Recovering after Natural Disasters: A Stabilizing Role of the Government

Shu LIU*, Yonghao XU†

ABSTRACT

This paper studies corporate recovery patterns after disasters. Using earthquakes as natural experiments, we find that the Chinese government plays a critical role in facilitating corporate recovery. Chinese firms recover fast after disasters. Their corporate profitability is more protected, especially when they are more financially constrained. The effects are driven by valuable capital injection, both direct and indirect from the government. Firms are less disturbed in their investments and are associated with improved investment efficiency. However, government intervention has a complicated nature. The protection would be diluted when the government offers more support through local fiscal expenditure. Overall, this paper suggests that the government has a noteworthy and complicated role in stabilizing the economy.

Keywords: Disasters, Profitability, SOE, Government

*School of Finance, Zhongnan University of Economics and Law, China. Email: sliu@zuel.edu.cn.
†School of Finance, Zhongnan University of Economics and Law, China. Email: xuyonghao@zuel.edu.cn.

I. Introduction

Climate risk has risen to the top corporate concern recently. According to the global risk report in 2020, climate risks and natural disasters are ranked as the top three concerns [1]. They are recognized to pose material damage to firms and society (Ilhan, Krueger, Sautner, Starks, et al., 2019; Froot, 2001; Barrot and Sauvagnat, 2016)[2]. To combat the adverse impacts in areas hit by natural disasters, firms usually resort to bank lending. However, bank lending is limited and constrained by banks' profit maximization motivation. The special institutional setting of China provides another important interference tool - government support. The government plays a critical role in China. Its centralization and control improve the ability and incentive to help, making it more important than banks in reviving. Despite the government's distinctive characteristics and potential influence, little is known about the role the government plays in reviving the local economy after a natural disaster.

In this paper, we fill this gap and investigate whether and how the government provides buffers to climate risks. Specifically, focusing on Chinese firms, we explore corporate performance after real shocks to quantify the impacts of climate risks on firms, and understand the government's role in altering the negative impacts of natural disasters. Such an examination is essential since social stabilizing is the top priority worldwide, and the government plays a pivotal role in corporate operations and social stabilizing.

We conjecture that government plays a key role in accelerating economic recovery from a disaster. The literature stresses that fund injection is critical for economic recovery (Gan, 2007; Garmaise and Moskowitz, 2009; Ivashina and Scharfstein, 2010; Puri, Rocholl, and

[1] http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf

[2] According to a study by The Economist Business Intelligence Unit (2015), up to 30% of the world's total stock of manageable assets may be at risk due to climate change impacts, highlighting the potential costs of climate change.

Steffen, 2011; De Haas and Van Horen, 2013; Cortés and Strahan, 2017). However, bank lending during disasters may be limited and insufficient. Given that climate disasters destroy corporate profitability, it decreases corporate ability to fulfill financial obligations. Rational banks would take the increased credit risk into account and engage in credit rationing, thus limiting their capital injections to firms (Garmaise and Moskowitz, 2009; Ivashina and Scharfstein, 2010). In contrast, the government's goal of social stabilization accompanied by its significant influence would make it a better resort for exposed firms. The government's goal of social stabilization increases its incentive to intervene and its significant influence stresses its ability to intervene. The government in China holds tight control of public resources and exerts significant influence on bank systems.[3] The direct control on capital increases the government's discretion at capital injection. Meanwhile, the government's significant influence on the banking system further enhances its ability to channel liquidity to firms that it emphasizes(Khwaja and Mian, 2005; Cull and Xu, 2003; Li, Meng, Wang, and Zhou, 2008). Both the direct liquidity provided and indirect liquidity channeled are valuable for corporate recovery, making exposed firms more equipped to cope with the real shocks and reduce the negative impacts. Furthermore, the government's notable absolute autonomy in policies and regulations could ensure these rescue actions are timelier. The immediate response and large capital injection are vital for recovery. It could accelerate the local recovery. The local economy thus potentially recovers faster after disasters under the protection from the government.

Take the well-known disaster - the 2008 Sichuan earthquake as an example[4]. In 2008, china experienced its worst earthquake - the Sichuan earthquake. The disaster causes $150 billion loss. Following the disaster, the government responds quickly, taking every resource to

[3]Banks in china are mostly owned by the government.

[4]Also known as the Great Sichuan earthquake or Wenchuan earthquake.

revive the local economy. It sends troops and capital for rescuing almost immediately. More importantly, the central government announced a 1 trillion RMB (about US$146.5 billion) reviving package to help rebuild areas ravaged by the earthquake. This amount is significant compared to the 4 trillion rescue package for the worldwide financial crisis in 2007-2008, and the 40 million restoration funds by the US government for its costliest hurricane disaster (Hurricane Katrina).

However, the government could also be inefficient at disaster recovery. When the local society is interrupted by disasters, the government has great incentives to use all the resources it controls to maintain social stability. It may exert its control on both public resources and private firms. Firms thus may be forced to pursue the goal of social welfare maximization in contrast to the typical goal of shareholder wealth maximization (Boycko, Shleifer, and Vishny, 1996; Bertrand, Schoar, and Thesmar, 2007). Politicians' incentive to secure personal benefits may further strengthen the rent-seeking behaviors. Healy, Malhotra, et al. (2010) and Gasper and Reeves (2011) show that citizens punish politicians for their non-doings in crisis. Disasters increase politicians' career concerns and incentives to pursue personal benefits, creating conflicts between public benefits and personal benefits. For example, they may window dress, pour funds into firms, and force local firms to invest more regardless of investment efficiency, leading to an inefficient allocation of resources. Government actions under their intervention turn out to be less efficient. The government's role in restoring is weakened. At the extreme, it may even hinder economic recovery.

To clear the net effect of government in buffering firms against real shocks, we exploit natural disasters as natural experiments. We investigate whether the tight-controlling and influential government is beneficial for corporate recovery, and how it facilitates or hinders the recovery. Specifically, we compare the performance of exposed firms which experienced

natural disasters with that of other firms that experienced no disasters. We also explore the interaction of different government intervention methods to help understand the complicated nature of government intervention.

Natural disasters provide a unique setting to investigate these issues [5]. First, natural disasters as exogenous shocks help mitigate potential endogeneity concerns in empirical studies. Natural disasters are unpredictable. So are subsequent government efforts in intervening. It is thus unlikely for firms to predict government assistance in the future and adjust beforehand. Second, natural disasters highlight the importance of government. As rational banks limit their liquidity supplies to affected firms, the government rises to be the major provider of stimulus funding. Its controls and intervention incentives are strengthened following disasters. As a result, firms under government intervention may behave differently.

