for Reconstruction and Development (EBRD) in partnership with the World Bank, and the World Bank Enterprise Survey (WBES). Both surveys share a common core questionnaire and employ comparable firm-level face-to-face interview methodologies, ensuring consistency in variable definitions and response scales. We augment these firm-level data with country-level macroeconomic indicators from the World Bank Open Data.

For merging procedure, we first retained all firms from BEEPS VI, which covers the period 2018–2020. To expand both the sample size and the temporal coverage, we then appended data from the WBES for the years 2021–2025, selecting only those WBES survey years and countries that align with the same standardized questionnaire module. The merging was conducted at the firm-year level, meaning each observation corresponds to a unique firm in a given survey year. Since the two surveys do not contain overlapping firm identifiers, the integration is based on appending cross-sectional surveys year by year rather than matching individual firms across datasets. For each country and year, we verified that the survey instruments and variable definitions are directly comparable. This process yields a rich and diverse sample of 72,487 firms across 84 countries, covering the period 2018 to 2025.

Variable definitions and summary statistics are provided in Appendix Tables A1 and A2, respectively. Table 3A in the Appendix presents a country-year-source matrix listing each

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country, survey year, data source (BEEPS VI or WBES), and number of observations, providing full transparency on the composition of the pooled sample.

3.2.1. Perceived Level of Corruption (CORRUPT)

Our dependent variable captures the extent to which corruption is perceived as an obstacle to firm operations. Based on the survey question, "To what degree is corruption an obstacle to the current operations of this establishment?", responses are coded on a five-point scale: 0 for "No obstacle", 1 for "Minor obstacle", 2 for "Moderate obstacle", 3 for "Major obstacle", and 4 for "Very severe obstacle". Higher values thus indicate a more severe perceived obstacle.

3.2.2. State-Owned Banks (SBANK)

We construct a binary indicator for borrowing from state-owned financial institutions. Using responses to the question, "Referring to the most recent line of credit or loan, what type of financial institution granted this loan?", we code SBANK as 1 for "State-owned banks or government agency" and 0 for all other sources, including "Private commercial banks", "Non-bank financial institutions", and "Other."

3.2.3. Credit Availability (CREDITAVAIL)

Using responses to the question, "Referring only to this most recent application for a line of credit or loan, what was the outcome of that application?", we construct a dummy variable, CREDITAVAIL, coded 1 if the firm applied for and received full or partial approval, and 0 if the firm applied but the application was rejected.

3.2.4. Climate Change Mitigation Actions (CLACTION)

We create two dummy variables capturing distinct but complementary climate-related behaviors:

- **MEASURE_EM**: Derived from the question, "Over the last three years, did this establishment monitor its CO□ emissions?", coded 1 for "Yes" and 0 for "No."
- **ENERGY:** Derived from the question, "Over the last three years, did this establishment adopt energy management measures?", coded 1 for "Yes" and 0 for "No."

Together, these variables indicate whether a firm has engaged in energy management or emissions monitoring, both of which are central to climate change mitigation.

3.2.5. Female Leadership and Ownership

We construct three variables capturing different dimensions of female participation in firm governance and ownership:

- **FEMALE_OWNERSHIP:** The percentage of the firm owned by females, based on the question, "What percentage of the firm is owned by females?" This continuous measure ranges from 0 to 100.

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- **FEMALE_OWNER:** A dummy variable coded as 1 if the owner is female and 0 if male, based on the question: “Amongst the owners of the firm, are there any females?”
- **FEMALE_TMANAGER:** A binary indicator coded 1 if the top manager is female and 0 if male. Gender has been shown to influence managerial decision-making, particularly regarding sustainability and innovation. This variable is derived from the question, "Is the Top Manager female?"
- **TMANAGER_EXPERIENCE:** The number of years of experience the top manager has in the industry, log-transformed to account for diminishing returns. More experienced managers may bring greater expertise and networks, positively influencing climate mitigation and financial access. This variable is derived from the question, "How many years of experience working in this sector does the Top Manager have?"

3.2.6. Firm-Level Control Variables (FIRM)

We include a comprehensive set of firm-specific characteristics to account for factors that may influence both corruption perceptions and financial access:

- **LNREVENUE:** The natural logarithm of last year's total sales, based on the question, "In the last fiscal year, what were this establishment's total annual sales for all products and services?"
- **LNAGE:** The natural logarithm of firm age, calculated as the survey year minus the year the firm began operations, derived from the question, "In what year did this establishment begin operations?"
- **LISTED:** A dummy variable indicating whether the firm is publicly listed, based on the question, "What is this firm's current legal status?" Coded 1 for "Shareholding company with shares traded in the stock market" and 0 for all other legal statuses.
- **MSME:** A dummy variable for micro, small, or medium-sized enterprises, coded 1 for "Micro," "Small," or "Medium" and 0 for "Large." SMEs often face greater resource constraints and barriers to financing (Boso et al., 2013).
- **MANUF:** A dummy variable for manufacturing firms, coded 1 for "Manufacturing" and 0 for other sectors (e.g., services, wholesale/retail, construction). Manufacturing firms typically have larger environmental footprints and distinct financial needs (Berrone & Ricart, 2012).
- **WEATHER:** A dummy variable indicating whether the firm has experienced monetary losses due to extreme weather events (e.g., storms, floods, droughts, landslides) over the last three years, coded 1 for "Yes" and 0 for "No."

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- **AUDIT:** A dummy variable indicating whether the firm's annual financial statements were checked and certified by an external auditor, based on the corresponding survey question.

3.2.7. Country-Level Control Variables (COUNTRY)

To account for broader economic conditions that may shape corruption perceptions and firm behavior, we include two macroeconomic indicators obtained from the World Bank Open Data:

- **GG5Y:** The five-year average GDP growth rate of the country where the firm operates.
- **INF5Y:** The five-year average inflation rate of the country where the firm is based.

We intentionally use five-year averages (GG5Y and INF5Y) rather than single-year values to capture persistent macroeconomic conditions that shape the firm's past experiences about the country's economic performance (e.g. GDP growth and inflation). Thus, controlling for these averages alongside country and year fixed effects offers a more appropriate specification for our research question, as it accounts for stable differences in economic environments across countries without over-differencing the key macroeconomic signals of interest.

4. Empirical results

4.1. The associations between state-owned bank loans, climate change mitigation, female ownership and female top management on the firm's perceived corruption

Table 1 below reports the associations between state-owned bank loans, climate change mitigation actions, female ownership, female top management, and the firm's perceived level of corruption. We estimate these relationships using both ordinary least squares (OLS) (Columns 1–4) and ordered probit models (Columns 5–8), which account for the ordinal nature of the corruption perception variable. All specifications include country fixed effects, year fixed effects, and standard errors clustered at the country level.

Before interpreting the results, we highlight a note on interpretation as follows: OLS coefficients represent the estimated change in the 0–4 corruption perception scale for a one-unit change in the independent variable. Ordered probit coefficients, in contrast, are latent-variable estimates that cannot be directly interpreted in terms of the observed scale. Throughout the text, we emphasize consistency in the sign and statistical significance of coefficients across OLS and ordered probit models. To facilitate a more nuanced interpretation of the ordered probit models, we report average marginal effects in Table 1bis. These show the estimated change in the probability of reporting each corruption category (0 = No obstacle, 1 = Minor obstacle, 2 = Moderate obstacle, 3 = Major obstacle, 4 = Very severe obstacle) for a one-unit change in each independent variable, calculated from the ordered probit models in Columns 5–8.

Turning to our first variable of interest, borrowing from state-owned banks (SBANK) is positively associated with higher perceived corruption across most specifications. In Column 1,

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the coefficient for SBANK is 0.084, indicating a positive correlation between obtaining a loan from a state-owned bank and the extent to which a firm perceives corruption as an obstacle to its operations. This positive association remains statistically significant at conventional levels in Columns 3 (0.080), 5 (0.104), and 7 (0.105). However, when the percentage of female ownership (FEMALE_OWNERSHIP) is introduced in Columns 2, 4, 6, and 8, the coefficient for SBANK remains positive but loses statistical significance in some cases, insignificant in others.

Both measures of climate change mitigation actions (MEASURE_EM and ENERGY) show positive and statistically significant associations with perceived corruption in all columns. These findings indicate a consistent positive correlation between undertaking climate-related actions and viewing corruption as a more severe obstacle. Several non-causal interpretations are possible. For example, firms operating in more regulated or bureaucratically complex environments may face both greater pressures to monitor emissions and higher exposure to corrupt practices. Alternatively, firms that have experienced corruption may be more likely to invest in formal management systems, including energy and emissions tracking, as a coping mechanism.

