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Do natural disasters affect credit risk? Evidence from global banks

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ABSTRACT

This study examines how natural disasters affect banks' global credit risk. This study measures the number of people killed, houses destroyed, and dwellings damaged by natural disasters while non-performing loan ratios measure credit risk. This study employed POLS, white heteroscedastic-robust and double-clustered standard errors to demonstrate the relationship between the variables for each measure using data from 485 global banking companies from 2018 to 2022. This study then used a two-stage GMM for the endogeneity result to confirm a causal relationship between natural disasters and credit risk. The result shows that all explanatory variables positively correlated, suggesting that natural disasters cause higher credit risk for global banks. This study shows that no relationship is robust to alternative credit risk measures and estimation methods, and it passes several endogeneity tests. The results of this study have practical implications for banks, emphasizing the need to adopt strong risk management techniques to reduce the effects of disasters on loan repayment. The implication of this study provides the government with an understanding of how to strategically provide assistance and incentives to help banks become more resilient in disaster-prone areas.

Contribution/Originality: This study offers original insights into how governments can strategically provide assistance and incentives to help banks become more resilient in disaster-prone areas. This study is the first to examine the effect of natural disasters on the credit risks of global banks.

1. INTRODUCTION

Natural disasters such as earthquakes, hurricanes, floods, and forest fires are occurring with increasing frequency and causing major damage worldwide (Chang & Berdiev, 2013; Chen, Zhao, & Chang, 2023). These events jeopardise people's safety, damage the environment, and have a lasting impact on national economies (Brei, Mohan, & Strobl, 2019). The destruction necessitates massive recovery spending leading to increased public debt, especially in financially constrained countries (Utomo & Marta, 2022). Natural disasters disrupt income, damage property, and increase spending, making it difficult for individuals to meet their credit obligations (Botzen, Deschenes, & Sanders, 2019). The loss of jobs, the closure of businesses, and limited access to banking services exacerbate the financial burden (Brahmana, Puah, & Chai, 2016) and pose significant challenges to debt repayment

after a disaster. However, the banking sector also faces particular risks due to the impact of disasters on people's ability to repay debt (Schüwer, Lambert, & Noth, 2019).

One of the risks to which banks are exposed due to natural disasters is operational risk which concerns the physical vulnerabilities of banking infrastructure in disaster-prone areas (Do, Phan, & Nguyen, 2022). From a business perspective, bank borrowers may find it difficult to meet their payment obligations if they experience financial difficulties due to property damage or loss of income. This can lead to delays or defaults in loan repayments and pose challenges for banks in maintaining liquidity and managing credit risk (Brahmana et al., 2016). Natural disasters, which can lead to widespread financial distress among borrowers are another credit risk. Individuals and businesses affected by disasters may suffer a loss of income or losses, affecting their ability to pay their loans (Cortés, 2014). This increases the likelihood of defaults and non-performing loans which affects the bank's balance sheet. Disasters often result in the loss of employment, a reduction in working hours or the destruction of business operations. For individuals, this can mean a drastic drop in household income, making it difficult to keep up with loan payments. The loss of income can be significant and affect their ability to service debt for businesses, especially small and medium-sized enterprises (SMEs) (Del Ninno, Dorosh, & Smith, 2003).

Government recovery efforts play a critical role in the recovery of communities and economies after natural disasters. Their efforts can mitigate the immediate and long-term effects of disasters on individuals, businesses, and financial institutions (Chia, Lim, & Goh, 2020). Governments offer various forms of financial assistance to individuals and businesses, including grants, low-interest loans, and direct cash transfers. This support can help cover immediate expenses and facilitate the recovery process. Despite reconstruction efforts by governments (Cavallo, Galiani, Noy, & Pantano, 2013; Horwich, 2000; Kahn, 2005), borrowers need time to rebuild their businesses (Chang et al., 2022). Banks with a strong financial foundation solve the problem quickly, resulting in a low proportion of non-performing loans (Brahmana et al., 2016). In some countries, government incentives support banks in avoiding high non-performing loans (Miao, Hou, & Abrigo, 2018).

