

Unconventional Lifelines: How Corruption Eases Firm Credit Constraints Amid Natural Disasters in Vietnam

Abstract

This paper investigates an intriguing question of whether corruption can serve as a lifeline for firms facing credit constraints in the aftermath of catastrophic natural disasters. By merging firm-level data on corrupt practices with geophysical information on natural disasters spanning 2004 to 2014, we employ a robust stacked difference-in-differences (DID) estimation method centred around natural disaster events. Our empirical findings provide compelling evidence that firms engaged in corrupt activities during the post-disaster period tend to experience lower credit constraints than their non-corrupt counterparts. Further, we uncover that politically connected firms enjoy a distinct advantage in securing vital credit resources during catastrophic natural disasters by engaging in corruption practices. These findings shed new light on the dynamics of firm-level corruption and its consequences amid catastrophic events.

JEL: D73, G21, H84, O16, Q54

Keywords: Corruption, Natural Disasters, Credit constraint, Credit access, Political connection, Developing countries

1. Introduction

This study investigates whether corruption lubricates firms' credit access in the wake of catastrophic natural disaster events. There is an emerging body of literature concerning the implication of firm-level corruption in economic development (e.g., Unsal et al., 2016; Krammer, 2019; Ferris et al., 2021; Boikos et al., 2023). Developing nations, characterised by weak institutional frameworks and limited financial accountability, often create fertile ground for the proliferation of corrupt practices, incentivising firms to engage in such behaviour (Adomako et al., 2021). In these corrupt environments, the costs associated with identifying willing partners in corrupt transactions are lower (Tonoyan et al., 2010). Moreover, the likelihood of detection through audits is diminished due to limited governmental resources (Lui, 1986), and penalties for getting caught can be mitigated through bribery (Cadot, 1987). Consequently, firms operating in developing countries may resort to corruption to gain unfair competitive advantages and improved access to finance (Ufere, 2020; Zhang, 2021).

The existing body of literature presents divergent perspectives regarding the impact of firm-level corruption on firms' access to credit. On the one hand, the "sand in the wheels" viewpoint contends that corruption hinders firms from securing credit, as it dissuades banks from extending loans and escalates borrowing costs (Weill, 2011; Qi and Ongena, 2019; Wellalage et al., 2019; Wellalage et al., 2020). Conversely, the "grease the wheels" perspective suggests that corruption can enhance firms' credit prospects, particularly in countries with malfunctioning institutions. By offering bribes to individuals responsible for credit allocation, such as banks or government officials, firms can improve their access to credit (Beck et al., 2006; Chen et al., 2013; Fungáčová et al., 2015).

While a substantial body of literature has explored the influence of firm-level corruption on the distribution of bank credit, there is a notable gap in our understanding of how

corruption affects firms' access to credit in the aftermath of natural disasters. This is a critical area of investigation, especially concerning small and medium enterprises (SMEs). SMEs play a pivotal role in the economic growth of emerging markets (Javalgi et al., 2012). However, SMEs are particularly susceptible to the disruptive impacts of catastrophic natural disasters, which can severely interrupt their operations (Hosono et al., 2016). Furthermore, the anticipated rise in the frequency and severity of extreme weather events poses a substantial and growing threat to SMEs (Zhou and Botzen, 2021).

Catastrophic natural disasters are unforeseeable events that can profoundly impact the financing needs and constraints businesses face. In the aftermath of such disasters, credit becomes a vital lifeline for firms struggling to recover from the devastation (Collier et al., 2020). This heightened demand for credit is well-documented (Del Ninno et al., 2003; Berg and Schrader, 2012). Paradoxically, despite the surge in demand, firms affected by disasters often find their access to credit constrained due to a combination of reduced creditworthiness and diminished credit supply (Berg and Schrader, 2012; Collier et al., 2020; Nguyen and Wilson, 2020; Baltas et al., 2022). Complicating matters, natural disasters create an environment where corruption among public officials becomes more prevalent (Yamamura, 2014; Escaleras and Register, 2016; Lee and Moumbark, 2022). Consequently, firms may be inclined to engage in corrupt practices in the wake of these disasters. This unique confluence of events presents a natural experiment for investigating the impact of firm-level corruption on firms' ability to access credit during times of crisis.

Vietnam is a compelling backdrop for our study due to its unique institutional context. Firstly, Vietnam is highly susceptible to a range of natural disasters owing to its geographical location, and it ranks among the top countries most adversely affected by the growing spectre of climate change, leading to an increase in the frequency and severity of such disasters (Trinh et al., 2022). Secondly, Vietnam has grappled with the pervasive corruption issue for an

extended period, representing a central concern in its social and political landscape (Vu et al., 2018). Despite government efforts to combat corruption, Vietnam continues to be perceived as a nation struggling with high levels of corruption¹. At the firm level, bribery is often seen as an unavoidable part of the cost of doing business, and firms frequently engage in corrupt practices (Rand and Tarp, 2012). Given the inefficiencies in combating corruption within the country's institutions and the formidable challenges facing anti-corruption campaigns, corruption fees are sometimes viewed as 'facilitation money' or 'greasing money', essential for firms to operate successfully within the Vietnamese business environment (Nguyen et al., 2016).

In the aftermath of catastrophic natural disasters, Vietnamese firms endure substantial losses due to operational disruptions and inadequate post-disaster government assistance (Nguyen et al., 2020). This lack of support can catalyse corrupt practices among firms seeking the necessary funding for post-disaster recovery, particularly when financial resources are scarce and in high demand (Baltas et al., 2022). In the Vietnamese context, corruption in allocating bank loans to firms is prevalent due to the discretionary power wielded by bank officials and government representatives. Firms may offer these officials bribes in exchange for loan approvals, as these individuals may prioritise personal gains and extend loans to corrupt firms (Beck et al., 2006). Furthermore, the predominantly state-owned nature of the Vietnamese banking sector provides government officials at various levels with significant latitude in the allocation of bank loans² (Pham and Talavera, 2018). Consequently, firms in Vietnam may employ corruption to influence either bank or government officials, thereby facilitating their access to credit.

¹ As indicated by the 2022 Corruption Perceptions Index (CPI) published by Transparency International in January 2023, Vietnam scores 42 out of 100 (where a lower score indicates more corruption) and ranks 77th out of 180 countries in 2022 (the rank of one is the least corrupt country).

² The big four banks in Vietnam are predominantly government owned.