Consistent with our conjecture, we find that the local economy is efficiently aided by the government against disasters. Firms experience higher profitability following disasters. Compared to the situations in the US or other economies where the government does not have such controlling power and autonomy, the better post-disaster profitability in china is quite surprising and worth noting. Specifically, when we dig further and consider corporate institutional background, we find that the better profitability documented is mainly from state-owned enterprises (SOEs), while non-SOEs do not experience any significant changes in their performance. SOEs, which are largely criticized for being bad performers and destroyers of social welfare in the literature (Cingano and Pinotti, 2013; Amore and Bennedsen, 2013; Fisman and Wang, 2015), regain their glory during real shocks. It suggests that government interventions in the type of ownership improve firms' resilience to real shocks. The evidence

[5]There are a lot of papers in the literature exploiting natural disasters as shocks to firms and examining their real consequences. See Ouazad and Kahn (2022); Bakkensen and Barrage (2022); Kilic and Wachter (2018); Gao, Liu, and Shi (2020) for example.

indicates the bright side of the government intervention - buffering in distress and spurring growth recovery.

The stimulation effects vary with corporate vulnerabilities to disasters. Firms with higher financial constraints are more vulnerable to disasters. On the one hand, they have fewer internal resources at hand to cope with real shocks. On the other hand, the less efficient adjustment would damage their credit conditions, and thus limit their external fund-raising ability. For those firms, the liquidity provided and induced by the government would be more relevant and important for their survival and subsequent recovery. Conditional on corporate vulnerability, we indeed show that firms that are more vulnerable to disasters benefit more from the government. They have better profitability compared to other firms and recover quicker from disasters.

We further investigate how the government helps combat disasters. We show that government provides sufficient liquidity to affected firms. It provides liquidity both directly and indirectly, which is essential for corporate rebuilding. Specifically, the government responds by providing more direct capital injections to help in economic recovery. They also influence banks and persuade them to lend more to affected areas. As a result, government-intervened firms not only gain direct government support, but also enjoy easier access to bank lending post-disasters.

Given these liquidity advantages, the government-intervened firms increase corporate investments. Government-intervened firms increase their investment by 5.2%. The effects are in direct contrast to the investment-shrinking situations of other non-intervened firms. It indicates that government intervention provides enough necessary funding for disaster relief. It is efficient in helping stimulate corporate growth. The results are in support of the performance protection effect of the government, as it indicates that real activities

corroborate the performance effect.

We also test the efficiency of government intervention. The better performance and fast recovery of firms provide the first piece of evidence on the efficiency of government interventions. We further investigate the question by examining the investment efficiency of intervened firms. We find that government-intervened firms exhibit higher investment efficiency. Their investments are beneficial for their profitability. Capital tilt to these efficient firms is beneficial for social welfare. In addition, we examine government intervention in social welfare from another perspective - employment. Unemployment is a top concern of the government. It could cause social unrest in distress. We find that government-intervened firms are stable in their employment, while non-intervened firms exhibit significant layoffs. All these indicate the efficiency of government intervention.

Finally, we document the complicated nature of government protection. The government can intervene in various ways, and combining different intervention methods can generate different impacts. We show that the appearance of another important disaster relief tool - fiscal expenditure alters the beneficial effects of ownership interventions. For government-intervened firms, the better performance documented before only appears when the local fiscal expenditure is low. On the contrary, local fiscal expenditure provides non-government-intervened firms valuable buffers. Non-government-intervened firms perform much better when local fiscal expenditure is high. This has important policy implications. It suggests that combinations of different intervention tools could generate different effects. The government should consider more carefully for its interventions when it has different relief targets.

Overall, this paper shows that the government is critical in disaster recovery. It provides sufficient liquidity to firms both directly and indirectly, stimulates corporate investments, and finally increases corporate performance and improves social welfare. Our results are robust

when we use alternative specifications, or consider self-selections of government intervention, omitted variable concerns, and disaster magnitude.

The paper has made several contributions to the literature. First, we contribute to the literature on economic recovery and development following natural shocks. Previous literature identifies banks as important players in the recovery process. However, the assistance of banks is not sufficient, and its effects vary with different bank systems and bank motivation (Morse, 2011; Cecchetti, King, and Yetman, 2011; Schüwer, Lambert, and Noth, 2019). The Chinese government provides a unique setting for us to examine important but understudied factors for economic recovery. Our findings that firms in china perform well even right after disasters are quite interesting and surprising. It is in contrast to existing findings in other developed countries, such as U.S. and U.K. which show that firms perform much worse after disasters and take time to recover. We provide an explanation for this particular phenomenon by proposing the government as a more essential and efficient buffer. This paper identifies the government as an important and critical player in economic recovery.

Second, we contribute to the literature on the value of government interventions. Previous studies about government intervention mainly focus on the effect of direct government intervention in firms (Chen, Sun, Tang, and Wu, 2011; Bond and Goldstein, 2015; Deng, Jiang, Li, and Liao, 2020). There are few papers exploring the interaction between different government interventions. Government usually uses a combination of several methods when engaging in economic recovery; among these, local fiscal spending is frequently used. Our finding that local fiscal spending mutes the beneficial effects on SOEs while stimulating non-SOEs' performance indicates the complicated nature of government interventions. It has strong policy implications for government policy-making during distress.

Third, this paper is closely related to the literature about the social cost of govern-

ment intervention. Government intervention is widely documented to be beneficial for private firms(Amore and Bennedsen, 2013; Bunkanwanicha and Wiwattanakantang, 2008; Chen et al., 2011; Goldman, 2020), but detrimental to social welfare (Cingano and Pinotti, 2013; Amore and Bennedsen, 2013; Fisman and Wang, 2015). The government thus devoted itself to privatization so as to mitigate government intervention (Boycko et al., 1996; Dinc and Gupta, 2011; Megginson et al., 2017; Boubakri, Guedhami, Kwok, and Wang, 2019). However, there are competing ideas about whether privatization is essential. Our paper contributes to the strand of literature by documenting the bright side of government interventions. Government intervention is critical for economic growth following real shocks. It channels liquidity to exposed firms both directly and indirectly, stimulates corporate investment, and finally boosts corporate recovery. Government intervention during distress can not only benefit private firms, but also promote social welfare. We also contribute by showing the complicated nature of different government interventions.