One may pose a question. Do natural disasters have a significant impact on banks' performance, specifically in terms of credit risk? This study aims to address this question by drawing on existing theoretical and empirical research. This study investigates whether natural disasters increase credit risks by increasing the probability of non-performing loans. The results of this study have practical implications for banks, emphasising the need to adopt strong risk management techniques to reduce credit risk. The results of this study improve the government's knowledge of how to strategically provide assistance and incentives to help banks become more resilient in disaster-prone areas. The next section (section 2) provides the literature review relevant to this study. Section 3 elucidates the research methodology, while section 4 showcases the results and discussion. The last section (section 5) summarises and concludes this study.

2. LITERATURE REVIEW

A natural disaster is an abrupt and unforeseen occurrence in the environment (Brahmana & Kontesa, 2023). The United Nations International Strategy for Disaster Reduction (UNSDR) (2009) defines it as a natural process or phenomenon that has the potential to cause loss of life, injury or other health consequences, damage to property, loss of livelihoods and services, social and economic disruption, or environmental damage due to a natural hazard. Disasters cannot be accurately predicted in terms of time, magnitude, or the location of the most important target, but they can be estimated based on modern knowledge, traditional signs of nature, and the historical recurrence of disasters (Chang et al., 2022). Government support is required through the distribution of relief supplies to improve conditions after a disaster. As soon as the emergency phase concludes, the government distributes aid. There are three categories that result from natural disasters (Vu & Noy, 2015) people killed, houses destroyed, and houses damaged.

Banks play a crucial role in a country's economy as a financial middleman, serving as the backbone of the economy in all nations. The banking business may be adversely affected by natural disasters through many means (Basel Committee on Banking Supervision, 2010). Initially, it has the capability to hinder lenders from fulfilling payments on current debts. According to Brei et al. (2019) , this would immediately increase the percentage of non-performing loans. Furthermore, the occurrence of disasters is directly associated with an increase in the need for financial resources from lenders and loans from enterprises and consumers. These losses exacerbate information asymmetry since historical performance may no longer serve as a dependable predictor of current or future performance (Brei et al., 2019). Both households and companies would have significant challenges in rebuilding without access to finance. Additionally, local lenders may struggle to keep up with the increasing demand for loans (Loukil & Jarboui, 2016). Consequently, the decrease in loans leads to a fall in bank income. This uncertainty and financial stress caused by the disaster can increase banks' non-performing loans. According to the Basel III framework, credit risk refers to the possibility that a borrower or counterparty of a bank may fail to meet its obligations as specified in the agreement. Consequently, this study employs non-performing loans as a substitute for credit risk. The level of non-performing loans is crucial for risk management protocols and the stability of the banking sector (Chen et al., 2023).

A body of accounting literature has examined the impact of natural disasters on the financial industry through the analysis of empirical data. For example, Klomp (2014) examined the impact of major natural disasters on commercial banks' distance-to-default metric. His study shows that natural disasters raise the probability of a bank's failure. His analysis indicates that geophysical and meteorological disasters have the greatest impact on reducing the distance to default because of the extensive damage they produce. The magnitude and extent of the consequences of a natural disaster are contingent upon the scale and severity of the disasters, the strictness of financial oversight and monitoring, and the degree of financial and economic advancement of a certain nation. He concludes that natural disasters will lead to a higher likelihood of credit defaults for several reasons, including financial regulation, financial and economic activity, and the intensity of the disaster. His findings align with those of Kousky, Palim, and Pan (2020) who found that natural disasters, particularly floods have a more severe impact on mortgage credit. Other studies, such as Brei et al. (2019) confirmed that natural disasters and large-scale withdrawals of deposits may significantly disrupt the bank financing mechanism. There is no evidence of a decline in loan defaults or bank capital.

Accounting literature has also analysed the banking industry's response to the aftermath of disasters. For example, Schüwer et al. (2019) discovered that banks located in areas prone to natural disasters preferred to increase their risk-based capital ratios after Hurricane Katrina in Caribbean countries. The bank's response to natural disasters is reflected in conflicting results. Brei et al. (2019) determined that banks are reducing their lending capacity and liquid assets to mitigate further losses. This finding is supported by Garmaise and Moskowitz (2009) who found a 20% decrease in the availability of commercial real estate loans after the 1994 Northridge, California, earthquake. Cortés and Strahan (2017) show in their study that multi-market banks strategically allocate their funds to disaster-affected areas with high credit demand, thereby enhancing the availability of short-term loans. The findings of these studies show that natural disasters have a profound impact on industry and the residents of the affected region.