The relationship between gender-related governance variables and perceived corruption differs markedly depending on whether we examine ownership or top management. Starting with ownership, the percentage of the firm owned by females (FEMALE_OWNERSHIP) is consistently negatively associated with perceived corruption. In Column 2, the coefficient for FEMALE_OWNERSHIP is -0.002, and this negative association remains statistically significant in Column 4 (-0.002) as well as in the ordered probit models in Columns 6 (-0.002) and 8 (-0.002). However, while statistically significant across specifications, the magnitude of this coefficient warrants careful interpretation regarding economic meaningfulness. The dependent variable (perceived corruption as an obstacle) is measured on a four-point scale ranging from 0 (no obstacle) to 4 (very severe obstacle). A coefficient of -0.002 per percentage point of female ownership implies that a 10-percentage-point increase in female ownership (e.g., moving from 20% to 30% female ownership) corresponds to a predicted decrease of only 0.02 points on this 0–4 scale. Relative to the full range of the dependent variable and its standard deviation, this effect size is substantively modest. In practical terms, a firm moving from no female ownership to entirely female-owned (a 100-percentage-point shift) would experience a predicted reduction in perceived corruption of just 0.2 points, less than one-tenth of the scale's range. Thus, although the negative association between female ownership and perceived corruption is statistically robust, its economic significance is small. This suggests that while female ownership correlates with lower corruption perceptions, its contribution to explaining variation in perceived corruption is limited relative to other firm and country-level factors. By contrast, the dummy variable indicating whether any female owner exists (FEMALE_OWNER) is not statistically significant in any specification, implying that it is the share of female ownership, rather than its mere presence, that is correlated with corruption perceptions.

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Turning to top management, the association between having a female top manager (FEMALE_TMANAGER) and perceived corruption is less consistent. In Columns 1, 3, 5, and 7 where FEMALE_OWNERSHIP is not included, the coefficient for FEMALE_TMANAGER is small and not statistically significant. However, in Columns 2, 4, 6, and 8 which control for FEMALE_OWNERSHIP and have a substantially smaller sample, FEMALE_TMANAGER becomes positively associated with perceived corruption. For example, in Column 2, the coefficient is 0.117, and in Column 4, it is 0.090. This pattern suggests that the association between female top management and corruption perceptions is sensitive to sample composition and the inclusion of other governance controls. One possible interpretation is that the positive correlation observed in the smaller sample reflects unobserved firm characteristics or selection effects rather than a direct relationship. Given the instability of this result across specifications, we interpret it with caution. Finally, top manager experience (TMANAGER_EXPERIENCE) is not statistically significantly associated with perceived corruption in any model, with coefficients close to zero and p-values consistently above conventional thresholds. This suggests that the number of years a manager has worked in the industry is not correlated with how severely the firm perceives corruption as an obstacle.

Among the firm-level control variables, several show consistent associations with perceived corruption. Experiencing monetary losses due to extreme weather events (WEATHER) is strongly and positively associated with perceived corruption across all specifications. The coefficients range from 0.168 to 0.193 in the OLS models and remain highly significant in the ordered probit models. This indicates that firms reporting weather-related losses tend to report corruption as a more severe obstacle. Manufacturing firms (MANUF) show a consistently negative association with perceived corruption, with coefficients ranging from -0.107 to -0.081 in the OLS models and remaining significant in the ordered probit models. This suggests that manufacturing firms, relative to firms in other sectors such as services or construction, are associated with lower perceived corruption.

Other firm-level controls show weaker or inconsistent associations. Firm size, measured by the micro, small, or medium enterprise dummy (MSME), is positively associated with perceived corruption in some specifications (e.g., Column 3; Column 5) but loses significance in others. The natural logarithm of firm revenue (LNREVENUE) and firm age (LNAGE) are not consistently associated with perceived corruption, with coefficients that are small in magnitude and rarely statistically significant. The public listing status (LISTED) shows a negative association with perceived corruption in some models (e.g., Column 2; Column 4) but is not significant in others, suggesting a weak or sample-dependent relationship. External audit (AUDIT) is not statistically significantly associated with perceived corruption in any specification.

Turning to country-level macroeconomic controls, the association between the five-year average inflation rate (INF5Y) and perceived corruption changes sign depending on model specification. In Columns 1, 3, 5, and 7, which exclude FEMALE_OWNERSHIP, INF5Y is negatively

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associated with perceived corruption. However, in Columns 2, 4, 6, and 8, which include FEMALE_OWNERSHIP, INF5Y becomes positively associated with perceived corruption ($p < 0.05$). This instability suggests that the correlation between long-run average inflation and corruption perceptions is sensitive to sample composition and the inclusion of firm-level governance controls. The five-year average GDP growth rate (GG5Y) is not statistically significantly associated with perceived corruption in any model.

Table 1: The associations between state-owned bank loans, climate change mitigation, female ownership and female top management on the firm's perceived corruption. We estimate these relationships using both ordinary least squares (OLS) (Columns 1–4) and ordered probit models (Columns 5–8), which account for the ordinal nature of the corruption perception variable (0 for "No obstacle", 1 for "Minor obstacle", 2 for "Moderate obstacle", 3 for "Major obstacle", and 4 for "Very severe obstacle") Higher values thus indicate a more severe perceived obstacle).

	CORRUPT OLS	CORRUPT OLS	CORRUPT OLS	CORRUPT OLS	CORRUPT Ordered probit	CORRUPT Ordered probit	CORRUPT Ordered probit	CORRUPT Ordered probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SBANK	0.084**	0.084	0.080**	0.086	0.104**	0.107*	0.105**	0.110*
	(0.027)	(0.141)	(0.025)	(0.106)	(0.022)	(0.083)	(0.018)	(0.056)
MEASURE_EM	0.096***	0.085**			0.127***	0.115***		
	(0.001)	(0.027)			(0.000)	(0.010)		
ENERGY			0.060*	0.100***			0.075**	0.111***
			(0.072)	(0.008)			(0.045)	(0.003)
TMANAGER_EXPERIENCE	-0.001	-0.002	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001
	(0.447)	(0.396)	(0.325)	(0.382)	(0.398)	(0.598)	(0.256)	(0.486)
FEMALE_TMANAGER	0.025	0.117***	0.011	0.090**	0.033	0.135***	0.021	0.109**
	(0.375)	(0.002)	(0.704)	(0.032)	(0.300)	(0.001)	(0.531)	(0.018)
FEMALE_OWNER	-0.013		-0.012		-0.021		-0.018	
	(0.450)		(0.465)		(0.285)		(0.340)	
FEMALE_OWNERSHIP		-0.002***		-0.002***		-0.002**		-0.002**
		(0.007)		(0.005)		(0.017)		(0.012)
LNREVENUE	-0.005	-0.007	-0.005	-0.007	-0.001	-0.005	-0.001	-0.004
	(0.537)	(0.589)	(0.499)	(0.524)	(0.871)	(0.681)	(0.890)	(0.690)
LNAGE	-0.005	-0.029	-0.003	-0.030	-0.003	-0.040*	0.000	-0.038*
	(0.747)	(0.186)	(0.829)	(0.159)	(0.842)	(0.081)	(0.991)	(0.083)
LISTED	-0.036	-0.151**	-0.037	-0.163**	-0.019	-0.139*	-0.025	-0.151**
	(0.469)	(0.049)	(0.412)	(0.023)	(0.712)	(0.085)	(0.607)	(0.041)
MSME	0.042	0.042	0.040*	0.050	0.056**	0.040	0.057**	0.054
	(0.101)	(0.292)	(0.091)	(0.153)	(0.046)	(0.357)	(0.033)	(0.177)
MANUF	-0.107***	-0.101***	-0.091***	-0.081**	-0.128***	-0.116***	-0.109***	-0.095**
	(0.000)	(0.005)	(0.000)	(0.025)	(0.000)	(0.002)	(0.000)	(0.016)
WEATHER	0.172***	0.193***	0.168***	0.174***	0.195***	0.210***	0.190***	0.191***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AUDIT	-0.039	-0.052	-0.026	-0.042	-0.040	-0.051	-0.026	-0.039
	(0.242)	(0.219)	(0.408)	(0.260)	(0.267)	(0.279)	(0.443)	(0.336)
GG5Y	0.022	0.056	0.018	0.051	0.012	0.042	0.007	0.041
	(0.628)	(0.284)	(0.677)	(0.280)	(0.792)	(0.397)	(0.864)	(0.373)
INF5Y	-0.022***	0.014**	-0.022***	0.015**	-0.018***	0.013**	-0.018***	0.013**
	(0.000)	(0.019)	(0.000)	(0.012)	(0.000)	(0.023)	(0.000)	(0.015)
Constant	0.246	0.374	0.273	0.363				
	(0.297)	(0.148)	(0.237)	(0.142)				
cut1								
Constant					1.187***	1.041***	1.181***	1.092***
					(0.000)	(0.000)	(0.000)	(0.000)
cut2								
Constant					1.753***	1.602***	1.744***	1.645***
					(0.000)	(0.000)	(0.000)	(0.000)
cut3								

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Constant					2.339*** (0.000)	2.138*** (0.000)	2.327*** (0.000)	2.177*** (0.000)
cut4								
Constant					3.020*** (0.000)	2.807*** (0.000)	3.001*** (0.000)	2.840*** (0.000)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster (Country)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18025	6186	19634	6966	18025	6186	19634	6966
Adjusted R^2	0.330	0.322	0.352	0.349				

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

(Source: Developed by authors).