The rest of the paper is organized as follows. Section II describes the data and sample. Section III investigates the role of government in disaster recovery, and tests the robustness of findings. Section IV explores the variance of the protection effect on firms' vulnerability to disasters. Section V studies the channel of government effects on disaster recovery and checks its efficiency. Finally, section VI concludes the paper.

II. Data

We combine two categories of data from the China Stock Market and Accounting Research (CSMAR) database. The database includes detailed information about earthquake events in mainland China since 1949 (the year of the founding of China), including the accurate

time the events happened and the areas affected. It also includes information about firm characteristics retrieved from corporate annual reports.

We begin with a sample of all A-share Chinese listed companies on the main board from 2002-2019. From this sample, we exclude companies with incomplete data regarding the controlling variables, and observations with missing values. To alleviate the impact of outliers, all the continuous variables are winsorized at the 1 and 99 percentiles. Our final sample has 33,983 firm-year observations with 2,900 firms.

We use earthquakes as natural disasters to examine the impact of climate risks on firms and the government's role in the recovery process. Compared to other types of natural disasters, earthquakes happen more frequently in China, and they usually incur tremendous losses. Based on the detailed earthquake data in CSMAR, we are able to trace corporate disaster experiences at the province level, and thus examine corporate recovery afterward. If a firm is located in a province affected by an earthquake during a year, we consider the firm as an exposed firm or affected firm, otherwise unaffected firm.

We measure the extent of corporate recovery using corporate financial performance as the proxy. Specifically, we focus on a firm's profitability (ROA) calculated by its net income divided by its total assets. Disasters usually disturb corporate profitability. Higher profitability after disasters would indicate better recovery.

Table II reports the descriptive statistics of firm-level key variables in our sample. An average firm in our sample has a profitability ratio of 2.84, with a stand deviation of 7.17, which is compared with that in the A-share market including all listed firms. The mean statistic of $Earthquake$ is 0.18. It indicates that earthquake is not so rare in China. About 18 percent of firms in our sample have experienced at least one earthquake in the previous year. Importantly, among those firms, 49% are state-owned enterprises (SOEs). The table

also reports summary statistics for typical firm characteristics. The average value of $LnAsset$ is 20.10, which means that the average size of sample firms is approximately 16 billion yuan. Meanwhile, an average firm in our sample has a Tobin's Q of 1.86, a leverage of 0.48, R&D investment intensity of 0.86 which is comparable to that in the literature. Firms in our sample are also fairly monitored. They have an average independent board member ratio of 33%, management ownership of only 3%, and ownership concentration of 35.46%.

[Insert Table II here]

III. Earthquakes and firm recovery

In this section, we explore the value of government in buffering disasters.

We explore corporate vulnerabilities to disasters and the government's ability to help. Specifically, we focus on the extreme case, examining the immediate recovery of firms after disasters. We compare the performance of exposed firms and unexposed firms right after disasters. The better performance of firms right after disasters would shed light on the incredible and efficient role of the Chinese government in the post-disaster economy stimulating. We use the following linear model to test the issues.

$$ROA_{i,t} = \alpha + \beta * Earthquake_{i,t-1} + Z_{i,t-1} + \eta_t + \mu_i + \varepsilon_{i,t} \tag{1}$$

where $ROA_{i,t}$ (return on asset) is the proxy for corporate recovery. It is calculated as corporate operating income divided by the total asset. $Earthquake_{i,t-1}$ is a dummy variable indicating whether a firm experienced an earthquake in the previous year. It equals one if firm i is located in the province affected by at least one earthquake in year $t-1$. $Z_{i,t}$

includes a series of control variables, including firm size ($LnAsset$), leverage ($Leverage$), growth opportunities ($TobinQ$), firm age (Age), the square of firm age (Age^2), R&D investment intensity ($R\&D$), percentage of independent directors on board($InBoard$), CEO duality($CeoDua$), managerial ownership(MO), and ownership concentration(OC). We also control for time-invariant firm differentials and time-variant macro trends by including firm fixed effect (η_t) and year fixed effect (μ_i). $\varepsilon_{i,t}$ is the error term, which is clustered at the firm level.

[Insert Table III here]

Results are reported in Table III. As depicted in the table, all coefficients of $Earthquake_{i,t-1}$ are significant and positive. In column (4), when we include all the control variables, the year and firm fixed effects, a significant positive correlation is persistent between the $Earthquake_{i,t-1}$ and the firm's financial performance afterward. The coefficient of 1.095 is statistically significant at the 5 percent level. When a firm experiences an earthquake in the former year, the firm's financial performance will not decrease but increase by 1.095%. The finding is surprising and in direct contradiction to these observed in other countries where firms usually rely on banks for capital injections during disasters. It suggests that the setting of China and the Chinese government would have some special points. The tight controls of the Chinese government on resources and its significant influence on banks and firms would make it better at economic recovery. Chinese firms recover incredibly fast after disasters.

The coefficients of the control variables are consistent with the previous empirical results. Specifically, growth opportunity ($TobinQ$), and the higher presence of independent directors ($InBoard$) have positive impacts on future financial performance, while financial leverage

(*Leverage*), and firm size (*LnAsset*), decrease corporate profitability. The estimated coefficients of *Age* and Age^2 show that the age of firms has a U-shaped effect on corporate financial performance. Overall, the baseline regression results support our hypothesis that a firm's financial performance improves after natural disasters in China given the ability and incentive of the government to help.

A. SOEs and Non-SOEs

This finding above is counter-intuitive since a firm's financial performance is expected to decrease after a natural disaster in an efficient market. However, China is an exception. To give an intuitive explanation to our finding, we first seek to analyze the role of ownership intervention by the government in the phenomenon.

Specifically, we examine the earthquake effect on state-owned enterprises and private businesses separately. Data on the corporate background is collected from the CSMAR database. Firms are classified into SOEs and Non-SOEs based on their equity nature. We split our sample into two groups based on whether firms are state-owned enterprises or private businesses and analyze whether the financial performance of these firms recovers differently after natural disasters.

In Table IV, we report the results when we run the main specification for SOEs and non-SOEs, separately. In column (1), we report the effects of earthquakes on non-SOEs. In column (2), we report the effect on SOEs. It shows the fast recovery we documented before comes mainly from SOEs. The ROA of SOEs indeed increases after the disaster. The ROA of SOEs increases by 1.103% after earthquakes, and the coefficient is statistically significant at the 5% level. However, private businesses do not recover as fast as SOEs. The ROA of private businesses increases by 0.852%, yet the coefficient is insignificant.