This paper draws upon two primary datasets: the Emergency Event Database (EM-DAT) and the Vietnamese Micro, Small, and Medium Enterprise Survey (SME Survey). EM-DAT offers a comprehensive repository of information on catastrophic natural disasters, including details on affected locations, disaster dates, and casualty figures. The SME Survey, on the other hand, furnishes firm-level data pertaining to access to formal financing and engagement in corrupt practices among Vietnamese micro, small, and medium-sized enterprises (SMEs).

Employing a robust stacked difference-in-differences (DID) methodology, our analysis scrutinises the credit access of firms engaged in corruption during the two survey waves (i.e. four years) preceding and following a catastrophic natural disaster. Our findings following such disasters reveal that corrupt firms in disaster-affected provinces are less likely to face credit constraints than their non-corrupt counterparts. Moreover, we observe that as firms increase their corruption payments in the post-disaster period, their likelihood of facing credit constraints diminishes. Lastly, our research underscores that politically connected firms engaged in corruption experience superior access to credit during catastrophes compared to firms lacking such political ties.

This study contributes significantly to the existing literature in several ways. Firstly, we add depth to the literature examining the impact of corruption on firms' credit access. Prior research has yielded conflicting empirical results regarding whether corruption facilitates or hampers credit access for firms. These contradictory findings may be attributed to simultaneity bias and potential endogeneity issues. Our study addresses these concerns by capitalising on a 'natural experiment' framework, enabling us to explicitly discern how corruption alleviates firms' credit constraints in response to unforeseeable aggregate shocks, such as natural disasters. This innovative approach provides fresh insights and offers a potential resolution to the existing controversy surrounding the role of corruption in firms' credit access.

Furthermore, our study expands the current understanding of the origins and strategic use of corruption in emerging markets (e.g., Martin et al., 2007) by closely linking them to firms' access to credit in the aftermath of severe, abrupt disruptions. Recognising that engaging in corruption represents a "strategic choice" for firms (Spencer and Gomez, 2011), recent scholarly attention has shifted towards investigating its consequences for firms, especially during crisis periods (e.g., Collins et al., 2009; Lee and Weng, 2013; Krammer, 2019). In this context, our study offers valuable insights into how firms navigate the challenges posed by natural disasters by employing corruption to meet their heightened demand for credit following extreme weather shocks. Thus, we present a more comprehensive perspective on firm-level corruption and its performance implications during times of catastrophic adversity.

Moreover, our study carries important implications for anti-corruption policy and practice. Corruption is a pervasive phenomenon in Vietnam, and conventional wisdom suggests that firms may resort to corruption to navigate unproductive regulations and achieve financial objectives (Malesky et al., 2020). Our findings align with the notion that corruption can serve as a functional lubricant in imperfect institutional environments (e.g., Méon and Weill, 2010). Specifically, corruption can assist firms in accessing critical financial resources necessary for recovery and survival during disruptions and crises. However, a cultural norm of corruption coupled with unfavourable economic conditions can incentivise firms to engage in opportunistic and unethical practices to gain unfair competitive advantages. Consequently, our study implies that governments should re-evaluate their natural disaster management strategies and formulate post-disaster policies and regulations that reduce both the opportunities for and benefits from firms engaging in corruption. This proactive approach can help mitigate the negative consequences of corruption while facilitating disaster recovery and fostering a more equitable business environment.

The rest of the paper is structured as follows. Section 2 presents an overview of the institutional background, literature review, and hypothesis development. Section 3 describes the data and the empirical approach employed. Section 4 reports empirical findings and robustness tests. Section 5 presents additional analyses that attempt to corroborate our main results, and section 6 concludes.

2. Institutional background, literature review and hypothesis development

2.1 Institutional background

Vietnam provides a unique setting to study the impact of corruption engagement on firms' credit constraints during natural disasters. Small and medium-sized enterprises (SMEs) are the backbone of Vietnam's economy. They contribute 40 percent of the country's GDP, nearly 30 percent of the state's budget revenue, 25 percent of export value, and employ about 51 percent of all employees (MPI, 2015). Despite being important contributors to the economy, SMEs still face many impediments, especially a lack of access to credit. Between 14 and 25 percent of Vietnamese enterprises are credit-constrained (Rand, 2007). SMEs account for just 22 percent of total bank lending, even though they account for approximately 98 percent of all registered private enterprises (OECD, 2021). Furthermore, as reported in the 2015 World Bank Enterprise Survey, 21.8 percent of firms consider access to finance the most formidable obstacle in their everyday operations.

In developing countries such as Vietnam, corruption runs rampant within business-government relations. These nations grapple with dysfunctional institutions and volatile regulatory landscapes (Peng and Luo, 2000; Hoskisson et al., 2000), which create fertile ground for unscrupulous dealings between businesses and the government, often to the detriment of the state (Liedong, 2020; Liedong et al., 2023).

Consequently, firms are incentivised to offer bribes to politicians or bureaucrats in exchange for favourable regulatory treatment or special privileges (Martin et al., 2007; Méon and Weill, 2010; Ferris et al., 2021). Furthermore, the feeble institutions cannot curtail government officials' arbitrary application of regulations, who wield control over the allocation of scarce resources (Acquaah, 2007; White et al., 2015). This lack of effective checks and balances and a fragile rule of law enables government officials to dispense favours to firms with little concern for the consequences (Liedong et al., 2023).

In light of these circumstances, businesses in developing countries often offer bribes to individuals with access to financial resources to surmount barriers to securing essential credit (Baron et al., 2018). It is suggested that firms may proffer bribes to bank officials to expedite the process of obtaining crucial bank loans. Bank officials may, in turn, exhibit biased behaviour in favour of personal gain, resulting in loans being granted to corrupt firms (Beck et al., 2006).

Moreover, the Vietnamese banking sector is subject to heavy state regulation, with major loan providers, including the prominent "big four" banks³, being predominantly state-owned. Consequently, government officials at various levels wield substantial control over the allocation of bank loans (Pham and Talavera, 2018). Consequently, businesses may also engage in corrupt practices with government officials to facilitate the approval of their loan applications (Ufere et al., 2020; Y. Zhang, 2021). In this complex context, firms in Vietnam may resort to bribing either bank or government officials to gain access to credit.

³ Vietnam's financial sector is dominated by the four state-controlled banks including the Bank for Investment and Development of Vietnam (BIDV), the Joint Stock Commercial Bank for Industry and Trade (Vietinbank), the Joint Stock Commercial Bank for Foreign Trade Of Vietnam (Vietcombank) and The Vietnam Bank for Agriculture and Rural Development (Agribank). These big four banks account for the lion's share of the market in loans and deposits in comparison with their private counterparts (Deloitte, 2019).