Table 1bis: Average Marginal Effects for Ordered Probit Models (Five-Point Scale). Average marginal effects calculated from ordered probit models. Category 0 = No obstacle; Category 1 = Minor obstacle; Category 2 = Moderate obstacle; Category 3 = Major obstacle; Category 4 = Very severe obstacle. Standard errors clustered at the country level. *** p < 0.01, ** p < 0.05, * p < 0.10. Marginal effects for continuous variables are calculated as the average partial effect; for binary variables, as the discrete change from 0 to 1. The sum of marginal effects across all categories equals zero (within rounding error), as required by the properties of ordered choice models.

Dependent variable: CORRUPT	**Category 0 (No Obstacle)**	**Category 1 (Minor)**	**Category 2 (Moderate)**	**Category 3 (Major)**	**Category 4 (Very Severe)**
SBANK	-0.008**	-0.005**	-0.002**	+0.003**	+0.010**
MEASURE_EM	-0.012***	-0.008***	-0.003***	+0.005***	+0.017***
ENERGY	-0.009**	-0.006**	-0.002**	+0.004**	+0.013**
FEMALE_OWNERSHIP	+0.0002**	+0.0001**	+0.0000**	-0.0001**	-0.0002**
FEMALE_OWNER	-0.003	-0.002	-0.001	+0.001	+0.005
FEMALE_TMANAGER	-0.009	-0.006	-0.002	+0.004	+0.011
TMANAGER_EXPERIENCE	+0.001	+0.001	+0.000	-0.000	-0.001
WEATHER	-0.019***	-0.012***	-0.005***	+0.008***	+0.027***
MANUF	+0.009**	+0.006**	+0.002**	-0.004**	-0.012**
MSME	-0.006	-0.004	-0.001	+0.003	+0.008
LNREVENUE	-0.002	-0.001	-0.000	+0.001	+0.002
LNAGE	+0.003	+0.002	+0.001	-0.001	-0.004
LISTED	+0.010	+0.006	+0.002	-0.004	-0.013
AUDIT	-0.003	-0.002	-0.001	+0.001	+0.004
INF5Y (from Col 5/7)	+0.002**	+0.001**	+0.000**	-0.001**	-0.003**
INF5Y (from Col 6/8)	-0.001**	-0.001**	-0.000**	+0.001**	+0.002**

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GG5Y	-0.001	-0.001	-0.000	+0.000	+0.001

(Source: Developed by authors).

4.2. The associations between credit availability, climate change mitigation, female ownership and female top management, and the firm's perceived corruption

Table 2 examines the associations between credit availability, climate change mitigation actions, female governance variables, and perceived corruption among firms that have applied for credit. The dependent variable is measured on a five-point scale where: 0 for "No obstacle", 1 for "Minor obstacle", 2 for "Moderate obstacle", 3 for "Major obstacle", and 4 for "Very severe obstacle. Higher values thus indicate a more severe perceived obstacle. We estimate these relationships using both ordinary least squares (OLS) (Columns 1–4) and ordered probit models (Columns 5–8), which account for the ordinal nature of the corruption perception variable. All specifications include country fixed effects, year fixed effects, and standard errors clustered at the country level. Before interpreting the results, we also highlight a note on interpretation about OLS and ordered probit like above in Section 4.1. We also report average marginal effects in Table 2bis below.

As can be seen in Table 2, there is the consistently negative and statistically significant association between credit availability (CREDITAVAIL) and perceived corruption (CORRUPT) across all eight specifications. In the OLS models, the coefficients range from -0.259 to -0.380, all significant at the 1 percent level ($p < 0.01$). The ordered probit models yield similarly negative and significant coefficients, ranging from -0.231 to -0.337. This pattern is remarkably robust: regardless of whether we include climate measures, gender governance variables, or use different estimation methods, firms that report better access to credit perceive corruption as a significantly less severe obstacle. The association between climate mitigation actions and perceived corruption in Table 2 varies depending on the specific measure used. Emissions monitoring (MEASURE_EM) shows a positive and statistically significant association with perceived corruption in both OLS and ordered probit models. In Columns 1 and 5 (without female ownership controls), the OLS coefficient is 0.108 ($p < 0.01$) and the ordered probit coefficient is 0.118 ($p < 0.01$). In Columns 2 and 6 (with female ownership controls), the coefficients increase slightly to 0.156 ($p < 0.05$) and 0.179 ($p < 0.01$), respectively. These results are consistent with our earlier findings in Table 1. However, the results for energy management (ENERGY) differ markedly from those in Table 1. In Table 2, ENERGY is not statistically significantly associated with perceived corruption in any specification. The OLS coefficients in Columns 3 and 4 are 0.043 ($p = 0.332$) and 0.090 ($p = 0.124$), respectively, and the ordered probit coefficients in Columns 7 and 8 yield similar p-values (0.280 and 0.130).

Turning to top management, having a female top manager (FEMALE_TMANAGER) is not consistently associated with perceived corruption. In most specifications, the coefficients are small and not statistically significant. The only exception is in Column 6, where FEMALE_TMANAGER shows a positive coefficient of 0.108 in the ordered probit

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model. However, given that this result is significant only at the 10 percent level and does not appear in other specifications, we interpret it with caution as weak evidence of a positive association. Top manager experience (TMANAGER_EXPERIENCE) shows some evidence of a negative association with perceived corruption, though the results are not fully consistent. In Columns 4 and 8, the coefficients are -0.004 and -0.005, respectively. The same for Column 7 with the negative association. Overall, these results provide limited evidence that more experienced top managers tend to report slightly lower levels of perceived corruption, but the association is weak and not robust across all specifications.

Several firm-level control variables show consistent associations with perceived corruption in Table 2, similar to the patterns observed in Table 1. Experiencing monetary losses due to extreme weather events (WEATHER) is strongly and positively associated with perceived corruption across all specifications. This indicates that, even among firms that have applied for credit, those reporting weather-related losses tend to report higher levels of perceived corruption.

Manufacturing firms (MANUF) show a consistently negative association with perceived corruption, with coefficients ranging from -0.126 to -0.090 in the OLS models and remaining statistically significant in the ordered probit models. This suggests that manufacturing firms, relative to firms in other sectors, are associated with lower perceived corruption, even after accounting for credit availability. Micro, small, and medium enterprises (MSME) show a positive and statistically significant association with perceived corruption across all specifications. This indicates that smaller firms tend to report higher levels of perceived corruption compared to large firms, consistent with the idea that resource constraints may make smaller firms more vulnerable to corrupt practices. Other firm-level controls show weaker or inconsistent associations. The natural logarithm of firm revenue (LNREVENUE) and firm age (LNAGE) are not statistically significantly associated with perceived corruption in any specification. Public listing status (LISTED) shows a negative association in some models (e.g., Column 2, $p < 0.10$; Column 4, $p < 0.05$) but is not significant in others, suggesting a weak or sample-dependent relationship. External audit (AUDIT) is not statistically significantly associated with perceived corruption in any specification. Turning to country-level macroeconomic controls, the five-year average inflation rate (INF5Y) shows a negative association with perceived corruption in Columns 1, 3, 5, and 7, which exclude FEMALE_OWNERSHIP. However, this association becomes statistically insignificant in Columns 2, 4, 6, and 8, which include FEMALE_OWNERSHIP. This suggests that the negative correlation between long-run average inflation and corruption perceptions is sensitive to sample composition. The five-year average GDP growth rate (GG5Y) is not statistically significantly associated with perceived corruption in any model.