The results in Table IV show an intuitive explanation for why firms' financial performance increases but does not decrease after disasters In China. We show suggestive evidence that government plays a significant role in post-disaster recovery. It exhibits a valuable helping hand. Although government ownership is usually criticized to be detrimental to firms and social welfare, the finding in this section document the bright side. Government ownership intervention is beneficial both for firm performance and economic stabilization at least when in disasters.

[Insert table IV here]

B. Endogeneity Concerns

Although exogenous earthquakes can mitigate the concerns that firms predict the occurrence and adjust in advance, we take several methods to further address the endogeneity concerns. We first carry out the parallel trend test to ensure the existence of parallel trends before disasters. We second use alternative specifications, including the staggered Difference-in-Difference design (DiD) and Propensity Score Matching Method (PSM) to address the concern that firms experiencing disasters are systematically different from those experiencing no disasters.

In Figure 1, we show the results of the parallel trend test. As shown in the Figure, the firm's financial performance is indifferent between the treated groups (firms that experience an earthquake) and the control groups (firms that do not experience an earthquake). Specially, we can see that the financial performance of the treated groups even does not decrease in the year of the earthquake.

[Insert figure 1 here]

We also implement the stacked Difference-in-Difference approach (Cengiz, Dube, Lindner, and Zipperer, 2019) to get rid of the influence of omitted firm characteristics. We identify every earthquake as an event and compare the performance of treated and control firms at different time points around earthquakes. Specifically, we run the following model:

$$\begin{aligned} ROA_{i,t} =& \alpha + \beta_1 * Earthquake_{i,t-1} + \beta_2 * Earthquake_{i,t} + \beta_3 * Earthquake_{i,t+1} \\ &+ \beta_4 * Earthquake_{i,t+2} + Z_{i,t-1} + \eta_t + \mu_i + \varepsilon_{i,t} \end{aligned} \tag{2}$$

where $Earthquake_{i,t+j}$ indicates whether firm i experiences any earthquake in the year $t+j$. All other variables are defined the same as that in the main specification 1.

Results in Table V show that our results are robust to the alternative specification. Firms' financial performance increases in a year after the earthquake in general, and such a relation still holds in the SOEs but not in the non-SOEs. And, coefficients for *Earthquake* in the pre-disaster period are neither significant. SOEs recover faster after disasters compared to other non-SOEs.

[Insert table V here]

To further alleviate the sample selection bias problem that firms in earthquake areas are different from those do not locate in such areas, we also examine the relation between disasters and performance protection in a propensity score matching (PSM) sample. We construct the matching sample as follows: first, we denote firms that had earthquake experiences a year before as treated firms and those that did not have such experiences as control firms;

second, for each treated firm, we implement the PSM method with replacement and select one matching firm among control firms with the nearest score. The matching dimensions include all the control variables denoted in the model 1.

Based on the matching sample, we re-estimate model VI and tabulate the results in Table VI. The coefficient of *Earthquake* is still significantly positive in this balanced sample. The positive relation between earthquakes and firms' financial performance is robust after considering sample selection bias. Besides, the significant positive relation between earthquakes and firms' performance recovery remains mainly in the SOEs. Government is a better resort for firms in the recovery process.

[Insert table VI here:]

Finally, we implement the placebo test of Chetty (2009)[6]. We randomly generate enterprises that experience the "Earthquake" in the prior year and test the effect of these pseudo-events on firm performance. We repeat the process 1000 times and draw the distribution of the coefficients.

The results show that the coefficient distribution obtained by random simulation is around 0, and the coefficients of the benchmark regression are completely independent of the distribution of the coefficients. In addition, the t value of the random simulation coefficient is also distributed on the right side of 1.96; that is, the coefficient result of the random simulation is not only economical but also statistically indifferent from 0.

[6]Results are available upon request.

IV. Mechanism Analyses

In this section, we further explore the channel for the documented stabilizing effects of government intervention against disasters. We propose that the controlling and influential Chinese government could stimulate economic recovery through two potential channels: sufficient capital injection and protection from investment liquidation.

A. Financing

To explore why firms' financial performance recovered quickly in a year after the natural disaster, we first test whether firms got more financing after the earthquake. Liquidity is essential for economic recovery(Gan, 2007; Garmaise and Moskowitz, 2009; Ivashina and Scharfstein, 2010; Puri et al., 2011; De Haas and Van Horen, 2013; Cortés and Strahan, 2017). In theory, firms that experienced an earthquake should have high demand but more difficulty in financing. While banks as the typical resort of firms for funds in disasters engage in credit rationing, the government would take economic stability and recovery as the top priority. It would have a much stronger motivation to channel valuable funds to affected firms for their recovery. Its absolute autonomy and control over public resources and banking systems also increase its ability to do so. In this case, we expect affected firms to enjoy sufficient capital injection in their recovery. They thus recover faster. Specifically, we investigate the liquidity provision by the government from both the direct allowance channel and the indirect bank credit channel. Testing whether these firms get more access to financing helps us to understand whether government plays a critical role in firms' post-disaster recovery.

We run the following linear model to examine whether the government provides sufficient liquidity to affected firms:

$$Allowance_{i,t}(Loan_{i,t}) = \alpha + \beta * Earthquake_{i,t-1} + Z_{i,t-1} + \eta_t + \mu_i + \varepsilon_{i,t}(2) \quad (3)$$

where $Allowance_{i,t}$ is the natural logarithm of firm i's allowance received from the government in year t, and $Loan_{i,t}$ is the natural logarithm of firm i's new loans received from banks in year t; $Earthquake_{i,t-1}$ is a dummy variable that equals one if firm i experiences at least one earthquake in the year t-1. $Z_{i,t}$ includes a series of control variables that are the same as in the model 1. η_t, and mu_i are year, and firm fixed effects, respectively. $\varepsilon_{i,t}$ is the error term, which is clustered at the firm level.

We report the results of liquidity injection in table VII. Panel A shows the direct funding provided by the government. Panel B presents the results of the bank lending channelled to firms. We find that firms' allowance from the government increased by 32.6% in the first year after earthquakes. The coefficient is statistically significant at the 5% level. In the subsample analysis, when we bisect the sample based on corporate equity nature, we find that only SOEs get more allowance. Private firms do not get more access to such financing after the earthquake. In Panel B, when we use the new bank loans received as the dependent variable, we find similar results. Bank loans received by firms from banks increased by 32.6% in the first year after the earthquake. In the subsample analysis, we again find that only SOEs get preferential treatment in financing, while private firms do not get more access to such financing after the earthquake.

