



ESG and Idiosyncratic Risk in Indian Firms

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Abstract. This study investigates the relationship between firm-specific idiosyncratic risk and Environmental, Social, and Governance (ESG) performance in 15 NSE listed Indian firms from 2014 to 2023, a decade marked by significant regulatory changes in sustainability disclosure requirements. The study uses a disclosure based ESG index built from annual reports, Business Responsibility Reports (BRR), and Business Responsibility and Sustainability Reporting (BRSR) filings. Pooled OLS regression is used in addition to lagged ESG specifications, firm fixed effects, two-way fixed effects, episode specific crisis interaction models, firm size interaction models, and ESG component decomposition analysis. The study found a positive and statistically significant association between ESG performance and idiosyncratic risk, which was consistent across pooled OLS ($\beta = 0.261$, $p < 0.001$) and firm fixed effects ($\beta = 0.405$, $p = 0.028$) specifications. This finding supports a sustainable transition concept that suggests ESG adoption can lead to implementation uncertainty, stakeholder scrutiny, and increased firm specific volatility throughout regulatory reform. The positive link continues with lagged ESG parameters ($\beta = 0.324$, $p = 0.033$), confirming temporal persistence beyond contemporaneous disclosure effects. ESG performance reduces firm-specific volatility during the NBFC liquidity crisis (ESG×NBFC: $\beta = -0.265$, $p = 0.004$) and the COVID-19 pandemic (ESG×COVID: $\beta = -0.226$, $p = 0.083$), but remains insignificant during the demonetization liquidity shock. This strengthens the stakeholder insurance concept by highlighting crisis type as a critical boundary condition governing ESG's risk-mitigating properties. Firm size has no substantial effect on the ESG-risk relationship. The ESG component decomposition indicates that the Social dimension is the only significant source of idiosyncratic risk ($\beta = 0.235$, $p = 0.030$), due to India's obligatory Corporate Social Responsibility framework under the Companies Act 2014. By showing that ESG performance is not a context-independent risk feature and that its financial implications are influenced by the institutional environment, regulatory trajectory, and type of economic shock, the study adds to the body of literature on sustainable finance.

Keywords: ESG Performance, Indian Capital Markets, Idiosyncratic Risk, Emerging Markets, Sustainability Transition.

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A. Kumar et al. (eds.), *Proceedings of the International Conference on Advancing Economics (ICAE): Redefining Growth: Integrating Economy Society and Sustainability for a Resilient Future (ICAE 2026)*, Advances in Economics, Business and Management Research 403,
https://doi.org/10.2991/978-94-6239-795-8_18

1 Introduction

Environmental, social, and governance (ESG) factors have grown in significance throughout the global financial markets as firms, investors, and regulators prioritize long-term value generation, sustainable corporate practices, and transparency. ESG performance is now widely recognized as a factor impacting company financial stability, investor confidence, and firm-level risk dynamics.

Previous studies present divergent perspectives on the connection between corporate risk and ESG performance. Stronger ESG practices, according to a substantial body of research, boost organizational resilience, lower information asymmetry, improve governance standards, and increase stakeholder confidence, all of which reduce firm-specific uncertainty and downside risk (Bouslah et al., 2018; Lins et al., 2017). According to this perspective, ESG functions as a tool that encourages transparency and sustains long-term corporate stability. On the other hand, more recent research contends that adoption of ESG practices may also increase firm-specific volatility in some contexts due to transition costs, changing disclosure standards, implementation difficulties, and changing investor expectations, particularly in emerging markets going through institutional and regulatory changes (Berg et al., 2022).

This tension is especially relevant in India, where ESG disclosure requirements have been actively evolving. The Securities and Exchange Board of India (SEBI) has progressively tightened sustainability reporting through the transition from Business Responsibility Reports (BRR) to Business Responsibility and Sustainability Reporting (BRSR), increasing the visibility and scrutiny of corporate ESG activity in Indian capital markets.

Even while ESG is becoming more popular in India, there is still a dearth of empirical data on the relationship between ESG performance and firm-specific risk. Much of the existing literature focuses on developed economies and frequently depends on commercial ESG ratings, which use proprietary methodology and provide inconsistent firm-level assessments (Berg et al., 2022). Additionally, there is limited research that look at how different ESG dimensions affect firm-specific risk or whether the relationship between ESG and risk varies among firms with varied organizational characteristics and during times of crisis.

In order to close these gaps, this study uses a disclosure-based ESG framework built from publicly accessible corporate disclosures to investigate the relationship between idiosyncratic risk and ESG performance among Indian listed enterprises between 2014 and 2023. The disclosure-based method used in this study offers more contextual relevance and transparency in the Indian regulatory framework than commercial ESG ratings.

The study examines overall ESG performance as well as whether there are differences in the relationship between ESG performance and firm-specific risk amongst firms of different sizes and during times of crisis. In order to determine which element predominantly influences firm-specific volatility in the context of the Indian market, the study further breaks down ESG into Environmental, Social, and Governance dimensions.

The study provides five contributions to the literature. First, it offers empirical data on the relationship between ESG and risk from an emerging economy that is actively experiencing regulatory change, a setting that is underrepresented in previous studies. Second, it improves measurement consistency and openness by using a disclosure-based ESG methodology that is directly drawn from regulatory filings.

Third, it investigates the conditional nature and temporal durability of the ESG–risk relationship using lagged ESG specifications and interaction models. Fourth, by identifying crisis type as the fundamental boundary condition determining ESG's risk-mitigating features rather than crisis per se, it advances the stakeholder insurance theory. Fifth, it identifies the main cause of idiosyncratic risk in the Indian context as the social dimension, which is specifically formed by India's obligatory CSR framework under the Companies Act 2014.

According to the empirical results, there is a statistically significant positive correlation between idiosyncratic risk and ESG performance. The findings imply that during times of sustainability transition and changing disclosure requirements, companies with more robust ESG processes face comparatively greater firm-specific uncertainty. The results further show that the observed link is primarily driven by the social dimension of ESG, while the crisis interaction analysis reveals episode specific moderating effects and firm size moderation remains statistically insignificant.