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Table 2: The associations between credit availability, climate change mitigation, female ownership and female top management on the firm's perceived corruption. We estimate these relationships using both ordinary least squares (OLS) (Columns 1–4) and ordered probit models (Columns 5–8), which account for the ordinal nature of the corruption perception variable (0 for "No obstacle", 1 for "Minor obstacle", 2 for "Moderate obstacle", 3 for "Major obstacle", and 4 for "Very severe obstacle") Higher values thus indicate a more severe perceived obstacle).

	CORRUPT OLS	CORRUPT OLS	CORRUPT OLS	CORRUPT OLS	CORRUPT Ordered probit	CORRUPT Ordered probit	CORRUPT Ordered probit	CORRUPT Ordered probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CREDITAVAIL	-0.268**	-0.380**	-0.259**	-0.354**	-0.236***	-0.337**	-0.231***	-0.317***
	(0.001)	(0.003)	(0.001)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)
MEASURE_EM	0.108**	0.156*			0.118**	0.179**		
	(0.009)	(0.016)			(0.005)	(0.006)		
ENERGY			0.043	0.090			0.048	0.085
			(0.332)	(0.124)			(0.280)	(0.130)
TMANAGER_EXPERIENCE	-0.002	-0.003	-0.002	-0.004*	-0.002	-0.003	-0.003*	-0.005*
	(0.244)	(0.288)	(0.107)	(0.080)	(0.184)	(0.296)	(0.063)	(0.056)
FEMALE_TMANAGER	0.009	0.093	-0.013	0.051	0.013	0.108*	-0.002	0.068
	(0.845)	(0.136)	(0.787)	(0.452)	(0.765)	(0.083)	(0.960)	(0.301)
FEMALE_OWNER	-0.027		-0.016		-0.031		-0.019	
	(0.268)		(0.454)		(0.202)		(0.382)	
FEMALE_OWNERSHIP		-0.002*		-0.002*		-0.002		-0.001
		(0.098)		(0.076)		(0.145)		(0.138)
LNREVENUE	0.001	0.005	0.001	0.004	0.002	0.005	0.002	0.007
	(0.949)	(0.776)	(0.909)	(0.794)	(0.829)	(0.713)	(0.783)	(0.595)
LNAGE	0.009	-0.007	0.010	-0.004	0.010	-0.018	0.013	-0.012
	(0.664)	(0.770)	(0.606)	(0.862)	(0.666)	(0.505)	(0.563)	(0.616)
LISTED	-0.043	-0.182*	-0.050	-0.202*	-0.021	-0.187*	-0.032	-0.197*
	(0.598)	(0.066)	(0.502)	(0.030)	(0.811)	(0.061)	(0.689)	(0.029)
MSME	0.087**	0.174**	0.078*	0.148**	0.093**	0.165**	0.092**	0.156**
	(0.008)	(0.002)	(0.011)	(0.002)	(0.003)	(0.001)	(0.004)	(0.001)
MANUF	-0.126***	-0.121**	-0.095**	-0.090*	-0.140***	-0.136**	-0.109***	-0.102*
	(0.000)	(0.011)	(0.001)	(0.046)	(0.000)	(0.004)	(0.000)	(0.037)
WEATHER	0.200***	0.189**	0.189***	0.166**	0.211***	0.192**	0.201***	0.174**
	(0.000)	(0.012)	(0.000)	(0.017)	(0.000)	(0.011)	(0.000)	(0.014)
AUDIT	-0.015	0.034	-0.002	0.026	-0.006	0.042	0.008	0.042
	(0.667)	(0.520)	(0.959)	(0.591)	(0.866)	(0.423)	(0.800)	(0.399)
GG5Y	0.016	-0.004	0.001	-0.000	0.012	-0.015	-0.005	-0.010
	(0.714)	(0.963)	(0.991)	(0.999)	(0.773)	(0.867)	(0.906)	(0.908)
INF5Y	-0.034***	-0.010	-0.035***	-0.011	-0.030***	-0.006	-0.030***	-0.007
	(0.000)	(0.269)	(0.000)	(0.226)	(0.000)	(0.454)	(0.000)	(0.394)
Constant	0.224	0.101	0.212	0.056				
	(0.413)	(0.794)	(0.413)	(0.881)				
cut1								
Constant					1.190***	1.267***	1.207***	1.371***
					(0.000)	(0.001)	(0.000)	(0.000)
cut2								
Constant					1.715***	1.802***	1.726***	1.895***
					(0.000)	(0.000)	(0.000)	(0.000)
cut3								
Constant					2.264***	2.312***	2.276***	2.398***
					(0.000)	(0.000)	(0.000)	(0.000)
cut4								

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Constant					2.908*** (0.000)	2.953*** (0.000)	2.907*** (0.000)	3.028*** (0.000)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster (Country)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8854	2902	10051	3481	8854	2902	10051	3481
Adjusted R^2	0.298	0.298	0.327	0.330				

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
(Source: Developed by authors).

Table 2bis: Average Marginal Effects for Ordered Probit Models (Five-Point Scale). Average marginal effects calculated from ordered probit models. Category 0 = No obstacle; Category 1 = Minor obstacle; Category 2 = Moderate obstacle; Category 3 = Major obstacle; Category 4 = Very severe obstacle. Standard errors clustered at the country level. *** p < 0.01, ** p < 0.05, * p < 0.10. Marginal effects for continuous variables are calculated as the average partial effect; for binary variables, as the discrete change from 0 to 1. The sum of marginal effects across all categories equals zero (within rounding error), as required by the properties of ordered choice models.

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Dependent variable: CORRUPT	Category 0 (No Obstacle)	Category 1 (Minor)	Category 2 (Moderate)	Category 3 (Major)	Category 4 (Very Severe)
CREDITAVAIL	+0.042***	+0.028***	+0.008***	-0.015***	-0.040***
MEASURE_EM	-0.016**	-0.011**	-0.003**	+0.006**	+0.017**
ENERGY	-0.008	-0.005	-0.001	+0.003	+0.009
FEMALE_OWNERSHIP	+0.0002*	+0.0001*	+0.0000*	-0.0001*	-0.0002*
FEMALE_OWNER	-0.004	-0.003	-0.001	+0.002	+0.005
FEMALE_TMANAGER	-0.010*	-0.007*	-0.002*	+0.004*	+0.010*
TMANAGER_EXPERIENCE	+0.0003	+0.0002	+0.0001	-0.0001	-0.0003
WEATHER	-0.021***	-0.014***	-0.004***	+0.008***	+0.022***
MANUF	+0.011**	+0.007**	+0.002**	-0.004**	-0.011**
MSME	-0.012**	-0.008**	-0.002**	+0.005**	+0.013**
LNREVENUE	-0.001	-0.001	-0.000	+0.001	+0.001
LNAGE	-0.001	-0.001	-0.000	+0.000	+0.001
LISTED	+0.014*	+0.009*	+0.003*	-0.005*	-0.015*
AUDIT	-0.003	-0.002	-0.001	+0.001	+0.003
INF5Y (from Col 5/7)	+0.003***	+0.002***	+0.001***	-0.001***	-0.003***

INF5Y (from Col 6/8)	+0.001	+0.001	+0.000	-0.000	-0.001
GG5Y	-0.001	-0.001	-0.000	+0.000	+0.001

4.3. Robustness check

For the robust checks, we control for the firm's borrowing status by adding a variable named BLOAN into the estimation regression. Using the survey question "At this time, does this establishment have a line of credit or a loan from a financial institution?", we code it as 1 for "Yes" and 0 for "No".

The key finding from this robustness check is that adding BLOAN as a control variable does not materially change the associations between our main variables of interest and perceived corruption, compared to the results reported in Tables 1 and 2. For example, as can be seen from Table 3 below compared to Table 1, the positive association between SBANK and perceived corruption remains largely unchanged in magnitude and statistical significance. This suggests that the positive correlation between borrowing from state-owned banks and perceived corruption is not explained by the general experience of having any bank loan. In addition, the positive associations between emissions monitoring (MEASURE_EM) and energy management (ENERGY) and perceived corruption also remain stable after controlling for BLOAN. Regarding female ownership and top management, the associations between gender-related governance variables and perceived corruption are also unchanged by the inclusion of BLOAN. The percentage of female ownership (FEMALE_OWNERSHIP) continues to show a negative and statistically significant association with perceived corruption in Columns 2, 4, 6, and 8 (coefficients of -0.002). Having a female top manager (FEMALE_TMANAGER) shows a positive association that is statistically significant only when FEMALE_OWNERSHIP is included (e.g., Column 2: 0.115), identical to the pattern observed in Table 1. The dummy variable for any female owner (FEMALE_OWNER) remains not statistically significant in any specification. The coefficients for other firm- and country-level control variables remain largely unchanged compared to Table 1. Experiencing weather-related losses (WEATHER) continues to show a strong positive association with perceived corruption in all specifications. Manufacturing firms (MANUF) continue to show a negative association.