Furthermore, Vietnam faces a heightened vulnerability to a wide array of natural disasters that span the entire country⁴, including floods, tropical cyclones, typhoons, tornadoes, landslides, and droughts. This susceptibility is primarily a result of its geographical location⁵ (GFDRR, 2015; Nguyen, 2017). Over the past two decades, from 1998 to 2017, Vietnam has experienced staggering 220 natural disasters and extreme weather events. These events have led to an average of 296 deaths annually and inflicted annual economic losses averaging around two billion dollars (Eckstein et al., 2018). Additionally, climate change has imposed substantial economic costs on the country, estimated at approximately two percent to six percent of its GDP each year, with projections indicating this figure could exceed 6.5 percent by 2050 (UNDP and World Bank Group, 2015).

In this context, Vietnamese businesses, particularly SMEs, grapple with significant disruptions caused by natural disasters and climate change (Vu and Noy, 2018; Zhou and Botzen, 2021). On an annual basis, the cumulative damages inflicted by these events on SMEs potentially reach into the trillions of Vietnamese dong, resulting in many businesses losing valuable assets and facing bankruptcy (The Asia Foundation, 2011).

The Vietnamese government has established supportive policies to assist businesses in dealing with the challenges posed by climate change and natural disasters. These policies include tax exemptions and reductions, preferential loan schemes, and credit support initiatives. However, the effectiveness of these policies is marred by inadequate implementation, leaving firms to struggle with losses without timely and appropriate assistance (Nguyen et al., 2020).

2.2 Literature review and hypothesis development

⁴ Vietnam is ranked as the seventh most exposed country in the world to climate change and natural hazards regarding impacted land area, affected population, economic damages, and capacity to response to natural disasters (World Bank, 2010).

⁵ The country locates in a tropical monsoon region, and possesses an extensive coastline of 3,200 km, as well as diverse and complex topography.

Access to credit plays a crucial role in enabling firms to recover from the shocks caused by natural disasters (Koetter et al., 2020). When catastrophic natural disasters strike, affected firms often face a heightened demand for credit. This credit is essential for repairing damages, bolstering liquidity, and ensuring the continuity of their business operations (Koetter et al., 2020; Brown et al., 2021). Yet, despite this increased demand for credit, firms may encounter credit constraints during the post-disaster period. This limitation arises because traditional sources of finance may become restricted, with banks becoming more cautious about the uncertainty surrounding repayment (Baltas et al., 2022). Furthermore, in the aftermath of natural catastrophes, banks contend with a significant decrease in deposits and capital. This reduction in financial resources can result in a diminished capacity to supply credit to firms post-disaster period (Brei et al., 2019).

To overcome credit constraints in the aftermath of natural disasters, firms operating in emerging and developing economies may resort to non-market strategies, including corruption, to secure much-needed access to credit, as observed in recent research (Zhou et al., 2022). However, the existing body of literature provides conflicting evidence regarding the impact of firms' engagement in corruption on their ability to access credit.

According to the "grease-the-wheel" hypothesis, corruption can be seen as a means for firms to facilitate their access to bank financing, especially in environments characterised by dysfunctional institutions and bureaucratic inefficiencies (e.g., Jiang and Nie, 2014; Ferris et al., 2021). In this context, corruption allows firms to navigate past bureaucratic obstacles and sidestep cumbersome regulations (Lui, 1985). Models developed by Beck and Maher (1986) and Lien (1986) suggest that those offering bribes may secure larger credit allocations. Firms with stronger economic performance might be able to offer larger bribes and, consequently, obtain more substantial bank financing. Empirical studies, such as Chen et al. (2013), have found evidence supporting this notion, particularly in cases like China, where the financial

sector is plagued by corruption. Similarly, Fungáčová et al. (2015) have shown that bribing bank officials can increase the likelihood of firms gaining access to bank loans.

On the contrary, the "sand-in-the-wheels" hypothesis presents an opposing view, suggesting that corruption could diminish the amount of credit extended to firms, as supported by prior research (Weill, 2011; Qi and Ongena, 2019; Wellalage et al., 2019; Wellalage et al., 2020). This hypothesis draws upon both supply-side and demand-side arguments. From a supply-side perspective, it is argued that higher levels of corruption tend to be associated with weaker legal institutions, which, in turn, increase the uncertainty surrounding lenders' ability to make claims and enforce them against corrupt firms in cases of default. When the capacity to enforce claims against borrowers diminishes, financial institutions may become reluctant to extend loans to corrupt firms. On the demand side, corruption can be likened to a tax that raises the cost of loans for firms. This heightened cost, in turn, can dampen firms' demand for loans, leading to an overall reduction in credit access for all firms, including those engaged in corrupt practices.

An important aspect of our study focuses on examining the impact of engaging in corruption on firms' access to credit in the aftermath of catastrophic natural disasters. In such circumstances, corruption could potentially provide certain competitive advantages, as it may enable firms to receive preferential treatment when seeking access to financial resources, whether in the form of disaster relief funds or bank loans. This unique context raises complex questions about the interplay between corruption, credit access, and disaster recovery, shedding light on the nuanced dynamics in post-disaster financial landscapes.

Engaging in corrupt practices by paying government officials fees can serve as a viable strategy for firms to facilitate easier access to natural disaster relief. Securing access to relief funds can expedite a firm's recovery process, strengthen its financial standing, and enhance its

credit access. Following catastrophic natural disasters, government agencies and various charitable organisations typically provide disaster relief funds (Nguyen, 2017). However, the management and allocation of these relief funds often suffer from issues related to deteriorating institutional quality and reduced government transparency during disaster times (Trinh et al., 2022). In such circumstances, individuals and organisations are incentivised to engage in corrupt behaviour to compete for a share of the disaster relief funds (Brollo et al., 2013). Given that government officials play a central role in managing disaster relief funds, they may use their positions of authority to extract personal benefits and prioritise corrupt firms when allocating limited financial resources (De Jong et al., 2012).

Moreover, corruption can also be a means for firms to gain access to bank loans after catastrophic natural disasters. In cases where the government predominantly controls the banking sector, firms may choose to bribe either bank or government officials to ensure their loan applications are approved. Specifically, when bank officials are offered bribes, they may be more inclined to exhibit biased behaviour in favour of their personal gain and grant credit to corrupt firms (Fungáčová et al., 2015). Similarly, government officials may pressure banks to provide loans to corrupt firms (Chen et al., 2013).

Taking into account the above-outlined reasons, the formulated hypothesis is as follows:

Hypothesis: Firms engaging in corruption will experience lower post-disaster credit constraints.