2 Literature Review and Hypothesis Development

2.1 ESG Performance and Firm Specific Risk: Theoretical Foundations

Similarly, La Porta et al. (1998) show that a lack of investor protection could make it more difficult for the market to reliably understand ESG data. Therefore, in emerging economies going through sustainability transitions, ESG disclosures that lower risk in established markets could instead create uncertainty.

Conflicting expectations for the Indian context are produced by these opposing theoretical stances. The transition cost and institutional void perspectives suggest that ESG adoption may increase idiosyncratic volatility during times of regulatory change, despite stakeholder and signalling theories suggesting that ESG performance should lower firm specific risk. This paper empirically investigates these conflicting forecasts in the Indian market between 2014 and 2023, a decade marked by significant changes in sustainability disclosure regulations.

This theoretical ambiguity leads to the following hypothesis being put forth:

H1: ESG performance is positively associated with idiosyncratic risk among Indian listed firms during the regulatory transition period.

2.2 ESG Performance and Risk Persistence

The aforementioned theoretical frameworks provide different predictions regarding the time dynamics of the ESG–risk link in addition to contemporaneous relationships. ESG performance's effects on firm-specific risk should show significant persistence over time if it largely functions through institutional channels, such as reputational capital accumulation, stakeholder trust-building, and governance quality improvements. Similar to how reputational capital accumulates and declines gradually, stakeholder relationships are not created or destroyed in a single fiscal year. Under these conditions, lagging ESG performance should still be able to explain current-period idiosyncratic risk after accounting for contemporaneous controls. This persistence hypothesis is supported by Khan, Serafeim, and Yoon (2016), who demonstrate that significant ESG improvements predict long-term stock returns and risk characteris-

tics, implying that the market incorporates ESG information gradually rather than instantly. In line with a lagged transmission mechanism, Eccles et al. (2014) also show that the financial benefits of sustainable policies appear across multi-year periods. On the other hand, these processes should also show temporal durability if the positive ESG–risk link seen in emerging markets is a reflection of sustainable transition dynamics. Stakeholder expectation modifications, organizational reorganization, and disclosure system upgrades are multi-year procedures. Firms that implemented greater ESG policies in previous years will continue to face the implications, such as stakeholder scrutiny, disclosure evolution, and implementation uncertainty, in later years.

Analysing lagged ESG parameters is also a crucial methodological step. A firm's ESG disclosure choices in a given year may be impacted by idiosyncratic risk; firms that are more volatile may be under more pressure to convince investors of their sustainable credentials. This reverse causation argument can be addressed in part by investigating if prior-year ESG performance predicts current-year idiosyncratic risk, resulting in a more acceptable causal ordering.

To investigate the temporal persistence of the ESG-risk association, the following hypothesis is put forth:

H2: Lagged ESG performance is positively associated with current period idiosyncratic risk, consistent with multi-period persistence of transition related volatility.

2.3 ESG Performance During Crisis Periods

A considerable corpus of ESG literature investigates whether the benefits of sustainable practices increase during times of economic duress.

Demonetization was largely a liquidity shock; the NBFC crisis impacted credit markets and financial intermediation; and COVID-19 caused simultaneous demand, supply, and financial market disruptions.

Treating these occurrences as a single crisis period may hide significant distinctions in how ESG performance affects firm-specific risk. Furthermore, strong macroeconomic shocks may raise the importance of systematic risk, thus lowering the explanatory power of firm-level ESG characteristics. As a result, ESG's effectiveness as a risk-mitigation tool may fluctuate depending on the crisis context.

As a result, the research puts forth the following hypothesis:

H3: The relationship between ESG performance and idiosyncratic risk changes throughout crisis periods, with the direction and amount of the moderating effect depending on the type of economic shock.

2.4 Firm Size and the ESG-Risk Relationship

Due to a number of conflicting factors, firm size is a theoretically significant mediator of the ESG-risk connection. On the one side, larger firms have higher investor relations skills, more advanced governance infrastructure, and more financial capacity to cover ESG implementation costs. These benefits imply that larger firms can more effectively convert ESG investments into signals that boost trust, possibly producing greater risk-reducing impacts from comparable levels of ESG performance.

However, institutional scrutiny and stakeholder visibility are disproportionately higher for larger firms. This visibility argument is especially important in the Indian context, where SEBI's BRSR framework initially required disclosure for the top 1,000 listed companies based on market capitalization. This meant that larger firms were subject to regulatory ESG disclosure requirements earlier and with more scrutiny than smaller firms.

The relationship between ESG and risk may function differently for smaller firms. Due to a lack of analyst coverage and poorer voluntary disclosure quality, smaller Indian firms usually experience more information asymmetry with external investors. Therefore, if their disclosures are sufficiently credible to investors, ESG disclosures may produce a stronger proportionate reduction in information asymmetry for smaller firms, potentially generating more dramatic risk-stabilizing benefits.

The overall theoretical prediction is unclear: the main effect in the Indian setting is an empirical matter, and magnitude may increase ESG's market impact in either direction. Small and large firms may experience comparable proportionate uncertainty from ESG transition dynamics due to the ongoing evolution of the Indian ESG disclosure landscape, which could reduce any size-based moderation effect.

Thus, the following hypothesis is proposed:

H4: Firm size does not significantly moderate the ESG risk relationship among large listed Indian firms, reflecting comparable transition cost exposures across the size distribution.

2.5 ESG Components and Firm Specific Risk: The Social Dimension in India

Although using a composite ESG score is analytically helpful, it could conceal significant disparities in how the Environmental, Social, and Governance dimensions influence firm-level outcomes. Berg et al. (2022) show that ESG ratings varied significantly, notably in the environmental and social dimensions, implying that various components may convey different information to investors and thus have diverse consequences for firm-specific risk.

The governance factor largely focuses on board independence, shareholder rights, executive compensation, and audit quality. According to Jensen and Meckling's agency theory (1976), stricter governance decreases agency conflicts and information asymmetry, minimizing firm-specific risk. In India, governance-related disclosures are largely standardized thanks to SEBI's disclosure rules, which may result in more predictable market responses and fewer effects on idiosyncratic volatility.

As a result, environmental disclosures may not currently have sufficient market significance to systematically alter firm-specific risk across industries.