When comparing Tables 2 (excluding BLOAN) and 4 (including BLOAN) The negative association between CREDITAVAIL and perceived corruption remains strong, stable, and statistically significant across all specifications after controlling for BLOAN. This suggests that the negative correlation between successful credit approval and perceived corruption is not explained by the general experience of having any bank loan. The pattern of associations for climate variables remains largely unchanged after controlling for BLOAN. Emissions monitoring (MEASURE_EM) continues to show a positive and statistically significant association with perceived corruption. For energy management (ENERGY), the coefficients in Table 4 show a slightly stronger pattern compared to Table 2. In Table 2, ENERGY was not statistically

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significantly associated with perceived corruption in any specification. However, in Table 4, after controlling for BLOAN, ENERGY shows a positive association that is statistically significant at the 10 percent level in Columns 3 (0.044), 4 (0.091), 7 (0.050), and 8 (0.085). This suggests that once general loan access is taken into account, a weak positive correlation between energy management and perceived corruption emerges among credit applicants, though the association remains relatively weak and only marginally significant. The associations between gender-related governance variables and perceived corruption remain largely unchanged by the inclusion of BLOAN. The percentage of female ownership (FEMALE_OWNERSHIP) continues to show a negative association with perceived corruption that is statistically significant at the 10 percent level or better in Columns 2, 4, 6, and 8. The dummy variable for any female owner (FEMALE_OWNER) remains not statistically significant in any specification. Top manager experience (TMANAGER_EXPERIENCE) continues to show some evidence of a negative association, with statistically significant coefficients at the 10 percent or 5 percent level. The coefficients for other firm- and country-level control variables remain largely unchanged compared to Table 2. Experiencing weather-related losses (WEATHER) continues to show a strong positive association with perceived corruption in all specifications. Manufacturing firms (MANUF) continue to show a negative association. Micro, small, and medium enterprises (MSME) continue to show a positive association with perceived corruption across all specifications. The five-year average inflation rate (INF5Y) continues to show a negative and statistically significant association with perceived corruption in some specifications.

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Table 3: Robustness check for the associations between state-owned bank loans, climate change mitigation, female ownership and female top management on the firm's perceived corruption by adding the variable of having bank loan. We estimate these relationships using both ordinary least squares (OLS) (Columns 1–4) and ordered probit models (Columns 5–8), which account for the ordinal nature of the corruption perception variable (0 for "No obstacle", 1 for "Minor obstacle", 2 for "Moderate obstacle", 3 for "Major obstacle", and 4 for "Very severe obstacle") Higher values thus indicate a more severe perceived obstacle).

	CORRUPT OLS (1)	CORRUPT OLS (2)	CORRUPT OLS (3)	CORRUPT OLS (4)	CORRUPT Ordered probit (5)	CORRUPT Ordered probit (6)	CORRUPT Ordered probit (7)	CORRUPT Ordered probit (8)
SBANK	0.083***	0.083*	0.079***	0.085*	0.102***	0.106*	0.104***	0.109*
	(0.000)	(0.044)	(0.000)	(0.032)	(0.000)	(0.015)	(0.000)	(0.010)
MEASURE_EM	0.095***	0.084*			0.126***	0.114**		
	(0.000)	(0.032)			(0.000)	(0.008)		
ENERGY			0.059**	0.099**			0.074***	0.110**
			(0.001)	(0.001)			(0.000)	(0.001)
TMANAGER_EXPERIENCE	-0.001	-0.002	-0.001	-0.001	-0.001	-0.001	-0.002*	-0.001
	(0.229)	(0.251)	(0.130)	(0.240)	(0.162)	(0.460)	(0.066)	(0.338)
FEMALE_TMANAGER	0.024	0.115**	0.010	0.089**	0.030	0.132**	0.018	0.107**
	(0.337)	(0.001)	(0.670)	(0.009)	(0.266)	(0.001)	(0.480)	(0.004)
FEMALE_OWNER	-0.012		-0.011		-0.019		-0.017	
	(0.545)		(0.559)		(0.357)		(0.414)	
FEMALE_OWNERSHIP		-0.002***		-0.002***		-0.002***		-0.002***
		(0.001)		(0.001)		(0.002)		(0.003)
LNREVENUE	-0.005	-0.007	-0.005	-0.007	-0.001	-0.005	-0.001	-0.004
	(0.371)	(0.484)	(0.343)	(0.440)	(0.838)	(0.626)	(0.866)	(0.656)
LNAGE	-0.005	-0.030	-0.003	-0.030	-0.003	-0.040*	0.000	-0.038*
	(0.706)	(0.157)	(0.801)	(0.133)	(0.833)	(0.086)	(0.977)	(0.088)
LISTED	-0.035	-0.152*	-0.037	-0.163**	-0.019	-0.141*	-0.024	-0.152*
	(0.352)	(0.021)	(0.307)	(0.009)	(0.645)	(0.046)	(0.532)	(0.022)
BLOAN	0.078**	0.065	0.078**	0.064	0.149**	0.121	0.147**	0.117

	(0.032)	(0.323)	(0.033)	(0.338)	(0.002)	(0.174)	(0.003)	(0.189)
MSME	0.042*	0.042	0.040*	0.051	0.057*	0.039	0.058*	0.054
	(0.061)	(0.296)	(0.064)	(0.184)	(0.023)	(0.364)	(0.017)	(0.193)
MANUF	-0.108***	-0.101**	-0.092***	-0.081**	-0.130***	-0.117***	-0.111***	-0.095**
	(0.000)	(0.001)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.002)
WEATHER	0.170***	0.191***	0.166***	0.173***	0.193***	0.209***	0.188***	0.191***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AUDIT	-0.041*	-0.054	-0.027	-0.044	-0.042*	-0.053	-0.028	-0.041
	(0.031)	(0.103)	(0.133)	(0.163)	(0.044)	(0.137)	(0.167)	(0.219)
GG5Y	0.023	0.057	0.019	0.052	0.014	0.043	0.009	0.042
	(0.424)	(0.301)	(0.504)	(0.344)	(0.657)	(0.450)	(0.763)	(0.464)
INF5Y	-0.022***	0.014	-0.023***	0.015	-0.018***	0.012	-0.018***	0.013
	(0.000)	(0.120)	(0.000)	(0.104)	(0.000)	(0.176)	(0.000)	(0.153)
Constant	0.166	0.310	0.193	0.300				
	(0.289)	(0.274)	(0.216)	(0.291)				
cut1								
Constant					1.343***	1.162***	1.334***	1.209***
					(0.000)	(0.000)	(0.000)	(0.000)
cut2								
Constant					1.909***	1.724***	1.897***	1.762***
					(0.000)	(0.000)	(0.000)	(0.000)
cut3								
Constant					2.495***	2.260***	2.480***	2.294***
					(0.000)	(0.000)	(0.000)	(0.000)
cut4								
Constant					3.177***	2.928***	3.155***	2.958***
					(0.000)	(0.000)	(0.000)	(0.000)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster (Country)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18018	6184	19627	6964	18018	6184	19627	6964
Adjusted R^2	0.330	0.322	0.352	0.349				

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

(Source: Developed by authors).

Table 4: Robustness check for the associations between credit availability, climate change mitigation, female ownership and female top management on the firm's perceived corruption by adding the variable of having bank loan. We estimate these relationships using both ordinary least squares (OLS) (Columns 1–4) and ordered probit models (Columns 5–8), which account for the ordinal nature of the corruption perception variable (0 for "No obstacle", 1 for "Minor obstacle", 2 for "Moderate obstacle", 3 for "Major obstacle", and 4 for "Very severe obstacle"). Higher values thus indicate a more severe perceived obstacle).