3. Data and model specification

3.1 Data and sample selection

We retrieve data on natural catastrophes from the Emergency Event Database (EM-DAT), an international disaster database provided by the Centre for Research on the Epidemiology of Disaster (CRED) at the Université Catholique de Louvain in Brussels, Belgium. The natural disaster included in the database must fulfil at least one of the following criteria: (i) ten or more people reported deaths; (ii) 100 or more people reported negatively affected; (iii) a declaration of a state of emergency; (iv) a call for international assistance. These disasters are classified into six categories, including geophysical disasters, meteorological disasters, hydro-meteorological disasters, climatological disasters, biological disasters, and terrestrial disasters. This study concentrates on three types of disasters in Vietnam during the examined period: meteorological, hydro-meteorological, and climatological. The EM-DAT database provides detailed information on each natural disaster regarding the affected location, the disaster occurrence date, and the measures of disaster magnitude (e.g., the number of deaths), which are critical to the analysis of our study. In order to have pre-disaster and post-disaster data for each natural catastrophe, we focus on natural disaster data from 2007 to 2011. The data on firm-level corrupt practices and formal credit access are available from 2004 to 2014, covering two waves of firm-level data before and after the disaster data period, given that the firm-level survey data is collected biennially.

Notably, the timing of natural catastrophes is mainly unforeseeable; however, the potential economic impact of these disasters could be alleviated if their severity is not significant. Because several natural disaster events in the dataset have a comparatively small magnitude, our study will only focus on extreme (large-scale) natural catastrophes whose consequences are nearly impossible to mitigate, as in Cavallo et al. (2013). Specifically, we identify a large-scale catastrophic natural disaster using the following steps. First, we calculate

the magnitude of the natural catastrophe by dividing the total number of people killed by the total population of affected provinces in the year before the natural catastrophe. We then calculate the 75th percentile of the catastrophic natural disaster and use it as a cut-off value to define a large-scale disaster. If the death toll ratio surpasses the cut-off value, we regard the disaster as an extreme (large-scale) natural catastrophe. The reason we use the percentage-based definition of severe natural catastrophe is that the number of people killed in a natural disaster is highly skewed; hence, the commonly used definition of one or two standard deviations above the mean serves as a poor indicator to judge the average intensity of the disaster (Cavallo et al., 2013).

It is noted that some provinces experience several catastrophic natural disasters over the examined period. Regarding these provinces, we use the data before and after the first extreme catastrophic natural disaster observed during the sample period (the data is up to the subsequent disaster). Moreover, if multiple disasters happen within a given year in the same province, we choose the most severe one with the largest magnitude. Provinces in the control group do not experience any disaster catastrophes from 2007-2011 and, therefore, are not included in the EM-DAT database. To this end, our study focuses on four catastrophic natural disasters for the period 2007-2011⁶.

We obtain data on firm-level corruption and access to credit from the six waves of the Micro, Small, and Medium Enterprise Survey in Vietnam conducted in 2005, 2007, 2009, 2011, 2013, and 2015, providing information for 2004, 2006, 2008, 2010, 2012, and 2014, respectively. The SME surveys are conducted biennially by the United Nations University World Institute for Development Economics Research (UNU-WIDER) in collaboration with the Central Institute for Economic Management (CIEM), the Institute of Labour Science and

⁶ These four natural catastrophes kill 50 people or more. The median number of people killed by natural disasters in Vietnam during the study period is 29.

Social Affairs (ILSSA), and the Development Economics Research Group (DERG) at the University of Copenhagen. The surveys contain information for manufacturing firms⁷ in nine provinces in Vietnam, including Hanoi, Ho Chi Minh, Hai Phong, Long An, Phu Tho, Quang Nam, Nghe An, Khanh Hoa, and Lam Dong. These provinces cover the country's northern, central, and southern regions. The survey questionnaires provide comprehensive information on firm financial (e.g., leverage and profitability), non-financial characteristics (e.g., firm age and accounting standard) and owner background characteristics (e.g., age and gender). Importantly, the surveys contain questions on firms' engagement in corruption, financing needs, and access to finance.

It is worth noting that our analysis concentrates on firms that have applied for bank loans or other formal credit lines since the last survey date. Consequently, we exclude all firms that did not apply for bank loans/formal credit lines for the following reasons including 1) high interest rates (i.e., loans are too costly) or 2) anticipated rejection or 3) having enough internal resources⁸. This ensures that our analysis evaluates the effect of catastrophic natural disasters and corruption on firms' access to credit exclusively from the supply side rather than self-rationing (Mayordomo and Rodríguez-Moreno, 2018; Aristei and Angori, 2022). Particularly, extant studies primarily identify credit constrained firms based on two main cases: (i) the firm's application for a bank loan or other credit line was rejected (i.e., the supply side of credit); (ii) the firm did not apply for loans because they were discouraged by, e.g., high borrowing cost or fear of rejection (i.e., self-rationing of firms). Our study hypothesises that firms' corruption engagement could affect banks' decisions to grant or reject their credit application. Hence, we only focus on the supply side of credit and do not consider discouraged firms.

⁷ All firms in our sample are in manufacturing industry. Therefore, our results are not subject to industry selection bias.

⁸ By excluding firms that do not apply for a loan because of having enough internal resources, we could mitigate the problem of self-selection bias whereby firms possessing more capacity to engage in corruption are less likely to be credit constrained.

To obtain the final sample, we perform the following data cleaning procedures. First, we exclude any duplicate observations or observations with missing values. Next, we eliminate any firms relocated to another province during the sample period⁹. Finally, to alleviate the issues of outliers and data errors, we winsorise all continuous variables at the five percent level at both tails. To this end, our final sample consists of a maximum of 4,400 firm-year observations of 1,057 firms.

3.2 Stacked difference-in-differences

Given the staggered nature of catastrophic natural disasters, the traditional generalised difference-in-differences (DID) method is likely biased (Goodman-Bacon, 2021; Baker et al., 2022). In our setting, where there are multiple periods, and firms are treated at different points in time, the traditional generalised DID may lead to estimation bias since it uses earlier-disaster-affected firms as part of the control units for later-disaster-affected firms. To mitigate this concern, we instead employ a stacked DID method, which removes all control firms that have been treated (Goodman-Bacon, 2021; Baker et al., 2022).