Overall, findings suggest that government increases funding injection to firms after earthquakes to fulfill corporate financial demands and the government mainly increases funding towards SOEs, rather than private firms.

[insert Table VII here]

B. Investment and Investment Efficiency

Financing is an essential requirement for corporate growth, but it does not guarantee a surge in financial performance of firms that experience an earthquake. Sustainable growth must be supported by efficient utilization of capital. We further test whether firms increase their investment after a disaster. If firms get enough financing after a disaster, they could transmit such a crisis into an opportunity by increasing their investment.

To test whether firms increase investment after a disaster, we re-run model 1 with the dependent variable replaced. We change the main dependent variable to *Investment*, which is the natural logarithm of firms' fixed asset investment in a year. In addition, we control the firm's fixed asset investment in the previous year to control the firm's investment trends.

As shown in Table VIII, firms suffer less in investment liquidation after disasters. A general firm's fixed investment increases by 2.4% in the first year after the earthquake, although such an increase is not statistically significant. When we focus on SOE and non-SOEs separately, the subsample analysis suggests that the increase is concentrated in SOEs. SOEs increase their fixed asset investment by 5.2%, while private firms slightly reduce their limited asset investment. The results are consistent with the findings in the previous section. Private firms do not get additional financing. They would suffer more in funding for recovery or growth, thus are more likely to forego valuable investment opportunities. The issue would be less permeated among SOEs with more capital injection.

[insert Table VIII here]

Up till now, our results provide suggestive evidence of the mechanisms of how firms recover fast after the disaster in China. However, financing and investment only help to boost the overall income of the firm, but not the return on assets. Higher investment expenditure

does not necessarily means higher profitability or growth. Firms may even engage in empire-building or other misbehavior in investing regardless of the potential profit. In this case, the protection provided by the government is inefficient. The large capital injection producing unsatisfied output hurt social welfare. Although the liquidity tilt to profitable firms indicates the efficiency of government interventions, we further explore this question by testing the investment efficiency of intervened firms. If intervened firms are better at capital utilization, the preferential treatment of these firms is efficient. Capital allocation to efficient firms increases social welfare.

Following (Bai, Philippon, and Savov, 2016; Carpenter, Lu, and Whitelaw, 2021), we run the following regression to test the efficiency of corporate investments:

$$ROA_{i,t} = \alpha + \beta * Earthquake_{i,t-1} * NetInv_{i,t-1} + Z_{i,t-1} + \eta_t + \mu_i + \varepsilon_{i,t} \tag{4}$$

where $ROA_{i,t}$ is firm i's return on asset in year t. $NetInv_{i,t}$ is the net investment to asset ratio of firm i in year t; $Earthquake_{i,t-1}$ is defined the same as before. It is a dummy variable that equals one if firm i is located in the province hit by earthquakes in the year $t-1$. $Z_{i,t}$ includes the same series of control variables as in the model 1. η_t and mu_i represents year and firm fixed effects, respectively. $\varepsilon_{i,t}$ is the error term, which is clustered at the firm level.

Results are reported in Table IX. We show that firms' investment efficiency increases by 0.067 in the first year after the earthquake. The positive effect is both economically and statistically significant. We then test whether such increases in investment efficiency are driven by private firms or SOEs. We separate firms into SOEs and Non-SOEs, an find that investment efficiency increases exist among both groups. Both SOEs and Non-SOEs utilize the capital more efficiently after disasters. Their investment bring larger increase in their

profitability. Furthermore, SOEs which are funded more by the government do not show a significantly weaker increase in their investment efficiency. These findings suggest that SOEs not only increase their fixed asset investment after disasters, but also improve their investment efficiency.

[insert Table IX here]

Finally, we explore another important investment activity of firms in their long-term strategy. We examine whether firms put more investment in R&D also after disasters with better investment opportunities and sufficient funding. We replace the dependent variable in the main specification, testing corporate innovation activities after disasters in general, for SOEs, and for Non-SOEs, separately.

Table X reports the results. Columns (1), (2) and (3) analyze corporate innovation activities using the whole sample, Non-SOEs only, and SOEs only, separately. Generally, corporate innovation activities do not change significantly after disasters. When we focus on SOEs and Non-SOEs, it becomes different. In column (3), we show that SOEs significantly increase their R&D investment by 1.258%. The coefficient is statistically significant at the 5% level. However, in column (2), the coefficient before *Earthquake* is insignificant and even has a negative sign. Private firms do not increase R&D investment due to financial constraints.

[insert Table X here]

Overall, findings in this section show that, with extra financing from the government, SOEs increase both their fixed asset investment and R&D investment after disasters, and

their investment efficiency also gets improved. In direct contrast, due to a lack of financing, private firms do not invest more after earthquakes. These results infer the valuable role of government in disaster recovery. Even under the same nice and helpful government, firms with government ownership intervention recover better and faster due to funding guarantees and thus investment protections. The real changes in financing and investment lend further support for the better performance we documented before. Furthermore, the improved utilization of capital by funded firms also indicate the efficiency of government's capital allocation.

V. Heterogeneous effect

After answering whether and how government plays its role in disaster recovery, we next examine the heterogeneity of the effect. We organize the analysis from both corporate vulnerability to disasters and government intervention characteristics.

A. Corporate Vulnerability to Disasters

We first explore the variant recovery effect of the government for firms with different vulnerabilities to disasters. The same earthquake may affect different firms differently. Some firms are more affected by the disruption caused by earthquakes, such as firms with higher financial constraints. As liquidity is essential for recovery, financial constraints firms have fewer resources at hand to help them adapt and adjust. They thus are expected to suffer more in disasters, which in turn, means that they would be the ones to benefit more from government intervention and protection.

We measure corporate financial constraints from both the micro-firm level and macro-

market level. First, We borrow China's Marketization Index from (Fan, Wang, and Zhu, 2010).[7]. If a firm is located in a province with high marketization index, it would be easier for firms to find other ways to gather capital needed for recovery. The visible hand of the government would be more valuable when the invisible hand of the market is disordered. We seek to find the meditation effect of marketization on the role of government. Second, we follow Chen and Lai (2021), using the WW index as the proxy for financial constraints. Firms with higher values in the WW index usually have more financial constraints. We split the firms into two samples based on medians of different measures for financial constraints, and run specification 1 on subgroups, separately.