According to Keerthiratne and Tol (2017), companies and people see an increase in debt after a natural disaster. Therefore, individuals need additional financial resources to recuperate from the devastation inflicted by natural calamities. Del Ninno et al. (2003) provide evidence to support the claim that households in Bangladesh experienced an increase in credit demand following a flood disaster. Sawada and Shimizutani (2008) observe that borrowing money from banks was a common practice for recovering damages caused by the Great Hansin earthquakes. The declining probability of loan acceptance due to natural disasters limits the growing need for credit (Berg & Schrader, 2012). In their study, Chen and Chang (2021) discover that natural disasters have a significant influence

on the banking system and may cause severe disruptions to the wider financial system, including banking institutions, insurance systems, and share markets. These studies have primarily focused on the impact of natural disasters on economic growth and the financial system as a whole, but there is a lack of literature that specifically investigates the direct influence of natural disasters on non-performing loans. For example, Chen et al. (2023) examined the relationship between natural disasters and non-performing loans. They discovered that natural disasters had a significant impact on non-performing loans in the short- and long- terms.

This study aims to enhance our comprehension of the relationship between natural disasters and the credit risk of global banks. This study uses a more recent dataset spanning from 2018 to 2022 to provide stakeholders with a more accurate perspective to inform future decision-making. In addition, this study used a distinct methodology to identify natural disasters, while prior studies just relied on the number of fatalities. According to Vu and Noy (2015) work, this study incorporates the destruction and damage of dwellings to provide a more thorough depiction of natural disasters.

3. RESEARCH METHODOLOGY

3.1. Sample Selection

This study chose all banking companies worldwide as the sample selection. However, this study selects banks that are listed on the stock market. This study employs purposive sampling by establishing certain criteria to achieve the research objective. Consequently, only banks with available data from 2018 to 2022 were included in the sampling frame. The samples used in this study were 485 banking companies in the world. This resulted in a total of 2425 observation data used in the analysis.

3.2. Research Instrument and Data Collection

This study uses content analysis as the research instrument. This study used data from 485 global banking companies over 5 years from 2018 to 2022. The data was retrieved from resources such as Refinitiv, the World Bank Indicator, and the National Oceanic and Atmospheric Administration. The data was collected over 6 months. In this study, the credit risk is the dependent variable proxied by non-performing loans. Natural disasters are the independent variables caused by several people killed, houses destroyed, and houses damaged. This study used several variables, such as profitability, company size, capital expenditure, and leverage as control variables. Table 1 presents the variables and measurements used in this study.

Table 1. Variables and measurement

Variables	Symbol	Measurement	Source
Credit risk	NPL	Non-performing loan	World Bank indicator
Natural disasters	KILL	Total people killed by natural disasters	National Oceanic and Atmospheric Administration
	DSTR	Total houses destroyed by natural disasters	National Oceanic and Atmospheric Administration
	DMGD	Total houses damaged by natural disasters	National Oceanic and Atmospheric Administration
Profitability	PROFIT	% net income to gross income	Refinitiv
Size of company	SIZE	Total asset	Refinitiv
Capital investment	INV	Capital investment to total expense	Refinitiv
Leverage	LEVRG	Debt to total assets	Refinitiv

3.3. Data Analysis

This study performed several model-fitting tests, including the Chow test, the Hausman test, and the Lagrange multiplier test to determine the optimal model among the common effects model (CEM), the fixed effects model

(FEM), and the random effects model (REM). This study used multicollinearity testing to elucidate the relationship between the explanatory factors to meet the criteria of ordinary least squares. The variables of interest in panel data as examined in this study often exhibit cross-sectional and serial correlations (Sun, Wang, & Zhang, 2018). Therefore, this study follows the methodology of Petersen (2009) and Chia et al. (2020) employing white heteroscedastic-robust and two-way cluster robustness techniques to tackle this issue.