To create our stacked sample, we use the following procedure. First, we group treated firms by the years natural catastrophes occur. For instance, firms that experience a catastrophic natural disaster in 2008 will be in the 2008 disaster-affected group, called a cohort. Each cohort t consists of the observations from two survey waves before and after the disaster event for disaster-affected and non-disaster-affected firms, removing the disaster year¹⁰. The reason for choosing this window is that the first catastrophic natural disaster (first cohort) happens in 2007

⁹ There are only 8 firms relocated to another province during the examined period.

¹⁰ The SME survey is conducted biennially, resulting in missing data for natural disaster event years in some cohort. To ensure the consistency across cohorts, we remove the disaster event year so that all cohorts consist of data for the four survey waves surrounding the catastrophic natural disasters. For example, the 2008 cohort consists of data including 2004 and 2006 survey waves (two survey waves prior to the disaster event) and the 2010 and 2012 survey waves (two survey waves after the disaster event).

(the first disaster event after the first two SME survey waves in 2004 and 2006); hence, the pre-event window uses firm-year observations on two survey waves before each event. Similarly, the last catastrophic natural disaster (last cohort) is in 2010 (the last disaster event before the last two SME survey waves in 2012 and 2014); therefore, the post-event window uses firm-year observations in the two survey waves after the event. Then, we choose firms that do not suffer any catastrophic natural disasters during the cohort window as control firms for cohort t . The stacked DID approach ensures that earlier-disaster-affected firms are not used as control units for later-disaster-affected firms, thereby addressing potential bias caused by the traditional generalised DID method. The summary statistics of the stacked sample are reported in Table 2.

We investigate the impact of corruption engagement on firms' access to credit after the natural disasters by employing the stacked DID specification as follows:

$$\begin{aligned}
\text{Prob}(\text{Credit Constrained}_{it} = 1) = & \beta_0 + \beta_1 \text{Disaster Affected}_{it} + \beta_2 \text{Post Corruption}_{it} \\
& + \beta_3 \text{Disaster Affected}_{it} * \text{Post Corruption}_{it} + \sum \beta_k \text{Controls} \\
& + \text{Province} - \text{cohort FEs} + \text{Year} - \text{cohort FEs} + \varepsilon_{it} \quad (1)
\end{aligned}$$

where i denotes a firm and t denotes the year. The dependent variable in our analysis is *Credit Constrained*, a dummy variable that equals one if the firm is credit constrained, and zero otherwise. Following the common approach in literature using survey data to measure credit constraints (e.g., Leon and Weill, 2018; Ferrando et al., 2019; Nicolas, 2022), we define a firm as credit constrained when its formal loan applications, both short and long term, have been rejected since the last survey. We do not consider firms as being credit constrained if they did not apply for bank loans or other formal credit since the last survey because they fear their applications would be turned down (i.e., discouraged borrowers) or they

have sufficient internal funds (i.e., non-demanding borrowers) or the cost of loans are too high (i.e., price rationing). By excluding these firms from our estimation sample, we are able to properly assess both the firm's credit demand behaviour and the bank or financial institution's actual decision to grant or reject the formal loans in catastrophic times (Mayordomo and Rodríguez-Moreno, 2018; Aristei and Angori, 2022).

In the model, *Disaster Affected* is a dummy variable that equals one if the firm is located in the province that experiences a natural catastrophe and in the post-disaster period, and zero otherwise. *Post Corruption* is a dummy variable that equals one if the firm pays corruption fees in post-disaster period, and zero otherwise¹¹. The main estimated coefficient of interest is β_3 , which is the estimated coefficient on the interaction term *Disaster Affected*Post Corruption*. The interaction coefficient β_3 denotes the difference in the change in credit constraints between corrupt and non-corrupt firms around the catastrophic natural disasters in the disaster-affected provinces relative to the control provinces.

Controls is a vector of control variables that could potentially impact firms' credit constraints. In particular, following prior studies (e.g., Pham and Talavera, 2018; Qi and Ongena, 2019; Wellalage et al., 2020; Zhang, 2021), we incorporate into our model a number of the firm- and owner-specific variables (i.e., *Firm Age*, *Large Firm*, *Leverage*, *Accounting*, *Bad Credit History*, *Male owner*, and *Owner Age*). Detailed definitions of all variables are provided in Table 1. We also include year-cohort fixed-effects (*Year-cohort FEs*) province-cohort fixed effects (*Province-cohort FEs*) in the model. Standard errors (ε_{it}) are clustered at the province level.

[Insert Table 1 around here]

¹¹ We follow prior studies (e.g., Wellalage et al., 2019; Wellalage et al., 2020) and use the amount of corruption fees firms paid to identify firms' engagement in corruption.

[Insert Table 2 around here]

4 Results

4.1 Impact of corruption on firm's access to credit during natural disasters

Table 3 presents the baseline results between firms' corruption engagement and credit access after catastrophic natural disasters. Column (1) compares the change in the credit constraints of corrupt firms in disaster-affected provinces relative to corrupt firms in control provinces. Column (2) repeats the investigation for non-corrupt firms. As shown in Column (1), we find a positive but insignificant coefficient on the probability of being credit constrained of corrupt firms in disaster-affected provinces relative to control provinces. In contrast, the estimated coefficient on *Post Corruption* in Column (2) is statistically significant and positive, suggesting that the probability of being credit constrained of non-corrupt firms in disaster-affected provinces increases compared with non-corrupt firms in control provinces.

In Column (3), we estimate Eq. (1), which compares the effect of catastrophic natural disasters on the access to credit of corrupt firms relative to non-corrupt firms. The estimated coefficient on *Disaster Affected*Post Corruption* is negative, with a significant level of 1%. This implies that firms consistently paying corruption fees post-disaster period are less likely to be credit constrained than their non-corrupt counterparts.

The results are in line with our hypothesis and corroborate the findings of Chen et al. (2013) and Fungáčová et al. (2015), who find that engaging in corruption helps facilitate firms' access to credit in bribery-prone environments. In countries where institutions are ill-functioning, and governments have extensive control over resources such as bank loans, firms depend significantly on the government to access crucial resources (Lee et al., 2023). Moreover, political markets are also opaque and unregulated, creating opportunities for unethical exchanges between firms and bribe-seeking officials (Liedong, 2020). In such

circumstances, firms could engage in corruption to enjoy arbitrary preferential treatments in post-disaster credit allocation.