Given India's distinct institutional and regulatory framework, it is anticipated that the social dimension will be increasingly significant. Corporate Social Responsibility (CSR) expenditure requirements were made mandatory for qualifying enterprises by Section 135 of the Companies Act, 2013, turning social initiatives from optional activities into legal mandates. In addition to raising stakeholder expectations for social responsibility, community involvement, and employee welfare, this regulatory framework made businesses social performance more visible and scrutinized.

Social activities entail direct interactions with various stakeholder groups, such as employees, communities, customers, and civil society organizations, in contrast to environmental and governance disclosures. These stakeholder-intensive initiatives are especially vulnerable to

public scrutiny, media attention, and shifting social norms. Therefore, compared to other ESG aspects, social performance could result in stronger and more unpredictable market reactions.

The significance of the social factor is supported by empirical data. Compared to other ESG dimensions, social capital and market results have larger correlations, according to Lins et al. (2017) and Albuquerque et al. (2019). The current analysis expands this reasoning to the Indian setting, where social ESG efforts may have a greater impact on firm-specific risk due to required CSR rules and changing stakeholder expectations.

As a result, this study puts forth the following hypothesis:

H5: The Social dimension is more strongly associated with idiosyncratic risk than the Environmental or Governance dimensions, attributable to India's mandatory CSR framework and the stakeholder intensive nature of social ESG activity.

2.6 Research Gap and Contribution

Third, little emphasis has been placed on studying how the ESG-risk link differs across crisis situations and business characteristics. The Indian context is an appropriate setting for investigating these moderating effects because the study period encompasses various economic shocks and significant variance in disclosure practices.

Finally, there is minimal data about the individual implications of the Environmental, Social, and Governance aspects on firm-specific risk. In particular, the mandated CSR regulations enacted by the Companies Act of 2013 offer a specific institutional structure that may increase the prominence of the social dimension in India.

To fill these gaps, this paper creates a disclosure-based ESG index based on publicly available corporate filings and applies a variety of empirical specifications, including as lagged ESG models, crisis interaction models, fixed-effects estimations, and ESG component analysis. Together, these methodologies provide a thorough evaluation of the relationship between ESG performance and idiosyncratic risk in an emerging market undergoing major regulatory transitions.

3 Data and Methodology

3.1 Sample and Data Sources

This study explores the relationship between firm-specific risk and Environmental, Social, and Governance (ESG) performance in Indian listed firms between 2014 and 2023. Firms from a variety of industries, including information technology, banking and finance, energy and power, manufacturing/FMCG, automotive, and infrastructure/real estate, make up the sample.

3.2 Variable Construction

Dependent Variable: Idiosyncratic Risk

$$R_{it} = \ln$$

where:

R_{it} = return of firm i at time t

P_t = closing stock price at time t

The risk-free rate is deducted from both firm-level and market returns to determine excess returns. The CAPM specification is calculated as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \epsilon_{it}$$

where:

R_{it} = firm return

R_{ft} = risk free rate

R_{mt} = market return (NIFTY 50)

β_i = systematic risk coefficient

ϵ_{it} = residual term

The variance of CAPM residuals is used to calculate idiosyncratic risk. To enhance distributional characteristics and firm-to-firm comparability, residual variance is transformed logarithmically.

$$\text{IdioRisk}_{it} = \ln (\text{Var}(\epsilon_{it}))$$

Increased firm-specific volatility and uncertainty are indicated by higher values of the dependent variable.

Independent Variable: ESG Performance

The main independent variable is the ESG score, which is derived from firm-level sustainability disclosures included in annual reports, sustainability reports, BRR filings, and BRSR disclosures (see table A1). Disclosure-based ESG frameworks are widely used in emerging market research because they provide more scientific transparency than proprietary ESG evaluations (Berg et al., 2022).

The ESG index is composed of three dimensions: Social (S), Environmental (E), and Governance (G). Based on implementation evidence, sustainability-related behaviors, and disclosure quality, each dimension is rated on a scale from 0 to 3. For each firm i and year t , the overall ESG score is computed as:

$$ESG_{\{it\}} = \{E_{\{it\}} + S_{\{it\}} + G_{\{it\}}\} / 3$$

In the Indian ESG reporting environment, the disclosure-based methodology enhances contextual relevance and transparency.

Table 3.1: Construction of ESG Composite Index

Pillar	Indicators	Description	Scoring Scale	Weight	Theoretical Basis / Data Source
Environmental (E)	Energy efficiency, emissions management, renewable initiatives	Assessment of firm's policies, targets, and disclosures related to environmental performance	0–3	1/3	SEBI-BRSR, GRI 302–305
Social (S)	Employee welfare, CSR expenditure, workplace diversity, communi-	Extent of CSR activity and internal social policies	0–3	1/3	CSR Policy Rules 2014, GRI 401–413

Governance (G)	ty engagement				
	Board independence, transparency, audit quality, shareholder rights	Evaluation of corporate governance structure and disclosure practices	0–3	1/3	Clause 49, SEBI LODR, GRI 102–26

Table 3.1 presents the construction of the ESG index. The created index offers a context specific and disclosure driven metric in line with Indian regulatory advancements, such as SEBI’s shift from BRR to BRSR, in contrast to commercial ESG ratings (such as MSCI and Refinitiv), which rely on opaque methodology. The index’s usefulness for analysing ESG related financial risk is increased by incorporating sector specific materiality factors, which are based on frameworks like SASB and TCFD. This strategy is in line with previous studies that focused on customised ESG measurement in developing nations (Khan et al., 2016; Eccles et al., 2014; Berg et al., 2022).

Control Variables

The analysis includes a number of firm- and market-level control variables that are often used in ESG and corporate finance literature (Albuquerque et al., 2019; Bouslah et al., 2018).