Table XI shows the results of subgroup tests. In panel A, we examine the variant effect of government intervention on corporate recovery conditional on the marketization index. In panel B, we bisect the sample according to the medians of the WW index, and test the conditional effects. In each panel, we also further divide the sample based on whether firms are SOEs or not. In column (1) and column (2) of panel A, we show that firms recover faster when located in provinces that perform better in terms of marketization. However, the effects differ for SOEs and Non-SOEs. For private firms, we find that their ROA increases after an earthquake if located in provinces with high marketization index. They benefit from marketization. For SOEs, the ROA only increases in provinces with a low marketization index. The findings suggest that local governments with a high degree of marketization tend to help private firms in a disaster, while local governments with a low degree of marketization tend to support SOEs. Marketization and government intervention are substitutes in disaster recovery.

[7]China's Marketization Index is constructed based on five different aspects, government-market relationship, development of non-state-owned economy, product market development, factor markets development, development of market intermediary and legal system. The index is at the province level.

[insert Table XI here]

B. Government Intervention

We then take into consideration of different types of government interventions. The government usually employs various tools in disaster recovery. In addition to the direct ownership interventions, as we discussed above, another important tool is fiscal spending. The government usually increases its fiscal spending a lot to stimulate the economy and firms as well. Although ownership interventions and fiscal spending differ in many aspects, they share a common goal. Then how these different tools would interact to generate a differential impact for the government to fulfill the goal? We explore this question by comparing the effect of government intervention when the local fiscal spending is relatively high and relatively low.

In Table XII, we split our sample into two different groups based on the government's local fiscal investment. We compare firm performance between provinces that have a high investment in local fiscal investment and provinces that have a low investment in local fiscal investment. The first two columns in Table XII show that fiscal spending seems not as important as expected. Coefficients before *Earthquake* in both high and low local fiscal spending groups are significant and positive. Firms' *ROA* increases by around 1.16% in both subgroups. We further separate the sample into SOEs and non-SOEs to test whether local fiscal spending could generate some different and interesting effects for private firms and state-owned firms. Surprisingly, we find that the recovery speed for SOEs and non-SOEs varies with local fiscal spending. The *ROA* of private firms increases after an earthquake if the government invests more in public investment, while the *ROA* of SOEs only increases in

provinces that spend less on public investments.

Our results suggest that the two typical intervention methods used by the government - direct ownership intervention and local fiscal spending - works are substitutes for each other. The protection and beneficial effect generated by ownership intervention in disaster recovery are muted by fiscal spending, while the beneficial effect of fiscal spending is higher when ownership intervention does not appear in firms. The results shed light on the complicated nature of government intervention. The combination of different intervention methods may generate different effects. It also has important implications for corporate policy-making post-disasters. Governments with different targeting industries, and different goals, may carefully consider the portfolio of their rescue package.

[insert Table XII here]

VI. Conclusion

This paper studies the role of government in the recovery process following disasters. Using the unique Chinese data where the government has absolute control over public sources and the banking system, we show that government is critical and efficient in spurring economic growth after real shocks. They inject essential liquidity directly into affected firms, and channel bank lending indirectly for the corporate rebuild. Liquidity insurance decreases the corporate probability of foregoing valuable investment opportunities due to liquidity constraints.

In addition, we find that firms with preferential funding treatment improve their investment efficiency. As a result, intervened firms perform much better and recover faster

than other non-intervened firms. The liquidity being supplied to efficient firms indicates the efficiency of government interventions. Furthermore, we show that the buffering effect of government is more pronounced for more financially constrained firms. We also document the complicated nature of government intervention. Ownership interaction and local fiscal spending exhibit a substituting relationship in disaster recovery.

Generally, findings in this paper identify the government as a more critical buffer for disasters. It sheds light on the bright side of government intervention which is usually criticized for being detrimental to social welfare. Government intervention is valuable, at least for economic growth and economic stability post-disaster. Our findings are important for understanding the whole picture of government interventions and influencers of economic recovery. It generates insight into government policy-making in disasters.

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Appendix A. Variable Description

Variable	Definition
ROA	The ratio of net income over the book value of total assets.
Earthquake	A dummy variable equals one if the company experienced an earthquake in the former year and zero otherwise.
Leverage	Total debt divided by total assets.
Tobin's Q	Total market value divided by total book value.
Age	The number of years since a firm first reported in the stock market.
Age^2	The squared firm age of a firm. Age is the number of years since a firm first reported in the stock market.
LnAsset	The natural logarithm of 1 plus total assets.
R&D	The natural logarithm of corporate R&D expenditure.
InBoard	The percentage of independent board members on a firm's board.
CeoDua	An indicator equals one if a CEO also serves as a chairman, and zero otherwise.
MO	The percentage of a firm's stock owned by its executives.
OC	The percentage of a firm's stock owned by its largest shareholder.
SOE	A dummy variable equals one if the company is state-owned, zero otherwise.

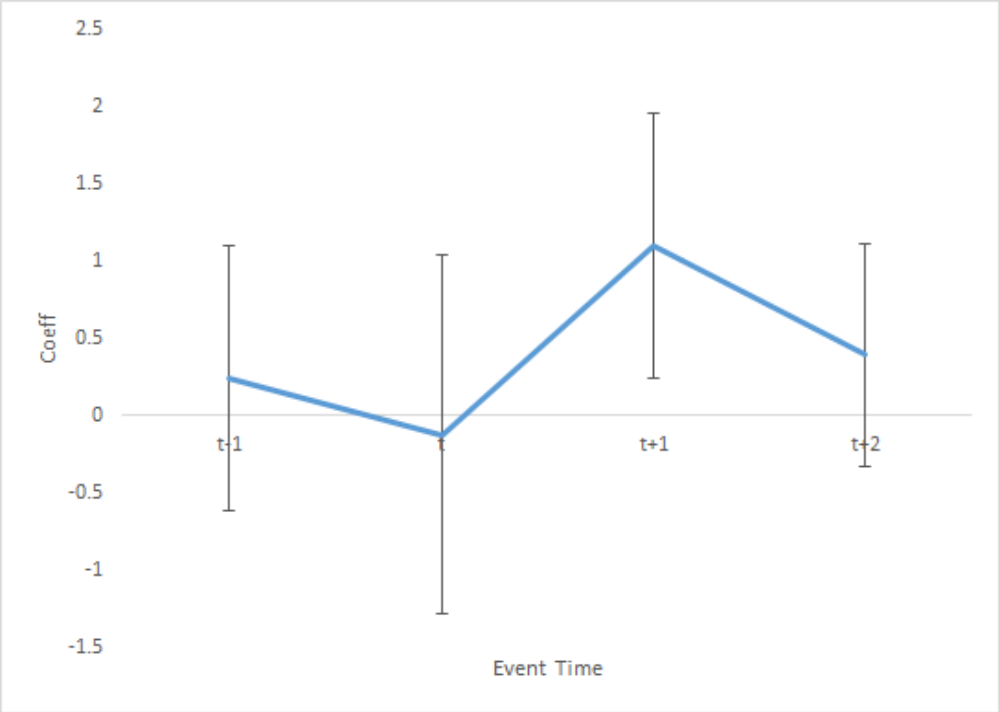

Figure 1. Corporate Financial Performance Around Earthquake
The figure shows the difference of corporate financial performance between affected firms and non-affected firms at different time points around earthquakes. Time t is the year when an earthquake happens. Affected firms are those located in the affected areas by the earthquake. Non-affected firms are located outside.