[Insert Table 3 around here]

4.2 Testing parallel trend assumption

The fundamental assumption of our DID strategy is that the treatment and control groups experience a parallel trend in the absence of natural catastrophes. The parallel trend of the DID model in our study means that before a catastrophic natural disaster, firms in provinces suffering catastrophic natural disasters and firms in provinces not experiencing disasters follow a similar trend in the likelihood of access to credit. To test the parallel trend assumption underlying our DID design, we follow the approach of Fauver et al. (2018) and include in our baseline model Eq. (1) a dummy variable that takes the value of one for the disaster-affected provinces and the survey wave prior to the natural disaster events, and zero otherwise (*Before (1,1)*) as well as its interaction term with *Post Corruption*. The results of the parallel trend assumption test are provided in Table 4.

[Insert Table 4 around here]

As shown in Table 4, the estimated coefficient on the interaction term *Before(1,1)*Post Corruption* is statistically insignificant. In contrast, the estimated coefficient on *Disaster Affected*Post Corruption* is statistically significant and negative. These results suggest that before catastrophic natural disasters, there is no significant difference in the trend of being credit constrained among firms with different corruption levels. Therefore, our DID research design does not violate the parallel trend assumption.

4.3 Demand and supply

One might be concerned that the effect of corruption engagement on firms' access to credit during the post-disaster period could be driven by either demand-side or supply-side factors. On the one hand, catastrophic natural disasters could increase firms' demand for credit for post-disaster recovery (Koetter et al., 2020; Brown et al., 2021). In this case, firms might bribe government or bank officials to access financial assistance or bank loans, enabling rapid post-disaster recovery and overcoming credit constraints caused by natural disasters. On the other hand, catastrophic natural disasters could also affect local credit supply. Banks may suffer from a decline in capital and deposits and a reduction in borrowers' collateral value and economic prospects in the aftermath of natural catastrophes. This decreases their risk capacity and funds available for lending (Nguyen and Wilson, 2020; Baltas et al., 2022). Thus, with limited lending ability, bank officials might only be willing to grant loans to corrupt firms, which offer them benefits.

We, therefore, attempt to disentangle the demand-side effects from the supply-side effects in our results by controlling banks' credit supply in the post-disaster period. More specifically, we examine whether the impact of corruption engagement on firms' access to credit during catastrophic times is stronger or weaker during economic downturn period. Economic downturn creates financing constraints for banks, leading them to decline lending (Drumond, 2009). Therefore, we capture banks' credit supply by using the period of the economic downturn in Vietnam (i.e., 2009-2012) as a proxy for periods of reduced credit supply. To control for credit supply after natural catastrophes, we introduce a dummy variable, *Economic Downturn*, which equals one for the survey waves during the economic downturn. We incorporate our baseline model Eq. (1) with the interaction term *Disaster Affected*Post Corruption*Economic Downturn*. If supply-side factors drive our baseline results, we should observe a stronger interaction effect between *Disaster Affected* and *Post Corruption* variables

for the period when both natural catastrophes and economic downturn occur. We present the regression results in Table 5.

[Insert Table 5 around here]

As shown in Table 5, the estimated coefficient of interest on *Disaster Affected*Post Corruption* remains negative and statistically significant as in our baseline regression in Table 3. However, the *Disaster Affected*Post Corruption*Economic Downturn* interaction coefficient is not statistically significant. These results suggest that the impact of corruption engagement on firms' access to credit in the post-disaster period is not predominantly driven by supply-side factors.

4.4 Financial capacity to corrupt post-disaster period

Another concern is that only firms that have the financial means to pay corruption fees post-disaster period can benefit from engaging in corrupt practices, which help reduce their credit constraints. To alleviate this concern, we attempt to control for firms' financial capacity to pay corruption fees post-disaster period by incorporating our baseline model Eq. (1) the interaction term *Disaster Affected*Post Corruption*Post Profit*. *Post Profit* is a dummy variable which equals one if the firm belongs to top quintile of average return on assets post-disaster period, and zero otherwise. We report the regression results in Table 6.

[Insert Table 6 around here]

As can be seen from Table 6, the estimated coefficient of *Disaster Affected*Post Corruption* is still statistically significantly negative, whereas the *Disaster Affected*Post Corruption*Post Profit* interaction coefficient is statistically insignificant. This finding confirm that our results are not driven by firms' financial capacity to pay corruption fees post-disaster period.

5 Further analyses

5.1 Does corruption amount matter?

So far, we find that engaging in corruption enables firms to get better access to credit in the aftermath of natural disasters. In this sub-section, we provide a deeper insight into how the amount of corruption fees paid by firms affects the probability of being credit-constrained post-disaster period. To conduct the analysis, we introduce a new variable, *Post Corruption Amount*, the natural logarithm of a firm's average corruption fees in the post-disaster period. We then re-estimate Eq. (1) by replacing the *Post Corruption* variable with the *Post Corruption Amount*. The regression results are shown in Table 7.

[Insert Table 7 around here]

The results from Table 7 show that the estimated coefficient on the interaction term between *Disaster Affected* and *Post Corruption Amount* appears to be negative and statistically significant. The impact is also economically significant. The marginal effect on the interaction term *Disaster Affected*Post Corruption Amount* is 15.90 percent $(4.077*0.039)^{12}$, suggesting that a one standard deviation increase in *Post Corruption Amount* leads to a 15.09 percentage point lower probability of being credit constrained in the average disaster-affected firms in the post-disaster period. This finding further reinforces our baseline results by showing that corruption engagement helps to shield disaster-affected firms from the negative impact of natural catastrophes.

5.2 Does political connections matter?

¹² Following Norton et al. (2004), we calculate the marginal effect by multiplying the one standard deviation change in *Corruption Amount* with the estimated coefficient on the interaction term between *Disaster Affected* and *Corruption Amount*.

Finally, we attempt to delve deeper and examine whether political connection moderates the impact of corruption engagement on firms' credit constraints in the aftermath of catastrophic natural disasters. Arguably, in a weak institutional environment where corruption is prevalent, firms may not obtain what they desire after engaging in corruption (Adomako et al., 2021). Therefore, in such an environment, good relationships and network ties with government officials are essential to ensure that corrupt transactions are performed as agreed by both parties (Lambsdorff et al., 2005) and subsequently facilitate firms' access to credit.

To formally test this proposition, we split our sample into two subsamples: politically connected vs. non-politically connected firms. We define politically connected firms as firms with owners with experience serving as a government officer or other positions of responsibility, a war veteran, or a member of the Communist Party. We then conduct a subsample analysis using Eq. (1). The results are reported in Table 8.

[Insert Table 8 around here]

The results in Table 8 show that the coefficient on *Disaster Affected*Post Corruption* in the subsample of politically connected firms is more significant and larger in magnitude than the coefficient in the subsample of non-politically connected firms. The coefficient difference between these two subsamples on *Disaster Affected*Post Corruption* is statistically significant at the 10%¹³.