Table 3.2: Variable Definitions and Sources

Variable	Description	Source	Measurement
IdioRisk	Firm-specific risk measure	Computed	Log variance of CAPM residuals
ESG	Aggregate ESG score	Constructed from disclosures	Composite score (0–3)
E	Environmental pillar score	Constructed	Disclosure-based score
S	Social pillar score	Constructed	Disclosure-based score
G	Governance pillar score	Constructed	Disclosure-based score
ESG_Lag	Lagged ESG score	Computed	Previous year ESG score
Size	Firm size	Screener.in	Natural logarithm of total assets
Leverage	Financial leverage	Screener.in	Total borrowings / total assets
ROA	Profitability	Screener.in	Net profit / total assets
VIX	Market volatility index	NSE	India VIX
Crisis	Crisis dummy variable	Constructed	1 = crisis year; 0 = otherwise
ESG × Crisis	Crisis interaction term	Computed	ESG × Crisis
ESG × Size	Size interaction term	Computed	ESG × Size

3.3 Econometric Model Specification

The study used pooled Ordinary Least Squares (OLS) regression models with robust standard errors to examine the relationship between idiosyncratic risk and ESG performance. Pooled OLS is the primary estimation method, supplemented by fixed effects specifications as detailed in Section 3.4.

Baseline Model

The baseline specification is estimated as:

$$\text{IdioRisk}_{it} = \beta_0 + \beta_1 \text{ESG}_{it} + \beta_2 \text{Size}_{it} + \beta_3 \text{Leverage}_{it} + \beta_4 \text{ROA}_{it} + \beta_5 \text{VIX}_t + \beta_6 \text{Crisis}_t + \epsilon_{it}$$

where:

$$\text{IdioRisk}_{it} = \text{firm-specific risk of firm } i \text{ in year } t$$

$$ESG_{it} = \text{ESG Score}$$

Size_{it} = firm size

Leverage_{it} = leverage ratio

ROA_{it} = return on assets

VIX_t = market volatility index

Crisis_t = crisis period dummy

After adjusting for firm-level and market-level factors, the model assesses whether ESG performance has a meaningful impact on firm-specific risk.

Lagged ESG Model

The following lagged ESG specification is computed in order to investigate persistence effects and handle possible reverse causality issues:

$$IdioRisk_{it} = \beta_0 + \beta_1 ESG_{it-1} + \beta_2 Controls_{it} + \epsilon_{it}$$

This specification assesses whether present firm-specific risk is still influenced by past ESG performance.

Crisis Interaction Model

The following interaction model is constructed in order to investigate whether ESG performance has different consequences during times of crisis.

$$IdioRisk_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Crisis_{it} + \beta_3 (ESG \times Crisis)_{it} + \beta_4 Controls_{it} + \epsilon_{it}$$

Whether ESG mitigates the effect of crisis times on firm-specific risk is captured by the interaction term (see table B1). Years marked by significant economic disturbances, such as demonetization, the NBFC crisis, and the COVID-19 epidemic, are referred to as crisis years.

The aggregate crisis dummy is replaced by episode-specific indicators for demonetization, the NBFC crisis, and COVID-19 in the extended specification. As explained in Section 3.4, distinct interaction terms are created for each episode.

Firm Size Interaction Model

The following model is constructed in order to investigate whether firm size modifies the ESG–risk relationship:

$$IdioRisk_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_2 Size_{it} + \beta_3 (ESG \times Size)_{it} + \beta_4 Controls_{it} + \epsilon_{it}$$

ESG Component Model

The overall ESG score is broken down into its Environmental, Social, and Governance components in order to determine which ESG factor has the greatest impact on firm-specific risk:

$$IdioRisk_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 S_{it} + \beta_3 G_{it} + \beta_4 Controls_{it} + \epsilon_{it}$$

This model enables the study to determine whether particular ESG aspects have different associations with idiosyncratic risk.

3.4 Estimation Strategy and Diagnostic Tests

The baseline estimation approach used in the study is pooled Ordinary Least Squares (OLS) regression with robust standard errors, which is consistent with the cross-sectional volatility in

ESG scores among enterprises. Firm fixed effects (FE) and two-way fixed effects specifications are added to the baseline to address concerns regarding unobserved firm-level heterogeneity, which refers to time-invariant firm characteristics like industry culture, ownership structure, and management philosophy that may concurrently influence ESG engagement and idiosyncratic risk (Wooldridge, 2010). Compared to pooled OLS, the firm fixed effects estimator provides a more conservative and causally credible estimate by identifying the ESG–risk connection solely from within-firm fluctuation in ESG scores over time.

In order to account for common macroeconomic shocks that impact every firm at once, the two-way fixed effects specification also includes year fixed effects, which are implemented via year dummy variables within the xtreg framework. To explicitly determine whether fixed or random effects is the better specification, the Hausman (1978) test is used. To ensure that baseline results are not influenced by extreme data, continuous variables such as idiosyncratic risk, ESG, firm size, leverage, and profitability are also winsorized at the first and 99th percentiles. Using the previous year's ESG score as the main explanatory variable, a lagged ESG specification is estimated under firm fixed effects in order to examine temporal persistence and address potential reverse causality, whereby firms experiencing higher idiosyncratic risk may alter their ESG disclosure intensity in the same period.

By creating three episode-specific indicators for demonetization (2016), the NBFC liquidity crisis (2018–2019), and the COVID-19 pandemic (2020–2021), crisis period analysis is expanded beyond the aggregate binary dummy used in the baseline. These indicators reflect the structurally heterogeneous nature of these shocks in terms of their transmission mechanisms, sectoral impacts, and duration. To determine whether the relationship between ESG and idiosyncratic risk varies depending on the type of crisis, interaction terms between ESG performance and each episode-specific crisis indicator are added. Pooled OLS with robust standard errors is used to estimate the firm size interaction model and ESG component decomposition parameters, which are based on the methodology outlined in Sections 3.3.4 and 3.3.5, respectively.

To confirm the accuracy of the estimation, a number of diagnostic procedures are carried out. To evaluate multicollinearity across all specifications, the Variance Inflation Factor (VIF) is calculated, with values consistently falling below acceptable bounds. The Breusch-Pagan test validates the use of robust standard errors by confirming the existence of heteroskedasticity. Additionally, the Pesaran cross-sectional dependence test and the Wooldridge (2002) test for serial correlation in panel data are carried out. Given the shared macroeconomic environment of Indian listed firms, some degree of cross-sectional dependence is expected and is partially addressed by the inclusion of market-level controls and year fixed effects. Stata 17 is used for all estimations.