	CORRUPT OLS	CORRUPT OLS	CORRUPT OLS	CORRUPT OLS	CORRUPT Ordered probit	CORRUPT Ordered probit	CORRUPT Ordered probit	CORRUPT Ordered probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CREDITAVAIL	-0.308***	-0.381***	-0.294***	-0.364***	-0.273***	-0.335***	-0.262***	-0.327***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
MEASURE_EM	0.108**	0.156*			0.117**	0.179**		
	(0.002)	(0.011)			(0.001)	(0.004)		
ENERGY			0.044*	0.091*			0.050*	0.085*
			(0.087)	(0.039)			(0.063)	(0.059)
TMANAGER_EXPERIENCE	-0.002	-0.003	-0.002*	-0.004*	-0.002*	-0.003	-0.003*	-0.005*
	(0.128)	(0.200)	(0.039)	(0.031)	(0.069)	(0.191)	(0.014)	(0.022)
FEMALE_TMANAGER	0.009	0.093	-0.013	0.051	0.013	0.109*	-0.003	0.068
	(0.816)	(0.100)	(0.713)	(0.330)	(0.743)	(0.056)	(0.937)	(0.195)
FEMALE_OWNER	-0.026		-0.016		-0.031		-0.019	
	(0.376)		(0.560)		(0.309)		(0.498)	
FEMALE_OWNERSHIP		-0.002*		-0.002*		-0.002*		-0.001*
		(0.041)		(0.026)		(0.050)		(0.052)
LNREVENUE	-0.000	0.005	0.001	0.005	0.001	0.006	0.002	0.008
	(0.985)	(0.753)	(0.947)	(0.747)	(0.881)	(0.714)	(0.806)	(0.579)
LNAGE	0.007	-0.007	0.009	-0.003	0.009	-0.018	0.012	-0.011
	(0.682)	(0.819)	(0.593)	(0.911)	(0.640)	(0.588)	(0.498)	(0.718)
LISTED	-0.040	-0.182*	-0.048	-0.202**	-0.018	-0.187*	-0.031	-0.197**
	(0.474)	(0.054)	(0.359)	(0.020)	(0.757)	(0.054)	(0.574)	(0.028)
BLOAN	0.075**	0.001	0.063*	0.012	0.069*	-0.003	0.056	0.013
	(0.049)	(0.988)	(0.082)	(0.853)	(0.081)	(0.971)	(0.142)	(0.852)
MSME	0.085*	0.174**	0.077*	0.149**	0.092**	0.165**	0.091**	0.157**

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	(0.013)	(0.005)	(0.016)	(0.007)	(0.009)	(0.007)	(0.006)	(0.006)
MANUF	-0.126***	-0.121**	-0.096***	-0.092*	-0.141***	-0.135**	-0.110***	-0.104*
	(0.000)	(0.010)	(0.000)	(0.032)	(0.000)	(0.005)	(0.000)	(0.018)
WEATHER	0.199***	0.189**	0.187***	0.166**	0.210***	0.192**	0.200***	0.174**
	(0.000)	(0.003)	(0.000)	(0.006)	(0.000)	(0.002)	(0.000)	(0.004)
AUDIT	-0.015	0.034	-0.001	0.025	-0.006	0.042	0.009	0.041
	(0.608)	(0.511)	(0.962)	(0.592)	(0.849)	(0.421)	(0.746)	(0.386)
GG5Y	0.018	-0.004	0.001	0.000	0.014	-0.015	-0.004	-0.010
	(0.676)	(0.959)	(0.977)	(0.999)	(0.746)	(0.853)	(0.922)	(0.904)
INF5Y	-0.034***	-0.010	-0.034***	-0.011	-0.029***	-0.006	-0.029***	-0.007
	(0.000)	(0.391)	(0.000)	(0.351)	(0.000)	(0.585)	(0.000)	(0.538)
Constant	0.226	0.100	0.212	0.040				
	(0.305)	(0.807)	(0.323)	(0.918)				
cut1								
Constant					1.191***	1.269***	1.211***	1.389***
					(0.000)	(0.004)	(0.000)	(0.001)
cut2								
Constant					1.716***	1.803***	1.731***	1.913***
					(0.000)	(0.000)	(0.000)	(0.000)
cut3								
Constant					2.264***	2.314***	2.280***	2.415***
					(0.000)	(0.000)	(0.000)	(0.000)
cut4								
Constant					2.906***	2.953***	2.909***	3.044***
					(0.000)	(0.000)	(0.000)	(0.000)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster (Country)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8830	2900	10023	3477	8830	2900	10023	3477
Adjusted R^2	0.298	0.297	0.327	0.330				

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

(Source: Developed by authors).

5. Discussion, Limitations and Future research

5.1. Discussion

This study set out to examine the relationships between firm-level financial arrangements, climate mitigation actions, female leadership, and the perception of corruption as an obstacle to business operations. Drawing on a large sample of firms across multiple countries, the results yield several novel and policy-relevant findings.

Perhaps the most striking insight from the analysis is the opposing association between two financial variables: borrowing from state-owned banks and general credit availability. State-owned bank loans are positively associated with perceived corruption, while broader credit availability is negatively associated with it. This divergence suggests that the source and accessibility of finance are not interchangeable from a governance perspective: a distinction that has received limited attention in prior literature. Existing research on corruption and finance has largely focused on how financial development reduces corruption by increasing transparency and competition (Beck et al., 2006; Barth et al., 2009). However, these studies have typically treated financial access as a uniform concept, paying less attention to the institutional heterogeneity of lenders. Our findings extend this literature by suggesting that state-owned banks may operate under different incentive structures than private or commercial banks. Prior evidence from transition economies indicates that state-owned banks are often subject to political interference, directed lending, and softer budget constraints (La Porta et al., 2002; Shleifer & Vishny, 1998). These institutional features could create conditions where firms encounter informal payment demands, bureaucratic delays, or favoritism all of which may heighten corruption perceptions. In

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contrast, broader credit availability, particularly from private commercial banks may reduce firms' reliance on informal financing channels or discretionary lending relationships, thereby lowering their exposure to corrupt practices.

The second is about the contrast in our results is between female ownership and female top management on perceived corruption. The percentage of female ownership exhibits a consistently negative association with perceived corruption. By contrast, the presence of a female top manager is either insignificant or, in certain subsamples, positively associated with perceived corruption, and this result is sensitive to the inclusion of female ownership and to sample composition. This divergence is not merely an empirical curiosity; it speaks to fundamentally different theoretical mechanisms through which ownership and management influence organizational behavior and corruption perceptions. We propose that ownership and management affect corruption perceptions through distinct channels: incentive structures versus operational discretion. Owners, particularly those with significant equity stakes, have long-term residual claims on the firm's value. They bear the full costs of corrupt transactions whether through direct bribe payments, reputational damage, or legal sanctions and capture the full benefits of integrity, such as enhanced trust, better access to finance, and higher valuation (Shleifer & Vishny, 1998). A higher percentage of female ownership therefore shifts the firm's incentive structure toward long-term value preservation, making corruption less attractive. Moreover, female owners may be embedded in different social and professional networks than male owners: networks that may offer fewer opportunities for corrupt exchanges or that impose higher reputational costs for engaging in them (Dollar et al., 2001; Swamy et al., 2001). The fact that the share of female ownership matters more than its mere presence supports an incentive-based interpretation: a controlling or substantial ownership stake confers greater influence over firm strategy and ethical norms than token ownership, and the marginal effect of additional female ownership is continuous rather than threshold-based.

Top managers, in contrast, operate under different constraints and incentives. Managers are agents who may have shorter time horizons, particularly if their compensation is tied to short-term performance or if they anticipate job mobility (Bertrand & Schoar, 2003). They also exercise operational discretion over day-to-day decisions, including interactions with regulators, suppliers, and clients precisely the contexts where corrupt demands may arise. A female top manager may bring individual traits or preferences that reduce corruption propensity, as some prior research suggests (Rivas, 2013). However, our results indicate that any such effect is weak, context-dependent, and easily offset by other factors. Why would female top management appear positively associated with perceived corruption in some subsamples? One interpretation is selection: firms with female top managers may be systematically different from those without in ways that correlate with both governance choices and corruption exposure. For instance, such firms may be more transparent and therefore more likely to report corruption when it occurs, creating a positive correlation that reflects reporting behavior rather than actual exposure (Olken, 2009). Alternatively, the subsample in which the positive coefficient appears is substantially

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smaller, suggesting that the result may be driven by unobserved firm characteristics such as industry, competitive pressure, or regulatory environment that are unevenly distributed across the sample. This instability underscores a broader methodological point: corruption perceptions are not a direct measure of corruption itself, but a composite of experience, awareness, and reporting norms. Female top managers may not change the underlying incidence of corruption so much as they change how it is perceived and reported.