This suggests that politically connected firms benefit more than non-politically connected firms when paying corruption fees to obtain credit during catastrophic natural disasters. This aligns with the previous study's findings (i.e., Adomako et al., 2021),

¹³ We compare coefficients between subsamples using seemingly unrelated estimation in Stata (suest commands) to perform chi-square test.

emphasising the importance of institutional networking in a business environment where corruption is prevalent.

6 Conclusion

In this study, we examine the impact of firms' engagement in corruption on their access to credit after natural catastrophes. Existing literature has provided mixed empirical evidence on whether corruption is detrimental or beneficial to firms' credit access. Our study reconciles such controversy by exploiting catastrophic natural disaster events as a 'natural experiment' to explicitly identify how corruption engagement determines firms' access to credit in response to unforeseeable aggregate shocks.

Our empirical results indicate that corrupt firms obtain better access to credit than their peers in the aftermath of catastrophic natural disasters. Moreover, the more significant the amount of corruption fees disaster-affected firms pay, the lower the probability of being credit constrained post-disaster. Our investigation of the moderating effect of political connection suggests that politically connected firms get more benefits than non-politically connected ones when paying corruption fees in the post-disaster period.

Consequently, our findings imply that corruption could help facilitate firms' access to credit during disruptions or crises in developing countries with inefficient institutional frameworks. Corruption represents the much-needed grease for the squeaking wheels of ineffective bureaucracies. Accordingly, our study provides a better understanding of the nature, evolution, and potential effect of corruption behaviour among firms with a view to identify relevant post-disaster policy actions to cope with such opportunistic behaviour.

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Table

Table 1: Variable definitions

Variable	Definition
Main variables	
<i>Credit Constrained</i>	A dummy variable that equals one if a firm's formal loan applications, both short and long-term, have been rejected since the last survey, and zero otherwise
<i>Post Corruption</i>	A dummy variable that equals one if the firm pays corruption fees during the post-disaster period, and zero otherwise
<i>Disaster Affected</i>	A dummy variable that equals one if the firm is located in the province that experienced a catastrophic natural disaster in the post-disaster period, and zero otherwise
<i>Firm Age</i>	The natural logarithm of the number of years since the firm appeared
<i>Large Firm</i>	A dummy variable that equals one if the firm's total labour employed is greater than or equals to 100, and zero otherwise
<i>Leverage</i>	The ratio of total liabilities to total assets
<i>Accounting</i>	A dummy variable that equals one if the firm follows the accounting standard following government guidelines, and zero otherwise
<i>Bad Credit History</i>	A dummy variable that equals one if the firm fails to service its debt on time, and zero otherwise
<i>Male Owner</i>	A dummy variable that equals one if the firm owner is male, and zero otherwise
<i>Owner Age</i>	The natural logarithm of the firm owner's age
Other variables	
<i>Before (1,1)</i>	A dummy variable that equals one if the firm is located in the province that experienced a catastrophic natural disaster and in the survey wave prior to the natural disaster events, and zero otherwise

<i>Economic Downturn</i>	A dummy variable equals one if the year is in the economic downturn period (2009-2012), and zero otherwise
<i>Post Corruption Amount</i>	The natural logarithm of a firm's average corruption fees during the post-disaster period
<i>Post Profit</i>	A dummy variable equals one if the firm belongs to top quintile of average return on assets post-disaster period, and zero otherwise

Table 2: Summary Statistics

Variable	N	Mean	SD	Min	p50	Max	Control	Treatment	Control - Treatment
							Mean	Mean	
<i>Disaster Affected</i>	4,400	0.136	0.342	0.000	0.000	1.000			
<i>Credit Constraint</i>	4,400	0.176	0.381	0.000	0.000	1.000	0.146	0.210	-0.064***
<i>Post Corruption</i>	4,400	0.655	0.475	0.000	1.000	1.000	0.691	0.614	0.077***
<i>Firm Age</i>	4,398	2.299	0.590	1.099	2.303	3.367	2.366	2.222	0.144***
<i>Large Firm</i>	4,400	0.099	0.299	0.000	0.000	1.000	0.070	0.133	-0.063***
<i>Leverage</i>	4,385	0.212	0.224	0.000	0.134	0.847	0.197	0.230	-0.033***
<i>Accounting</i>	4,400	0.678	0.467	0.000	1.000	1.000	0.554	0.821	-0.267***
<i>Bad Credit History</i>	4,400	0.079	0.270	0.000	0.000	1.000	0.069	0.090	-0.020***
<i>Male owner</i>	4,400	0.556	0.497	0.000	1.000	1.000	0.571	0.539	0.032**
<i>Owner Age</i>	4,400	3.732	0.240	3.296	3.761	4.111	3.738	3.724	0.013**

Note: The table shows summary statistics for the main variables in our empirical analysis. All continuous variables are winsorised at the 5 percent level.

Table 3: Baseline results

	Dependant variable: <i>Credit Constraint</i>		
	(1) Corrupt Firms	(2) Non-corrupt Firms	(3) All Firms
<i>Disaster Affected</i>	-0.053	0.414***	0.394**
	(0.352)	(0.124)	(0.171)
<i>Post Corruption</i>			-0.009
			(0.076)
<i>Disaster Affected*Post Corruption</i>			-0.429***
			(0.158)
<i>Firm Age</i>	-0.034	0.234***	0.074***
	(0.065)	(0.063)	(0.027)
<i>Large Firm</i>	-0.095	0.092	-0.072
	(0.150)	(0.224)	(0.135)
<i>Leverage</i>	-0.210**	0.138	-0.087
	(0.090)	(0.256)	(0.148)
<i>Accounting</i>	-0.163*	0.076	-0.062
	(0.084)	(0.081)	(0.053)
<i>Bad Credit History</i>	0.807***	0.237**	0.618***
	(0.223)	(0.092)	(0.215)
<i>Male owner</i>	-0.052	-0.051	-0.054
	(0.094)	(0.094)	(0.058)
<i>Owner Age</i>	-0.123	0.379**	0.005
	(0.107)	(0.173)	(0.088)
Constant	0.274	-1.922***	-0.395
	(0.434)	(0.456)	(0.340)
Province-cohort FEs	YES	YES	YES
Year-cohort FEs	YES	YES	YES
Pseudo R2	0.104	0.0865	0.0862
Observations	2,879	1,427	4,383

Note: The table reports the results of Eq. (1) examining the impact of corruption engagement on firms' credit constraints during catastrophic natural disasters. Variable descriptions are provided in Table 1. Robust standard errors clustered at the province level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 4: Testing parallel trend assumption