3.4. Research Model

This study used the generalized method-of-moments (GMM) dynamic panel framework as robustness checks to address the concern of endogeneity. GMM can make estimators that are consistent and asymptotically normal. This makes it very useful in dynamic panel data settings where other estimators might not work. In the second step, preliminary estimates are used to improve the weighting matrix which leads to more accurate parameter estimates (Caner & Zhang, 2014). Previous studies such as Chen et al. (2023) have also used GMM methods. Vu and Noy (2015) combined GMM with three-stage least squares (3SLS) estimations. Hence, the model is displayed as follows:

$$NPL = \alpha + \beta_1 KILL + \beta_2 DSTR + \beta_3 DMGD + \beta_4 PROFIT + \beta_5 SIZE + B_6 INV + \beta_7 LVRG + \varepsilon_{it}$$

4. RESULTS AND DISCUSSION

4.1. Preliminary Analyses

Table 2 provides an overview of the statistical data for the variables used in this study. The average number of fatalities is 50. This graph illustrates that the mean number of fatalities resulting from global natural disasters between 2018 and 2022 is very low. This is in contrast to the results of Vu and Noy (2015) who reported an average of 154 fatalities. Chen et al. (2023) who reported a mean of 343 fatalities. According to Chen et al. (2023), the data from 1990 to 2020 indicates that contemporary catastrophes result in fewer fatalities compared to earlier natural disasters. Similarly, the average number of buildings demolished in this research was 17.849, which is much lower than the results reported by Vu and Noy (2015). They found an average of 30.028 dwellings destroyed between 2010 and 2011.

The reported mean number of destroyed dwellings was 4813, a figure lower than the 68.069 observed by Vu and Noy (2015). These findings indicate that the government and its citizens are becoming more proficient in enhancing many facets of disaster preparation to reduce the effect of casualties.

Table 2. Summary statistics

Variables	Mean	Std. dev.
KILL	50	378
DSTR	17849	89320
DMGD	4813	34204

Before conducting hypothesis testing, the KILL, DSTRY, DMGD, and SIZE data were converted into natural logarithm form (Ln). This function is used to reduce the variability between independent variable levels and to mitigate the impact of extreme values or outliers. This study then conducted several tests to determine the model's best estimator. Cross-sectional F-squared and cross-sectional chi-squared values are above 0.5 indicating that the CEM was selected. Subsequently, the Lagrange multiplier test indicates that the probability value is above 0.5, which indicates CEM or pooled OLS is the best model for this study.

Table 3. Correlation matrix

Variables	KILL	DSTR	DMGD	PROFIT	SIZE	INV	LVRG
LnKILL	1						
LnDSTR	0.948	1					
LnDMGD	0.944	0.885	1				
PROFIT	-0.179	-0.142	-0.175	1			
LnSIZE	0.028	0.034	-0.027	-0.067	1		
INV	-0.227	-0.197	-0.212	0.837	-0.086	1	
LVRG	0.171	0.187	0.141	0.068	0.319	0.077	1

4.2. Hypothesis Testing

The multicollinearity test was conducted to confirm the presence of a correlation between the independent variables after selecting the POLS as the model's estimator. The results show that all independent variables' interactions provided a preliminary view of their univariate relationship. Table 3 shows the explanatory and control variables are free from multicollinearity symptoms, as the correlation coefficient is below 0.95.

Table 4. Baseline result

Variables	KILL			DSTR			DMGD		
	POLS	White test	Two-cluster	POLS	White test	Two-cluster	POLS	White test	Two-cluster
Natural disasters	0.018	0.305	0.018	0.018	0.15	0.018	0.002	0.14	0.002
	(0.021)	(0.238)	(0.036)	(0.010)	(0.125)	(0.018)	(0.013)	(0.086)	(0.021)
Profit	0.008	0.018	0.008	0.01	0.021	0.01	0.007	0.034	0.007
	(0.063)	(0.110)	(0.073)	(0.063)	(0.111)	(0.072)	(0.064)	(0.112)	(0.073)
Size	0.897***	1.115***	0.897***	0.900***	1.119***	0.900***	0.895***	1.098***	0.895***
	(0.020)	(0.124)	(0.020)	(0.020)	(0.125)	(0.020)	(0.020)	(0.120)	(0.020)
INV	0.001	0.029	0.001	-0.002	0.026	-0.002	0.003	0.036	0.003
	(0.018)	(0.057)	(0.037)	(0.019)	(0.056)	(0.038)	(0.018)	(0.065)	(0.037)
LVRG	-0.004	-0.017*	-0.004	-0.004	-0.017*	-0.004	-0.005	-0.018**	-0.005
	(0.009)	(0.010)	(0.018)	(0.009)	(0.010)	(0.018)	(0.009)	(0.008)	(0.018)
Constant	-1.801***	-7.213**	-1.801***	-1.863***	-7.324**	-1.863***	-1.750***	-6.804**	-1.750***
	(0.547)	(3.110)	(0.538)	(0.543)	(3.154)	(0.532)	(2.998)		
Adjuster R-squared	0.699	0.355	0.701	0.7	0.353	0.701	0.348		

Note: ****, ** and * indicate significance at 1%, 5% and 10%, respectively.