This interpretation aligns with agency theory (Jensen & Meckling, 1976) and the distinction between ownership and control. Owners set the governance architecture—the incentives, monitoring systems, and ethical tone that shape the firm's corruption risk profile. Managers operate within that architecture, but their individual influence is more circumscribed, particularly in larger or more institutionalized firms.

The third theoretical contribution concerns the climate-related variables. We included two distinct measures: emissions monitoring and energy management. While both are positively associated with perceived corruption, we argue that they operate through different mechanisms and that conflating them obscures important theoretical distinctions. Emissions monitoring is primarily a regulatory compliance activity. Firms that monitor their emissions are likely subject to environmental regulations, reporting requirements, or carbon pricing mechanisms. These regulatory frameworks require firms to interact with government agencies—to obtain permits, submit reports, undergo inspections, and certify compliance. Each interaction point represents a potential site of bureaucratic discretion, delay, or informal payment demand (Fredriksson & Svensson, 2003; Damania et al., 2003). In this view, emissions monitoring correlates with corruption perceptions not because monitoring itself is corrupt, but because it signals deeper engagement with a regulatory bureaucracy where corrupt extraction is more likely. Firms that monitor emissions are more visible to the state and more entangled in its administrative processes, increasing both their exposure to and awareness of corrupt practices. Energy management, by contrast, may reflect a broader organizational modernization strategy. Firms that invest in energy efficiency, tracking, and optimization often implement formal management systems, adopt international standards, and integrate sustainability into their operational routines. These firms may be larger, more formalized, and more likely to have professionalized management—attributes that should, in theory, reduce corruption. Yet we observe a positive association. Why? One possibility is that energy management, like emissions monitoring, signals interaction with state agencies that administer energy subsidies, green certification programs, or tax incentives for efficiency investments all of which create opportunities for rent-seeking.

Fourth, the positive association between weather-related losses and corruption perceptions aligns with emerging evidence on climate governance. Recent studies have documented that natural disasters and extreme weather events can strain institutional capacity, create emergency spending with limited oversight, and generate new opportunities for rent-seeking (Yamamura, 2014; De Winne & Peersman, 2021). Firms attempting to access disaster relief, rebuild damaged infrastructure, or navigate post-crisis regulations may face heightened demands for informal

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payments. A third interpretation which we cannot rule out is that more transparent and environmentally responsible firms are simply more likely to recognize and report corruption when it occurs. If this is the case, the positive correlation would reflect differential reporting behavior rather than differential exposure. Disentangling these mechanisms would require objective measures of corruption (e.g., audit data or administrative records) alongside survey-based perceptions, as well as longitudinal designs tracking firms before and after climate policy changes.

5.2. Limitation and future research

While our findings are robust and consistently significant across multiple specifications, we acknowledge several inherent limitations that preclude a purely causal interpretation. Reverse causality, selection bias, and omitted variables are raised.

First, reverse causality is possible: firms that already perceive high levels of corruption may strategically seek state bank financing as a coping mechanism, rather than state bank access directly shaping corruption perceptions. Second, selection bias may operate, as firms that borrow from state banks likely differ systematically from other firms in unobservable ways such as political connections, risk tolerance, or managerial quality. Third, omitted variable bias remains a concern: local institutional quality could drive both the prevalence of state bank financing and firm-level corruption perceptions, potentially confounding the relationships we estimate.

While our dataset spans multiple years (2018–2025) and includes 72,487 firms across 84 countries, it is not structured as a true panel at the firm level. Consequently, we cannot employ instrumental variables, difference-in-differences, or firm-year panel methods with fixed effects at the firm level. The absence of such identification strategies means our estimates should be interpreted as strong associational evidence rather than definitive causal effects. In addition, it is important to clarify the sample composition and the reasons for variation in sample sizes across specifications. The full pooled sample used in this study comprises 72,487 firms across multiple countries, drawn from the World Bank Enterprise Surveys. However, the regression analyses reported in Tables 1 and 2 record smaller samples, ranging from approximately 2,900 to 19,600 observations depending on the specification. This variation arises primarily from the inclusion of variables with substantial missing data, particularly FEMALE_OWNERSHIP and CREDITAVAIL. The reduction is due to the fact that data on the percentage of female ownership or credit availability are not available for all firms in the Enterprise Surveys; many firms either did not respond to these questions or the information.

That said, our findings are still robust when applying both Ordinary Least Squares (OLS) and Ordered Probit as the methods. We also add the variable of having bank loan and the main findings remain robust. However, the findings might be associational and that reverse causality, omitted variables, and selection bias remain possible.

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These limitations do not undermine the value of our contribution; rather, they highlight important directions for future research. Future studies with panel firm-level data, natural experiments, or quasi-experimental designs (e.g., exogenous shocks to state bank lending or institutional reforms) could establish causality more rigorously. Additionally, collecting detailed data on local institutional quality, political connections, and firm-level coping strategies would help disentangle the mechanisms we identify. Until then, our results provide the most comprehensive, cross-country descriptive evidence to date and point clearly toward the need for causal work in this understudied area.

6. Conclusion and implications

This study examined the relationships between financial arrangements, climate mitigation actions, female leadership, and firms' perception of corruption as an obstacle to business operations. Using a large cross-country firm-level dataset, the analysis yielded several important findings. First, borrowing from state-owned banks is positively associated with perceived corruption, while broader credit availability is negatively associated with it, suggesting that the source and accessibility of finance shape firms' exposure to governance failures in opposing ways. Second, the percentage of female ownership is consistently and robustly negatively associated with perceived corruption across all specifications, representing one of the most stable findings in the analysis. Third, firms that adopt climate change mitigation actions report higher levels of perceived corruption. Fourth, losses from extreme weather events are strongly positively associated with perceived corruption, indicating an important interaction between climate vulnerability and governance quality. Finally, small and medium enterprises perceive corruption as a more severe obstacle than large firms, while manufacturing firms perceive significantly less corruption than service-sector firms.

Taken together, these findings underscore that corruption perceptions are shaped not only by broad institutional factors but also by specific firm-level characteristics including financial choices, environmental strategies, ownership structure, and leadership attributes. The contrasting results for state-owned bank loans versus general credit availability suggest that researchers and policymakers should distinguish between different dimensions of financial access rather than treating finance as a monolithic concept. The robust negative association with female ownership points to gender diversity as a potentially meaningful factor in governance outcomes, while the positive association with energy management raises important questions about whether corruption impedes climate action or whether climate-active firms are simply more likely to recognize and report corruption.

The findings of this study carry several practical implications. First, the positive association between borrowing from state-owned banks and higher perceived corruption, observed across multiple specifications, suggests that the governance of state-owned financial institutions may warrant closer examination. One possible interpretation is that these institutions may face particular vulnerabilities to political interference, informal payment demands, or bureaucratic

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inefficiencies, though the current evidence does not confirm a causal relationship. Policymakers may therefore wish to consider exploring measures that could increase the transparency and autonomy of state-owned banks. Potential options for further investigation or pilot implementation include independent oversight boards, standardized and publicly available procedures for loan approvals, digital lending platforms that reduce administrative discretion, and strengthened anti-fraud mechanisms. Second, the consistent negative association between credit availability and perceived corruption suggests the possibility that improving access to formal finance could be correlated with lower corruption perceptions, though causality remains unclear. One plausible interpretation which warrants further causal investigation is that when firms can obtain loans through transparent, competitive, and well-regulated financial markets, they may encounter fewer situations where informal payments or bribes are demanded to secure financing. However, an equally plausible interpretation is reverse causality: firms that perceive lower levels of corruption may be more likely to apply for and receive formal credit. Given these competing interpretations, we suggest that central banks and financial regulators consider pilot programs or natural experiments to evaluate whether specific credit market reforms are associated with subsequent changes in corruption perceptions. For example, targeted credit guarantee programs for small and medium enterprises (SMEs) could be implemented alongside rigorous evaluation to assess whether they produce measurable changes in how firms experience corruption. Such programs may be particularly worth exploring given that smaller firms in our sample consistently reported higher levels of perceived corruption. Third, the strong positive association between weather-related losses and perceived corruption indicates that firms experiencing climate shocks tend to report higher levels of perceived corruption. One possible interpretation is that climate-vulnerable firms may be particularly susceptible to corrupt demands, whether in accessing disaster relief, rebuilding after extreme events, or navigating post-disaster regulations. However, alternative interpretations such as the possibility that firms in more corrupt environments are less resilient to weather shocks cannot be ruled out. Given this association, policymakers designing climate adaptation and disaster response programs may wish to incorporate transparency mechanisms as a precaution. Potential measures worth exploring include public tracking of relief fund disbursements, independent monitoring of post-disaster reconstruction projects, and accessible complaint channels for affected firms.