	Dependant variable: <i>Credit Constraint</i>
	(1)
<i>Disaster Affected</i>	0.176 (0.215)
<i>Post Corruption</i>	-0.006 (0.078)
<i>Before (1,1)</i>	-0.395 (0.310)
<i>Before (1,1)*Post Corruption</i>	-0.195 (0.255)
<i>Disaster Affected*Post Corruption</i>	-0.440*** (0.158)
<i>Firm Age</i>	0.075*** (0.026)
<i>Large Firm</i>	-0.073 (0.136)
<i>Leverage</i>	-0.088 (0.150)
<i>Accounting</i>	-0.061 (0.052)
<i>Bad Credit History</i>	0.615*** (0.216)
<i>Male owner</i>	-0.053 (0.058)
<i>Owner Age</i>	0.006 (0.089)
Constant	-0.455 (0.347)
Province-cohort FEs	YES
Year-cohort FEs	YES
Pseudo R2	0.0874
Observations	4,383

Note: The table reports the results of the parallel trend assumption test. Variable descriptions are provided in Table 1. Robust standard errors clustered at the province level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Demand vs. supply

	Dependent variable: <i>Credit Constraint</i> (1)
<i>Disaster Affected</i>	0.577*** (0.141)
<i>Post Corruption</i>	0.008 (0.051)
<i>Economic Downturn</i>	0.460*** (0.138)
<i>Disaster Affected*Post Corruption</i>	-0.322* (0.166)
<i>Disaster Affected*Post Corruption*Economic Downturn</i>	-0.105 (0.234)
<i>Disaster Affected*Economic Downturn</i>	-0.290* (0.152)
<i>Post Corruption* Economic Downturn</i>	-0.039 (0.188)
<i>Firm Age</i>	0.076*** (0.028)
<i>Large Firm</i>	-0.072 (0.135)
<i>Leverage</i>	-0.084 (0.145)
<i>Accounting</i>	-0.062 (0.054)
<i>Bad Credit History</i>	0.621*** (0.214)
<i>Male owner</i>	-0.056 (0.060)
<i>Owner Age</i>	0.006 (0.093)
Constant	-0.400 (0.305)
Province-cohort FEs	YES
Year-cohort FEs	YES
Pseudo R2	0.0871
Observations	4,383

Note: The table reports the results when we incorporate into Eq. (1) the interaction term between *Disaster* and *Post Corruption* with *Economic Downturn*. Variable descriptions are provided in Table 1. Robust standard errors clustered at the province level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Control for firms' financial capacity to corrupt post-disaster period

	Dependent variable: <i>Credit Constraint</i> (1)
<i>Disaster Affected</i>	0.313 (0.211)
<i>Post Corruption</i>	-0.055 (0.099)
<i>Disaster Affected*Post Corruption</i>	-0.284** (0.144)
<i>Disaster Affected*Post Corruption*Post Profit</i>	-0.486 (0.343)
<i>Disaster Affected*Post Profit</i>	0.180 (0.202)
<i>Post Corruption*Post Profit</i>	0.199** (0.096)
<i>Profit</i>	0.101 (0.134)
<i>Firm Age</i>	0.089*** (0.032)
<i>Large Firm</i>	-0.101 (0.120)
<i>Leverage</i>	-0.133 (0.153)
<i>Accounting</i>	-0.041 (0.047)
<i>Bad Credit History</i>	0.634*** (0.228)
<i>Male owner</i>	-0.076 (0.057)
<i>Owner Age</i>	0.036 (0.104)
Constant	-0.524 (0.416)
Province-cohort FEs	YES
Year-cohort FEs	YES
Pseudo R2	0.0932
Observations	4,297

Note: The table reports the results when we incorporate into Eq. (1) the interaction term between *Disaster* and *Post Corruption* with *Post Profit*. Variable descriptions are provided in Table 1. Robust standard errors clustered at the province level are reported in parentheses.

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Does corruption amount matter?

	Dependent variable: <i>Credit Constraint</i>
	(1)
<i>Disaster Affected</i>	0.327** (0.166)
<i>Post Corruption Amount</i>	-0.007 (0.010)
<i>Disaster Affected*Post Corruption Amount</i>	-0.039* (0.021)
<i>Firm Age</i>	0.073*** (0.027)
<i>Large Firm</i>	-0.064 (0.131)
<i>Leverage</i>	-0.085 (0.146)
<i>Accounting</i>	-0.049 (0.051)
<i>Bad Credit History</i>	0.620*** (0.218)
<i>Male owner</i>	-0.052 (0.058)
<i>Owner Age</i>	-0.000 (0.087)
Constant	-0.344 (0.331)
Province-cohort FEs	YES
Year-cohort FEs	YES
Pseudo R2	0.0858
Observations	4,383

Note: The table reports the results to examine whether the amount of corruption fees firms pay in the post-disaster period influences their access to credit. Variable descriptions are provided in Table 1. Robust standard errors clustered at the province level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 8: Does political connections matter?

	Dependant variable: <i>Credit Constraint</i>	
	(1) Political-connected Firms	(2) Non-political-connected Firms
<i>Disaster Affected</i>	1.100*** (0.354)	0.291 (0.259)
<i>Post Corruption</i>	-0.319* (0.193)	0.074 (0.092)
<i>Disaster Affected*Post Corruption</i>	-1.325*** (0.447)	-0.320** (0.155)
<i>Firm Age</i>	0.253* (0.144)	0.019 (0.031)
<i>Large Firm</i>	-0.018 (0.210)	-0.090 (0.162)
<i>Leverage</i>	-0.301 (0.387)	-0.027 (0.148)
<i>Accounting</i>	0.289*** (0.096)	-0.136** (0.064)
<i>Bad Credit History</i>	0.155 (0.298)	0.693*** (0.235)
<i>Male owner</i>	0.059 (0.099)	-0.079 (0.068)
<i>Owner Age</i>	-0.165 (0.221)	-0.052 (0.059)
Constant	-0.145 (0.686)	-0.093 (0.240)
Cross-Model Comparison (Chi-square)	3.25	
Prob > chi-squared	0.0712	
Province-cohort FEs	YES	YES
Year-cohort FEs	YES	YES
Cluster	Province	Province
Pseudo R2	0.126	0.0874
Observations	705	3,630

Note: This table reports a subsample analysis of how firms' political connections affect the impact of corruption engagement on firms' credit constraints during catastrophic natural disasters. Variable descriptions are provided in Table 1. Robust standard errors clustered at the province level are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.