4 Results and Discussion

4.1 Descriptive Statistics

Descriptive statistics for the 150 firm-year observations made up of 15 NSE-listed companies between 2014 and 2023 are shown in Table 4.1. With precisely ten annual observations from each firm, the panel is well-balanced. Idiosyncratic risk, the dependent variable, shows signifi-

cant cross-sectional and temporal variance, indicating enough heterogeneity to detect the link between ESG and risk. ESG scores, which have a mean of roughly 2.0 and range from 1 to 3, represent differences in sustainability engagement and disclosure quality between firms and over time. The India VIX, which measures market volatility during both crisis and non-crisis times, peaked at 26.75 during the COVID-19 shock year.

Table 4.1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
IdioRisk	150	-9.665	0.514	-10.62	-8.75
ESG	150	2.015	0.694	1	3
Size	150	11.658	1.593	8.61	15.21
Leverage	150	0.323	0.285	0	0.86
ROA	150	0.097	0.100	-0.011	0.397
VIX	150	17.217	4.021	12.44	26.75

Source: Author's estimation based on compiled firm level data

4.2 Correlation Analysis

Table 4.2 shows the pairwise correlation matrix of the variables utilized in the regression.

Table 4.2: Correlation Matrix

Vari-ables	ESG	Size	Lev-erage	R OA	VIX	Idi-oRisk
ESG	1.000					
Size	-0.371***	1.000				
Lev-erage	-0.487***	0.564***	1.000			
ROA	0.323***	-0.220**	-0.580***	1.000		
VIX	0.067	0.006	-0.014	-0.013	1.000	
Idio-Risk	0.326***	0.127	-0.163*	0.027	0.429***	1.000

Source: Author's estimation based on compiled firm level data

Note: ***p<0.01, **p<0.05, *p<0.1

The control variables do not show extremely high pairwise correlations, which could bias coefficient estimates.

The Variance Inflation Factor (VIF) results provide additional evidence that multicollinearity is not a serious issue under the regression requirements.

4.3 Baseline Regression Results

Regression findings across five parameters are shown in Table 4.3. Column 1 displays the baseline pooled OLS results; columns 2–5 present the lagged ESG, crisis interaction, size interaction, and ESG component models, which are covered in sections 4.5–4.8, respectively.

Table 4.3: ESG Performance and Idiosyncratic Risk

Variables	Baseline	ESG Lag	Crisis Inter-action	Size Interaction	ESG Components
ESG	0.261*** (0.057)		0.316*** (0.078)	-0.113 (0.350)	
ESG_Lag		0.324** (0.137)			
ESG × Demo			-0.112 (0.158)		
ESG × NBFC			-0.265*** (0.090)		
ESG × COVID			-0.226* (0.129)		
ESG × Size				0.034 (0.032)	
Environment (E)					-0.042 (0.107)
Social (S)					0.235** (0.107)
Governance (G)					0.133 (0.126)
Demo (2016)			0.404 (0.357)		
NBFC (2018-19)			0.541*** (0.191)		
COVID (2020-21)			1.303*** (0.301)		
Size	0.129*** (0.027)	0.679*** (0.093)	0.108*** (0.025)	0.069 (0.064)	0.111*** (0.028)
Leverage	-0.557*** (0.213)	-0.478 (0.461)	-0.512** (0.186)	- 0.527** (0.216)	- 0.651*** (0.225)
ROA	-0.808 (0.488)	-0.099 (0.636)	-0.589 (0.441)	-0.840* (0.478)	-0.765 (0.497)
VIX	0.031*** (0.011)	0.035*** (0.007)	-0.006 (0.011)	* 0.031** (0.011)	0.030*** (0.011)
Crisis	0.322*** (0.080)	0.262*** (0.031)		* 0.323** (0.080)	0.319*** (0.081)
Constant	-12.159*** (0.355)	-18.779*** (1.173)	-11.471*** (0.362)	- 11.505*** (0.715)	- 12.150*** (0.382)
<i>Model Diagnostics</i>					
Observations	150	135	150	150	150
R ²	0.403	0.631 (within)	0.544	0.408	0.414
Estimator	OLS	Firm FE	OLS	OLS	OLS
Standard Errors	Robust	Clustered	Robust	Robust	Robust

Source: Author’s estimation based on compiled firm level data

Note: Columns (1), (3), (4), and (5) have robust standard errors in parenthesis. Column (2) shows a cluster of standard errors at the firm level. Using lagged ESG as the explanatory variable and firm fixed effects, column (2) yields 135 observations after one year of lagging. Demonetization (Demo, 2016), the NBFC liquidity crisis (NBFC, 2018–2019), and the COVID-19 pandemic (COVID, 2020–2021) episode-specific indicators are substituted for the aggregate crisis dummy in Column (3); the crisis dummy is absorbed by episode dummies and removed. The composite ESG score is broken down into the Environmental (E), Social (S), and Governance (G) dimension scores in Column (5). For specifications with fixed effects, the constant is not reported. * $p < 0.10$, *** $p < 0.01$, ** $p < 0.05$.

Idiosyncratic risk is positively and strongly correlated with ESG performance at baseline ($\beta = 0.261$, $SE = 0.057$, $p < 0.001$). $F(6,143) = 19.25$ ($p < 0.001$) and $R^2 = 0.403$ indicate an excellent model fit. Firm size is positively correlated with idiosyncratic risk among control factors ($\beta = 0.129$, $p < 0.001$), which is consistent with larger firms being more volatile because of stakeholder sensitivity and transparency needs. Firm-specific residual volatility is amplified by broader market uncertainty, as demonstrated by the positive and considerable market volatility (VIX) ($\beta = 0.031$, $p = 0.005$). Idiosyncratic risk has a negative correlation with leverage ($\beta = -0.557$, $p = 0.010$). At $p = 0.100$, ROA is statistically insignificant. Economic stress episodes are linked to increased firm-specific uncertainty, as confirmed by the crisis dummy, which is positive and highly significant ($\beta = 0.322$, $p < 0.001$).