In summary, reducing corruption as an obstacle to business operations requires a multi-faceted approach that addresses financial sector governance, credit market development, gender diversity, climate adaptation, and sector-specific vulnerabilities. The findings of this study suggest that these domains are not separate but interconnected, and that policy interventions in one area may generate positive spillovers in another.

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Appendix

Table 1A. Data description (Source: Developed by authors).

Name	Definition	Source
Perceived corruption		
CORRUPT	The perceived corruption of the firm. It is coded as 4 for "*Very severe obstacle,*"3 for *Major obstacle,*"2 for *Moderate obstacle,*"1 for "Minor obstacle" and 0 for "No obstacle".	BEEPS VI, WBES
State-Owned Banks		
SBANK	A variable of borrowing from state-owned financial institutions. It is coded as 1 for "State-owned banks or government agency" and 0 for all other sources, including "Private commercial banks", "Non-bank financial institutions", and "Other."	BEEPS VI, WBES
Credit Availability		
CREDITAVAIL	Dummy =1 if the firm received full or partial credit; 0 rejected.	BEEPS VI, WBES
Variables of firm climate change mitigation action		
MEASURE_EM	Dummy =1 if the firm monitors its CO_2 emissions; 0 otherwise.	BEEPS VI, WBES
ENERGY	Dummy =1 if the firm adopts measures for energy management; 0 otherwise.	BEEPS VI, WBES
Variable of female ownership		
FEMALE_OWNERSHIP	The percentage of the firm owned by females	BEEPS VI, WBES
FEMALE_OWNER	Dummy =1 if the owner is female; 0 if male	BEEPS VI, WBES

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Variables for the firm top manager's characteristics		
FEMALE_TMANAGER	Dummy=1 if the top manager is female; 0 otherwise.	BEEPS VI, WBES
TMANAGER_EXPERIENCE	Logarithm of the number of years of experience in the sector for the top manager.	BEEPS VI, WBES
Control variables for firm characteristics		
LNREVENUE	The natural logarithm of last year's total sales	BEEPS VI, WBES
LNAGE	Logarithm of the firm's age.	BEEPS VI, WBES
LISTED	Dummy = 1 if the firm is listed in a stock market; 0 otherwise.	BEEPS VI, WBES
BLOAN	Dummy = 1 if the firm has bank loan currently; 0 otherwise.	BEEPS VI, WBES
MSME	Dummy = 1 if the firm is a micro, small and medium-sized enterprise (MSME); 0 otherwise.	BEEPS VI, WBES
MANUF	Dummy = 1 if the firm is in manufacturing sector; 0 for others.	BEEPS VI, WBES
WEATHER	Dummy = 1 if the firm experiences monetary losses by extreme weather events; 0 otherwise.	BEEPS VI, WBES
AUDIT	Dummy = 1 if the firm's annual financial statements were checked and certified by an external auditor; 0 otherwise.	BEEPS VI, WBES
Control variables for country		
GG5Y	Average real five-year GDP growth rate of the country where the firm operates.	WBOD
INF5Y	Average five-year inflation rate of the country where the firm operates.	WBOD

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Table 2A. Descriptive statistics of the variables (Source: Developed by authors).

Variable	Obs	Mean	Std. Dev.	Min	Max
CORRUPT	68,793	1.17	1.38	0	4
SBANK	26,470	0.19	0.39	0	1
CREDITAVAIL	13,887	0.93	0.26	0	1
MEASURE_EM	58,688	0.15	0.35	0	1
ENERGY	62,285	0.36	0.48	0	1
TMANAGER_EXPERIENCE	70,395	20.83	11.67	1	75
FEMALE_TMANAGER	72,271	0.17	0.37	0	1
FEMALE_OWNER	71,092	0.32	0.47	0	1
FEMALE_OWNERSHIP	20,815	56.16	35.14	0	100
LNREVENUE	67,232	13.56	2.94	-0.94	27.36
LNAGE	71,468	2.80	0.81	0	5.56
LISTED	72,264	0.05	0.21	0	1
BLOAN	70,482	0.37	0.48	0	1
MSME	72,157	0.78	0.42	0	1
MANUF	71,362	0.45	0.50	0	1
WEATHER	69,608	0.07	0.26	0	1

AUDIT	71,161	0.47	0.50	0	1
GG5Y	71,058	2.68	1.78	-1.62	6.86
INF5Y	70,135	5.96	6.73	-0.95	43.31

Table 3A: Table of a country-year-source matrix listing each country, survey year, data source (Source: Developed by authors).

Country	Sample years	Number of observations from BEEPS VI (2018 – 2020)	Number of observations from WBES (2021 – 2025)	Total
Albania	2018, 2019, 2025	377	365	742
Angola	2024, 2025		430	430
Armenia	2019, 2020, 2024, 2025		921	921
Austria	2025		601	601
Azerbaijan	2019, 2020, 2024, 2025	225	368	593
Belarus	2018, 2019	600		600
Belgium	2024, 2025		320	320
Benin	2024, 2025		364	364
Bolivia	2025		610	610
Bosnia and Herz.	2019	171		171
Brunei	2025		150	150
Bulgaria	2019, 2020	772		772
BurkinaFaso	2024, 2025		380	380

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Cameroon	2024, 2025		615	615
Canada	2024, 2025		1015	1015
China	2024, 2025		2189	2189
Croatia	2018, 2019	404		404
Cyprus	2018, 2019		240	240
Czechia	2018, 2019, 2020, 2024, 2025	502	268	770
Denmark	2025		822	822
Ecuador	2024, 2025		345	345
Egypt	2019, 2020, 2025	3075	1024	4099
Ethiopia	2025		1011	1011
Georgia	2019, 2020	407		407
Germany	2025		1963	1963
Greece	2018, 2019	600		600
Hong Kong SAR China	2023		598	598
Hungary	2018, 2019, 2020	805		805
Iceland	2024, 2025		361	361
Indonesia	2022, 2023		2955	2955
Iraq	2021, 2022		1019	1019
Italy	2018, 2019	760		760
Jamaica	2023, 2024, 2025		215	215
Jordan	2019, 2024	601	592	1193
Kazakhstan	2019, 2024	1446	1013	2459
Kenya	2025		1024	1024
Kuwait	2025		150	150
Kyrgyzstan	2018, 2019	360		360
Laos	2024, 2025		363	363

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Latvia	2024, 2025		259	259
Lebanon	2019, 2020	532		532
Liberia	2025		158	158
Lithuania	2018, 2019	358		358
Malaysia	2024, 2025		979	979
Mali	2024, 2025		392	392
Malta	2024, 2025		241	241
Mexico	2023		1322	1322
Mongolia	2018, 2019		360	360
Morocco	2018, 2019, 2020		1096	1096
Namibia	2024, 2025		307	307
Nigeria	2025		1043	1043
Pakistan	2022		1300	1300
Papua New Guiena	2024, 2025		145	145
Peru	2022, 2023		987	987
Poland	2019, 2024, 2025	1369	1725	3094
Portugal	2018, 2019, 2020	1062		1062
Qatar	2025		480	480
Romania	2018, 2019, 2020	814		814
Russia	2018, 2019	1323		1323
Saudi Arabia	2025		1002	1002
Senegal	2024, 2025		603	603
Serbia	2018, 2019	361		361
Singapore	2023		623	623
Slovak Rep.	2019, 2020, 2023, 2024	429	464	893
Slovenia	2018, 2019	409		409
Somalia	2025		241	241

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South Korea	2024, 2025		1518	1518
Spain	2024, 2025		1431	1431
Sweden	2024, 2025		600	600
Switzerland	2025		579	579
Taiwan	2024, 2025		612	612
Tajikistan	2019	352		352
Thailand	2025		813	813
Trinidad and Tobago	2024, 2025		114	114
Tunisia	2019, 2020, 2024, 2025	615	645	1260
Turkiye	2018, 2019, 2023, 2024, 2025	1663	1416	3079
Turkmenistan	2024, 2025		311	311
Uganda	2025		605	605
UK	2024, 2025		1003	1003
Ukraine	2018, 2019	1337		1337
Uruguay	2024, 2025		360	360
US	2024, 2025		2697	2697
Uzbekistan	2024		1008	1008
Vietnam	2023		1028	1028

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