Table II: Summary Statistics

This table reports summary statistics of our main variables. Panel A shows the sample of A-share Chinese listed companies on the main board from 2002-2019. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels.

	Obs.	Mean	St.D.	25 percentile	Median	75 percentile
ROA	33,983	2.84	7.17	1.00	3.02	5.85
Earthquake	33,983	0.01	0.08	0.00	0.00	0.00
LnAsset	33,983	20.10	6.29	20.75	21.67	22.63
Tobinq	33,983	1.86	1.61	1.15	1.48	2.13
Leverage	33,983	0.48	0.22	0.32	0.48	0.63
Age	33,983	13.35	6.64	9.00	13.00	18.00
R&D	33,983	0.86	1.47	0.00	0.00	1.41
InBoard	33,983	0.33	0.11	0.33	0.33	0.38
CeoDua	33,983	0.48	0.77	0.00	1.00	1.00
MO	33,983	0.03	0.10	0.00	0.00	0.00
OC	33,983	35.46	17.27	23.06	33.77	48.08

Table III: Performance After Disasters

This table reports the effect of earthquakes on firms' financial performance from 2002 to 2019 using model (1). The dependent variable of interest is *ROA*. *Earthquake* is a dummy variable that equals one if a firm experiences at least one earthquake in the previous year. Firm and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all control variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Dependent Variable: ROA			
	(1)	(2)	(3)	(4)
Earthquake	1.071**	1.050**	1.105**	1.095**
	(0.472)	(0.450)	(0.448)	(0.446)
LnAsset		-0.071***	-0.052***	-0.050***
		(0.006)	(0.006)	(0.006)
Tobinq		0.324***	0.335***	0.371***
		(0.048)	(0.048)	(0.049)
Leverage		-4.342***	-3.917***	-3.789***
		(0.467)	(0.463)	(0.460)
Age			-0.401***	-0.276***
			(0.067)	(0.070)
Age^2			0.010***	0.007***
			(0.002)	(0.002)
R&D			0.121*	0.126**
			(0.062)	(0.061)
InBoard				0.980
				(0.967)
CeoDua				-0.009
				(0.099)
MO				3.908***
				(1.227)
OC				0.060***
				(0.008)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	33,908	33,908	33,908	33,908
Adjusted R^2	0.230	0.243	0.246	0.250

Table IV: Performance Effects of Disasters on SOEs and non-SOEs

This table reports the differential effects of earthquakes on the performance of SOEs and non-SOEs. The sample period is from 2002 to 2019. The dependent variable of interest is *ROA*. *Earthquake* is a dummy variable that equals one if a firm experiences at least one earthquake in the previous year. The controls include firm size (*LnAsset*), Tobin's Q, leverage, firm age, squared firm age, R&D expenditure, the percentage of independent board (*InBoard*), CEO duality (*CeoDua*), managerial ownership (*MO*) and ownership concentration (*OC*). Firm and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Dependent Variable: ROA	
	Non-SOE	SOE
	(1)	(2)
Earthquake	0.852	1.013**
	(0.707)	(0.458)
Controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	16,555	15,679
Adjusted R^2	0.244	0.269

Table V: Performance Effects of Disasters_DiD

This table reports the effect of earthquakes on corporate financial performance using stacked DID. The sample period is from 2002 to 2019. The dependent variable is *ROA*. *Quake_j* is a dummy variable that equals one if a firm experiences at least one earthquake in year t+j. The controls include firm size (*LnAsset*), Tobin's Q, leverage, firm age, squared firm age, R&D expenditure, the percentage of independent board (*InBoard*), CEO duality (*CeoDua*), managerial ownership (*MO*) and ownership concentration (*OC*). Firm and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Dependent Variable: ROA		
	Whole	Non-SOE	SOE
	(1)	(2)	(3)
$Quake_{-1}$	-0.338	-0.966	0.157
	(0.672)	(1.093)	(0.674)
$Quake_0$	0.988	0.828	0.719
	(0.638)	(1.050)	(0.634)
$Quake_1$	1.131**	0.681	1.232**
	(0.459)	(0.695)	(0.536)
$Quake_2$	0.252	-0.003	0.295
	(0.608)	(0.776)	(0.946)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	123,449	59,502	57,628
Adjusted R^2	0.300	0.303	0.310

Table VI: Performance Effect of Disasters_PSM

This table reports the effect of earthquakes on corporate performance based on the balanced sample constructed using Propensity Score Matching (PSM). The sample period is from 2002 to 2019. The dependent variable is *ROA*. *Earthquake* is a dummy variable that equals one if a firm experiences at least one earthquake in the previous year. The controls include firm size (*LnAsset*), Tobin's Q, leverage, firm age, squared firm age, R&D expenditure, the percentage of independent board (*InBoard*), CEO duality (*CeoDua*), managerial ownership (*MO*) and ownership concentration (*OC*). Firm and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Dependent Variable: ROA		
	Whole	Non-SOE	SOE
	(1)	(2)	(3)
Earthquake	1.087**	0.786	1.037**
	(0.472)	(0.787)	(0.468)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	6,503	2,844	3,497
Adjusted R^2	0.208	0.183	0.251