These findings confirm the sustainability transition hypothesis, which states that firms with greater ESG participation experience relatively higher firm-specific volatility during India's disclosure transition because of implementation uncertainty, increased stakeholder scrutiny, and evolving regulatory requirements.

4.4 Fixed Effects Robustness

Table 4.4 presents findings from the firm fixed effects (within) estimator, which solely uses within-firm variation in ESG scores over time to determine the ESG–risk association. This directly addresses worries that pooled OLS estimates might capture time-invariant firm characteristics that concurrently affect idiosyncratic risk and ESG engagement. The ESG coefficient under firm fixed effects is significantly higher than the baseline pooled OLS estimate and is positive and statistically significant at the 5 percent level ($\beta = 0.405$, $SE = 0.165$, $p = 0.028$). The amplified effect shows that within-firm improvements in ESG performance are linked to even higher firm-specific volatility than the cross-sectional comparison alone would imply.

The null hypothesis that there is no systematic difference between the fixed and random effects coefficients is not rejected by the Hausman test, which produces $\chi^2(6) = 6.43$ ($p = 0.376$). The test is not invalidated by the non-positive definite variance matrix, which is a recognized characteristic of small panels. Although the Hausman test does not reject the random-effects specification, the significant correlation between firm effects and regressors ($\text{corr}(u_i, Xb) = -0.887$) and the study's emphasis on controlling for unobserved heterogeneity justify the use of firm fixed effects as a conservative robustness specification.

The two-way fixed effects specification, which simultaneously accounts for unobserved firm heterogeneity and common macroeconomic shocks, is shown in column (3) and includes both firm and year fixed effects. The ESG coefficient reduces to 0.018 under this stricter definition,

making it statistically insignificant ($p = 0.831$). VIX and the crisis dummy, which are time-varying but firm-invariant, are notably absorbed by year fixed effects since they are collinear with the year dummies.

Column (4) shows that baseline results are robust to outliers. The winsorized specification (1st–99th percentile) produces an ESG coefficient of 0.261 ($p < 0.001$), which is nearly identical to the baseline estimate, demonstrating that the finding is not driven by extreme observations.

Table 4.4: Baseline and Robustness Results

Variables	(1) Baseline Pooled OLS	(2) Firm Fixed Effects	(3) Two- Way Fixed Effects	(4) Winsorized Pooled OLS
ESG	0.261*** (0.057)	0.405** (0.165)	0.018 (0.083)	0.261*** (0.057)
Size	0.129*** (0.027)	0.670*** (0.086)	0.129** (0.059)	0.129*** (0.027)
Leverage	-0.557*** (0.213)	-0.424 (0.456)	-0.245* (0.124)	-0.557*** (0.213)
ROA	-0.808 (0.488)	0.011 (0.566)	-0.181 (0.250)	-0.808 (0.488)
VIX	0.031*** (0.011)	0.030*** (0.007)	—	0.031*** (0.011)
Crisis	0.322*** (0.080)	0.296*** (0.052)	—	0.322*** (0.080)
Constant	-12.159*** (0.355)	—	—	-12.152*** (0.355)
F-statistic	F (6,143) = 19.25***			
Observations	150	150	150	150
R-squared	0.403	0.667 (with- in)	0.848 (within)	0.403
Firm Fixed Ef- fects	No	Yes	Yes	No
Year Fixed Ef- fects	No	No	Yes	No
Standard Errors	Robust	Clustered by Firm	Clustered by Firm	Robust

Note: For Columns (1) and (4), robust standard errors are given in parenthesis. Columns (2) and (3) present standard errors that are clustered at the firm level. Columns (2) and (3) contain firm fixed effects, while Column (3) contains year fixed effects. Column (4) contains variables that are winsorized at the first and 99th percentiles. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

4.5 Lagged ESG and Temporal Persistence

The lagged ESG specification under firm fixed effects is shown in Column (2) of Table 4.3, which addresses reverse causality issues and tests whether the ESG–risk link endures over time. Even after accounting for unobserved firm heterogeneity, the lagged ESG coefficient ($\beta = 0.324$, $SE = 0.137$, $p = 0.033$) is positive and statistically significant, indicating that prior-year ESG performance continues to positively influence current-period firm-specific volatility.

There are two significant implications to this temporal persistence. First, it eliminates the possibility that the observed link is solely due to contemporaneous disclosure effects, in which fresh ESG disclosures cause immediate but fleeting market reactions. Rather, ESG-related transition dynamics seem to produce persistent firm-specific volatility over several time periods, which is in line with the multi-year nature of disclosure system upgrades, organizational reorganization, and stakeholder expectation adjustment. Second, the finding is more likely to represent true ESG-driven dynamics rather than stable firm features when the lagged coefficient persists under fixed effects, when identification depends solely on within-firm variation. These results support H2.

4.6 Crisis Interaction Effects

The crisis interaction model substitutes three episode-specific variables for the COVID-19 pandemic (2020–2021), the NBFC liquidity crisis (2018–2019), and demonetization (2016) for the aggregate crisis dummy. The episode-level dummies show significant variation in the severity of crises: demonetization has a statistically insignificant effect ($\beta = 0.404$, $p = 0.260$), while COVID-19 has the biggest independent effect on idiosyncratic risk ($\beta = 1.303$, $p < 0.001$), followed by the NBFC crisis ($\beta = 0.541$, $p = 0.005$).

ESG performance lowers firm-specific volatility during the NBFC crisis (ESG×NBFC: $\beta = -0.265$, $p = 0.004$) and slightly during COVID-19 (ESG×COVID: $\beta = -0.226$, $p = 0.083$), but the demonetization interaction is negligible (ESG×Demo: $\beta = -0.112$, $p = 0.479$), according to the interaction terms. The stakeholder insurance hypothesis is supported by this pattern: ESG's risk-mitigating qualities are activated during credit and demand shocks, when relational capital and stakeholder trust are most valuable, but not during a pure liquidity shock, when systemic cash constraints dominate firm-level dynamics. These results imply that the primary moderating variable is crisis type rather than crisis per se, and they partially support H3.