Table 4 displays the results of the baseline model testing. This study takes into account the possibility of correlations within clusters by estimating all regressions with POLS, white heteroscedastic-robust and double-clustered standard errors. The top row of the table displays each measurement of natural disasters, while the left column displays all the independent and control variables used in this study. The white test and two-cluster test results show that natural disasters with each measurement (people killed, houses destroyed, and houses damaged) have no significant effect on a global bank's credit risk. However, the three variables have positive coefficients, which means that the several people killed, houses destroyed, and houses damaged due to natural disasters, the higher the credit risk. These findings align with Chen et al. (2023) who found that more people killed due to natural disasters will increase credit risk. Brei et al. (2019) note that there are no signals of loan defaults or bank capital decreases after the occurrence of natural disasters.

With regard to control variables, the test shows that only size or company size significantly influences credit risk, while profitability, company size, and investment have a positive coefficient but an insignificant correlation with credit risk. Similarly, leverage has a negative relationship with credit risk, indicating that the higher the capital expenditure, the lower the credit risk.

Table 5 displays the results of several robustness checks conducted to address the endogeneity concern. This study employed the GMM dynamic panel framework. The lagged dependent variable of the NPL is input with lagged data at the right of the baseline model and the dynamic panel model is estimated with a GMM system. The findings in the final column support a causal relationship between natural disasters and credit risk. The results in Table 5 show that although natural disasters have an insignificant impact on credit risk, the positive coefficient verifies the hypothesis that natural disasters have a positive impact on global banking's credit risk. Insignificant results may occur because of the involvement of third-party institutions, such as insurance companies.

Firstly, when dealing with natural disasters, the majority of banks have implied credit risk management by transferring the risk to insurance companies. The existence of insurance companies serves as a buffer against both economic losses for society and institutions from natural disasters. For example, the US government requires creditors to take out flood insurance if they wish to take out a bank loan. Kousky et al. (2020) found that flood insurance protects mortgage lenders and homeowners in the US from credit risk, proving the appropriateness of this policy. Secondly, insurance coverage has had very high penetration, especially in regions prone to natural disasters.

Table 5. Two-step GMM

Variables	KILL	DSTR	DMGD
NPL	0.640***	0.655***	0.657***
	(0.127)	(0.115)	(0.114)
Natural disaster	-0.196	-0.077	-0.104
	(0.239)	(0.065)	(0.086)
PROFIT	-0.005	-0.003	-0.009
	(0.045)	(0.047)	(0.046)
SIZE	0.785***	0.777***	0.760***
	(0.228)	(0.226)	(0.223)
INV	-0.017	-0.016	-0.018
	(0.023)	(0.023)	(0.024)
LVRG	-0.004	-0.004	-0.003
	(0.011)	(0.011)	(0.011)
Constant	-11.545***	-11.646***	-11.292***
	(3.989)	(3.763)	(3.666)
AR(1)	0.0136	0.0102	0.0102
AR(2)	0.3437	0.3513	0.3558
Sargan	0.4645	0.528	0.5132

Note: **** indicate significance at 1%, respectively.

Breckner, Englmaier, Stowasser, and Sunde (2016) stated that the adoption of private insurance and a stable, institutionalized environment work in tandem to mitigate the negative effects of natural disasters. Compared to data from Linnerooth-Bayer, Mechler, and Hochrainer (2011) which shows that the insured share of total losses due to natural disasters was only 17% in 2005. This indicates a very good penetration of insurance coverage. From a societal perspective, Liu, Tang, Ge, and Miranda (2019) also found that people who live in places with more vulnerable locations to natural disasters have a higher willingness to pay for insurance costs.

4.3. Discussion

The growing awareness of global climate change is what drives the increased public and policy awareness of extreme climate events (Vu & Noy, 2015). This research focusses on how natural disasters can affect credit risk, and the results above showed that people killed, houses destroyed, and houses damaged have a positive correlation with global banks' credit risk. This means that more natural disasters will raise credit risk. This result aligns with the findings of Chen et al. (2023) who used the number of people killed as a proxy for natural disasters and found a higher impact on non-performing loans. Additionally, Kousky et al. (2020) also found that natural disasters, specifically floods had a higher impact on mortgage credit. Another study by Brei et al. (2019) discovered that following natural disasters, there are no indications of a decline in bank capital or loan defaults. They found a positive relationship between natural disasters and default, which is similar to this study's results. The relationship is positive but insignificant.