Table VII: Earthquakes and Financing

This table reports the effect of earthquakes on corporate financing. The sample period is from 2002 to 2019. In panel A, we test the effect on direct government allowance provided to a firm. Specifically, we use the natural logarithm of 1 plus the allowance a firm received from the government in a year as the dependent variable (*Allowance*). In panel B, we test the effect of earthquakes on indirect financing, that is bank loans. The dependent variable here is the natural logarithm of 1 plus the loan amount a firm received from banks in a year (*Loan*). *Earthquake* is a dummy variable that equals one if a firm experiences at least one earthquake in the previous year. The controls include firm size (*LnAsset*), Tobin's Q, leverage, firm age, squared firm age, R&D expenditure, the percentage of independent board (*InBoard*), CEO duality (*CeoDua*), managerial ownership (*MO*) and ownership concentration (*OC*). Firm and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Whole	Non-SOE	SOE
	(1)	(2)	(3)
Panel A: The Effect of Earthquakes on Government Allowance			
Earthquake	0.326*	-0.003	0.776***
	(0.197)	(0.289)	(0.240)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	33,908	16,555	15,679
Adjusted R^2	0.874	0.874	0.870
Panel B: The Effect of Earthquakes on Bank Loans			
Earthquake	0.035*	0.015	0.064**
	(0.019)	(0.026)	(0.027)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	33,908	16,555	15,679
Adjusted R^2	0.468	0.503	0.393

Table VIII: Earthquakes and Corporate Investments

This table reports the effect of earthquakes on corporate investment behaviors. The sample period is from 2002 to 2019. The dependent variable is the natural logarithm of 1 plus total fixed asset investments of a firm in a year (Fix_asset). $Earthquake$ is a dummy variable that equals one if a firm experiences at least one earthquake in the previous year. The controls include firm size ($LnAsset$), Tobin's Q, leverage, firm age, squared firm age, R&D expenditure, the percentage of independent board ($InBoard$), CEO duality ($CeoDua$), managerial ownership (MO) and ownership concentration (OC). Firm and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Dependent Variable: Fix_asset		
	Whole	Non-SOE	SOE
	(1)	(2)	(3)
Earthquake	0.024	-0.005	0.052**
	(0.018)	(0.031)	(0.025)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	33,908	16,611	15,698
Adjusted R^2	0.989	0.966	0.988

Table IX: Earthquakes and Corporate Investment Efficiency

This table reports the effect of earthquakes on corporate investment efficiency. The sample period is from 2002 to 2019. The dependent variable is ROA. Net_Inv is the a firm's ratio of net investment to total asset. *Earthquake* is a dummy variable that equals one if a firm experiences at least one earthquake in the previous year. The controls include firm size ($LnAsset$), Tobin's Q, leverage, firm age, squared firm age, R&D expenditure, the percentage of independent board ($InBoard$), CEO duality ($CeoDua$), managerial ownership (MO) and ownership concentration (OC). Industry and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Dependent Variable: ROA		
	Whole	Non-SOE	SOE
	(1)	(2)	(3)
Earthquake * Net_Inv	0.067***	0.064*	0.070**
	(0.024)	(0.037)	(0.033)
Earthquake	0.201	-0.218	0.728*
	(0.425)	(0.679)	(0.440)
Net_Inv	0.016**	0.024**	0.009
	(0.007)	(0.010)	(0.009)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	33,983	16,611	15,698
Adjusted R^2	0.233	0.231	0.265

Table X: Earthquakes and Corporate Innovation Activities

This table reports the effect of earthquakes on corporate innovation activities. The sample period is from 2002 to 2019. The dependent variable is the natural logarithm of 1 plus a firm's total innovation investments in a year ($R\&D$). *Earthquake* is a dummy variable that equals one if a firm experiences at least one earthquake in the previous year. The controls include firm size ($LnAsset$), Tobin's Q, leverage, firm age, squared firm age, R&D expenditure, the percentage of independent board ($InBoard$), CEO duality ($CeoDua$), managerial ownership (MO) and ownership concentration (OC). Firm and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Dependent Variable: R&D		
	Whole	Non-SOE	SOE
	(1)	(2)	(3)
Earthquake	0.404	-0.247	1.258**
	(0.387)	(0.504)	(0.572)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	33,908	16,555	15,679
Adjusted R^2	0.732	0.746	0.688

Table XI: Financial Vulnerability and the Performance Effect of Earthquakes

This table reports the effect of earthquakes on corporate financial performance conditional on corporate vulnerability to disasters. We measure corporate financial constraints from both a firm's internal environment and external environment, using measures WW index and local marketization index. The sample period is from 2002 to 2019. In Panel A, we bisect the sample based on local marketization index. In Panel B, we bisect the sample based on WW index. The dependent variable is *ROA*. *Earthquake* is a dummy variable that equals one if a firm experiences at least one earthquake in the previous year. We bisect the sample according to medians of corresponding factors. The controls include firm size (*LnAsset*), Tobin's Q, leverage, firm age, squared firm age, R&D expenditure, the percentage of independent board (*InBoard*), CEO duality (*CeoDua*), managerial ownership (*MO*) and ownership concentration (*OC*). Firm and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Dependent Variable: ROA					
	Whole		Non-SOE		SOE	
	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Conditional Effect on Marketization Index						
Earthquake	1.112	1.411***	0.479	1.871***	1.867***	0.348
	(0.701)	(0.520)	(1.161)	(0.695)	(0.614)	(0.686)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,141	26,582	3,130	13,333	3,792	11,799
Adjusted R^2	0.288	0.334	0.286	0.344	0.318	0.341
Panel B: Conditional Effect on the WW Index						
	0.260	1.571***	-0.559	1.552*	0.648	1.193*
	(0.509)	(0.603)	(0.576)	-0.837	(0.749)	(0.723)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,956	15,990	6,601	9,630	9,272	6,194
Adjusted R^2	0.433	0.177	0.426	0.187	0.436	0.161

Table XII: Fiscal Spending and the Performance Effect of Earthquakes

This table reports the effect of earthquakes on corporate financial performance conditional on the amount of government investments. The sample period is from 2002 to 2019. We bisect the corresponding sample according to the median of the government investment amount. The dependent variable is *ROA*. *Earthquake* is a dummy variable that equals one if a firm experiences at least one earthquake in the previous year. The controls include firm size (*LnAsset*), Tobin's Q, leverage, firm age, squared firm age, R&D expenditure, the percentage of independent board (*InBoard*), CEO duality (*CeoDua*), managerial ownership (*MO*) and ownership concentration (*OC*). Firm and year fixed effects (FEs) are included. Standard errors clustered at the firm level are reported in parentheses. Definitions of all variables are described in the Appendix. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** denote significance at the 10%, 5%, and 1% levels ,respectively.

	Dependent Variable: ROA					
	Whole		Non-SOE		SOE	
	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)
Earthquake	1.163*	1.162*	0.585	1.745**	1.516***	-0.063
	(0.626)	(0.622)	(1.052)	(0.702)	(0.516)	(0.954)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,019	17,441	8,050	7,536	6,683	8,528
Adjusted R^2	0.266	0.24	0.266	0.22	0.283	0.274