4.7 Firm Size Interaction

The firm size interaction model is shown in Table 4.3's column (4). The ESG–idiosyncratic risk association does not change systematically with business size, as evidenced by the statistically insignificant interaction term between ESG performance and firm size ($\beta = 0.034$, $SE = 0.032$, $p = 0.285$). This result implies that ESG-related disclosure sensitivity and transition uncertainty have generally similar effects on large and small Indian listed enterprises, suggesting that ESG transition costs are proportionally similar across the size distribution of large listed firms, which is in line with H4's null prediction.

Table 4.5: Extended Models and Interaction Effects

Variables	(5) Lagged ESG Model	(6) Crisis Interaction Model	(7) Size Interaction Model
ESG		0.316*** (0.078)	-0.113 (0.350)
ESG (Lagged)	0.324** (0.137)		
ESG × Demo		-0.112 (0.158)	

ESG × NBFC		-0.265*** (0.090)	
ESG × COVID		-0.226* (0.129)	
ESG × Size			0.034 (0.032)
Demo		0.404 (0.357)	
NBFC		0.541*** (0.191)	
COVID		1.303*** (0.301)	
Controls	Yes	Yes	Yes
Observations	135	150	150
R-squared	0.631 (within)	0.544	0.408
Estimator	Firm Fixed Effects	Pooled OLS	Pooled OLS
Standard Errors	Clustered by Firm	Robust	Robust

Note: Column (5) shows the standard errors grouped at the firm level. Columns (6) and (7) have robust standard errors. Demo represents the demonetization period (2016), NBFC represents the NBFC crisis (2018-2019), and COVID represents the COVID-19 pandemic (2020-2021). In all models, the control variables are Size, Leverage, ROA, VIX, and Crisis. In column (6), the aggregate crisis dummy is replaced by the episode specific crisis indicators. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

4.8 ESG Component Analysis

The ESG composite score is broken down into its Environmental (E), Social (S), and Governance (G) categories in Table 4.3, column 5. The Environmental ($\beta = -0.042$, $p = 0.694$) and Governance ($\beta = 0.133$, $p = 0.293$) dimensions are not statistically significant in relation to idiosyncratic risk; only the Social dimension shows a statistically significant positive connection ($\beta = 0.235$, $SE = 0.107$, $p = 0.030$).

The social dimension's importance is in line with India's unique regulatory framework. The ratchet dynamic of stakeholder expectations not seen in environmental or governance efforts was created by the Companies Act 2014 Section 135 CSR mandate, which made social expenditure a legally regulated public obligation. Higher social ESG performance is associated with increased exposure to public scrutiny, continuing stakeholder engagement demands, and heightened reputational sensitivity, all plausible mechanisms via which social ESG activity creates persistent firm-specific volatility.

Given that agency theory predicts that improved governance will lower firm-specific risk by reducing information asymmetry, the Governance dimension's insignificance is valuable. One plausible explanation is that, due to SEBI's LODR requirements, governance disclosures in India are comparatively standardized, producing predictable market reactions with few implications for idiosyncratic volatility. The early stage of environmental disclosure standardization in India, where criteria are still too inconsistent across enterprises to produce systematic market responses, is also reflected in environmental insignificance.

4.9 Findings and Discussion

This suggests that ESG-related volatility is concentrated at times of regulatory change rather than being a time-invariant characteristic of ESG-active enterprises, which is consistent with the transition-cost view. The findings from the crisis interaction offer additional insights: although ESG is linked to increased firm-specific volatility during typical and transitional phases, improved ESG performance lowers idiosyncratic risk amid the NBFC crisis ($\beta = -0.265$, $p = 0.004$) and the COVID-19 pandemic ($\beta = -0.226$, $p = 0.083$), aligning with the stakeholder insurance mechanism. This implies that while ESG standards offer some crisis insurance amid severe economic stress, India's shift to ESG disclosure creates a short-run volatility premium during normal and transition periods.

A particular policy-relevant mechanism that sets the Indian ESG context apart from developed-market settings is identified by the social dimension's predominance, which is driven by the CSR mandate and stakeholder-intensive engagement initiatives. Further evidence that this is a structural aspect of India's sustainability disclosure environment comes from the constancy of the ESG–risk link across business size categories. Section 5 develops the significance of these findings for company management, investors, and regulators.

5 Conclusion

5.1 Summary of Findings

Using a disclosure-based ESG index and panel regression models, this study examined the relationship between idiosyncratic risk and ESG performance across 15 Indian companies listed on the NSE between 2014 and 2023. The main conclusion is that there is a positive and statistically significant relationship between ESG and idiosyncratic risk that holds true under both pooled OLS ($\beta = 0.261$, $p < 0.001$) and firm fixed effects estimation ($\beta = 0.405$, $p = 0.028$). This finding is consistent with a framework for the sustainability transition, which holds that the adoption of ESG causes implementation uncertainty, increased stakeholder scrutiny, and increased firm-specific volatility during times of regulatory change. Under fixed effects, lagged ESG performance is still significant ($\beta = 0.324$, $p = 0.033$), indicating that these dynamics do not just reflect contemporaneous disclosure effects but also persist across numerous periods. The stakeholder insurance hypothesis has been developed by the crisis interaction analysis, which shows that ESG lowers firm-specific volatility during credit and demand shocks, namely the NBFC crisis ($\beta = -0.265$, $p = 0.004$) and COVID-19 pandemic ($\beta = -0.226$, $p = 0.083$), but not during the liquidity shock of demonetization. The Companies Act 2014's mandated CSR framework is the only significant driver of idiosyncratic risk ($\beta = 0.235$, $p = 0.030$), according to ESG component decomposition. Firm size does not significantly moderate the ESG–risk link.

5.2 Theoretical and Practical Implications

The findings contribute to the sustainable finance literature by demonstrating that the ESG–risk relationship is contingent on the institutional environment, regulatory transition stage, crisis

type, and ESG dimension under consideration, departing from the conventional ESG-stabilisation hypothesis derived from developed-market evidence and aligning with institutional voids theory (Khanna & Palepu, 2000) and weak investor protection arguments (La Porta et al., 1998). The crisis-type heterogeneity result advances the stakeholder insurance hypothesis of Lins et al. (2017) by establishing that its risk-mitigating predictions apply specifically to shocks operating through relational capital channels.