The positive relationship result can occur because natural disasters can harm the banking industry through a variety of channels, resulting in a positive correlation. Following natural disasters, a multitude of interconnected factors contribute to the escalation of non-performing loans and heightened credit risk for banks (Brei et al., 2019). The severe disruptions inflicted upon local economies often result in extensive business interruptions, causing revenue losses and financial strain (Isa, 2006). The relationship between natural disasters and the surge in NPLs stems from the profound and interconnected impacts that cataclysmic events unleash on both businesses and individuals. Natural disasters inflict widespread damage on local economies, disrupting businesses' operational capacities and causing substantial financial losses. This, in turn, translates into a diminished ability for businesses to meet their financial commitments, increasing NPLs.

For individuals, the aftermath of a natural disaster often involves significant personal and financial setbacks. Businesses may close causing damage or destruction to homes and dwindling employment opportunities. The resulting economic uncertainty places immense strain on individuals' financial capabilities leading to difficulties in repaying loans on time. Mortgages, personal loans, and other financial obligations become particularly vulnerable, contributing further to the rise in NPLs. Furthermore, asset values are likely to fall, leading to an increase in bank provisioning (Collier, Katchova, & Skees, 2011). In essence, the relationship between natural disasters and the escalation of NPLs is a nuanced interplay of economic, social, and environmental factors. The fallout from these events ripples through communities and financial systems, underscoring the intricate dynamics that shape the vulnerability of loan portfolios in the face of natural calamities. Although the correlation is positive, the result shown is statistically insignificant. As mentioned above, the involvement of third-party institutions, such as insurance companies may be insignificant. Firstly, most banks implement credit risk management by shifting the risk to insurance companies in response to natural disasters. Insurance companies act as a buffer against both societal and institutional economic losses caused by natural disasters. For example, to obtain a bank loan, the US government requires creditors to obtain flood insurance. Kousky et al. (2020) found that US flood insurance shields homeowners and mortgage lenders from credit risk resulting from flood events, indicating the appropriateness of this policy.

Natural disasters have recently resulted in annual direct costs that averaged between $100 and $200 billion globally in 2014 (Kousky, 2019). This excludes disaster-related indirect costs, such as nonmarket damages, as well

as pain, suffering, and loss of life. Disaster costs have risen over time, even when adjusted for inflation (Kousky, 2019). Certain aspects of insurance plans may encourage risk reduction (Paleari, 2019). For example, insurers in 18 EU countries generally use risk-based premiums, which reflect hazard exposure and/or building vulnerability to varying degrees related to natural disasters. The Netherlands uses flood risk maps to determine insurance premium discounts (Surminski et al., 2014). Insurance coverage is widely available, particularly in areas prone to natural disasters. Breckner et al. (2016) state that individual insurance penetration and a steady, institutionalised environment both contribute to lessening the harmful consequences of natural disasters. Liu et al. (2019) discovered that people who live in high-risk areas of natural disasters are more willing to pay for insurance costs to supplement their findings.

5. CONCLUSION

This study investigates the phenomenon of natural disasters that affect global banks' credit risk. As shown above, the baseline result and endogeneity test have reaffirmed the fact that natural disasters, which are associated with people killed, houses destroyed, and houses damaged, have a positive correlation with the global bank's credit risk, but the impact is not strong enough to be statistically significant. This study concludes that banks have effectively reduced the credit risk resulting from natural disasters. This success is inseparable from the important role of insurance companies and the government as regulators. Insurance companies act as a buffer so that there is no significant economic loss, which can result in banking credit instability. The penetration of insurance coverage has generally reduced the impact of natural disaster risk on the credit risk of global banks. Governments, as stakeholders also play a crucial role by implementing various preventive policies that can mitigate risk. These policies may include requiring creditors to obtain various types of insurance to obtain a bank loan, expanding the penetration of government-backed insurance coverage, and promoting the private insurance market.

In addition, the lack of global research on natural disasters, irrespective of national boundaries, primarily motivates this study. We establish the groundwork for any subsequent investigation into this subject. However, further research on larger samples and longer periods is necessary to validate our findings on specific common characteristics used as independent variables.

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