5.3 Limitations and Future Research

Finally, the crisis analysis relies on identified macroeconomic episodes and their interaction with ESG performance. The distinction between crisis types provides useful evidence on the conditional nature of the ESG–risk relationship, but the results may depend on the definition and timing of the crisis periods. Future research could address these limitations by expanding the sample, incorporating additional sectors and firms, using alternative ESG ratings alongside disclosure-based measures, and examining more granular firm-level ESG events. Longer panels and alternative identification strategies could also help establish causal mechanisms and test whether the observed relationships persist as India's ESG reporting framework becomes more mature.

Third, the study combines annual ESG and firm-level financial information with daily stock-market observations used to estimate idiosyncratic risk. This structure captures the relationship between annual changes in ESG performance and market-based risk, but it cannot fully establish the timing through which individual ESG disclosures affect daily investor responses. In addition, the observational panel design does not by itself establish a causal relationship between ESG performance and idiosyncratic risk.

Second, the ESG measure is constructed from publicly disclosed information using a disclosure-based scoring framework. This approach improves transparency and provides greater contextual relevance to the Indian regulatory environment, but disclosure quality may not fully capture the underlying quality or effectiveness of a firm's ESG practices. Although the scoring process was guided by a predefined rubric and intra-rater reliability was assessed, some degree of researcher judgement remains unavoidable in classifying the content and quality of disclosures.

This study has several limitations that should be considered when interpreting the findings. First, the analysis is based on a relatively small sample of 15 listed Indian firms observed over the 2014–2023 period. Although the firms were selected to provide sectoral representation and consistent availability of financial and ESG disclosures, the sample limits the extent to which the findings can be generalized to the wider population of Indian listed firms, particularly smaller firms and firms outside the sectors represented in the study.

5.4 Concluding Remarks

Taken together, the findings indicate that ESG should not be viewed as having a uniformly risk-reducing or risk-increasing effect. In the Indian setting, its relationship

with firm-specific risk appears to depend on the stage of regulatory transition, the type of economic shock, and the ESG dimension being considered. The results therefore highlight the importance of institutional context when assessing the financial implications of ESG performance and provide evidence relevant to firms, investors, and regulators as India's sustainability disclosure framework continues to evolve.

At the same time, the crisis analysis shows that the ESG–risk relationship is not uniform across economic shocks. ESG performance is associated with lower idiosyncratic risk during the NBFC crisis and the COVID-19 pandemic, while the same risk-mitigating effect is not observed during demonetization. The component-level analysis further identifies the Social dimension as the only ESG pillar with a statistically significant relationship with idiosyncratic risk, while the Environmental and Governance dimensions are not statistically significant in the main specification. Firm size also does not significantly alter the ESG–risk relationship.

This study examined the relationship between ESG performance and idiosyncratic risk among Indian listed firms using a disclosure-based ESG index and panel regression models for the 2014–2023 period. The results show that higher ESG performance is associated with greater firm-specific risk in the overall sample, including under pooled OLS and firm fixed-effects specifications. The persistence of the relationship when lagged ESG performance is considered suggests that the observed association is not limited to contemporaneous disclosure effects.

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Appendix A

ESG Scoring Rubric and Index Construction

For every firm-year observation, the disclosure-based ESG index is constructed through methodically analysing the content of annual reports, Business Responsibility Reports (BRR), and Business Responsibility and Sustainability Reporting (BRSR) filings. The rubric shown in Table A1 assigns a score of 0 to 3 to each of the three ESG dimensions: environmental, social, and governance. The presence of a policy statement (score = 1), the formulation of quantifiable targets (score = 2), and the reporting of quantified outcomes against stated targets (score = 3) are all distinguished by the quality and specificity of disclosed information rather than just the volume of disclosure. When there is no material disclosure, a score of 0 is given.

The same researcher independently rescored a random subsample of 20 percent of firm-year observations after a 30-day gap in order to evaluate intra-rater reliability. Cohen’s Kappa was used to examine agreement between initial and rescored assessments; the result was a coefficient of 0.82, indicating strong reliability. To reduce ex-post subjectivity, all scoring was done using the rubric that was established before data collection.

Table A1: ESG Disclosure Scoring Rubric

Panel A- Environmental (E)		
Score	Level	Disclosure Criteria
0	No Disclosure	No mention of environmental policies, practices, or targets in annual report or BRR/BRSR filing.
1	Minimal Disclosure	Qualitative statement of environmental commitment or policy present; no targets or quantified metrics disclosed.
2	Moderate Disclosure	Specific environmental targets stated (e.g., energy reduction, emissions intensity) with partial quantitative reporting against at least one metric.
3	Strong Disclosure	Quantified targets reported with performance outcomes across multiple environmental metrics; third party verification or assurance present.
Panel B- Social (S)		
Score	Level	Disclosure Criteria
0	No Disclosure	No mention of CSR expenditure, employee welfare, community engagement, or workplace policies.
1	Minimal Disclosure	General statement of CSR policy or employee welfare commitment present; no expenditure data or programme outcomes disclosed.
2	Moderate Disclosure	CSR expenditure amount disclosed with description of at least one programme area; basic employee welfare metrics (headcount, training hours) reported.
3	Strong Disclosure	Comprehensive CSR reporting with expenditure, programme outcomes, and impact metrics; diversity data, employee welfare indicators, and community engagement outcomes quantitatively reported.
Panel C- Governance (G)		
Score	Level	Disclosure Criteria
0	No Disclosure	No disclosure beyond statutory minimum filings; no board composition, audit committee, or shareholder rights information provided.
1	Minimal Disclosure	Basic board composition data present (board size, independence ratio) but no audit committee details or shareholder rights disclosures.

2	Moderate Disclosure	Board independence, audit committee composition, and related party transaction policies disclosed; basic shareholder rights information present.
3	Strong Disclosure	Comprehensive governance disclosure including board evaluation processes, executive remuneration linked to performance, detailed audit committee reporting, and whistle blower or anti-corruption policies.

Note: Scores are provided based on the quality and specificity of disclosures rather than their volume. A firm-year observation may receive partial scores (e.g., 1.33, 1.67) if it partially meets criteria across several indicators within a dimension. Primary sources include SEBI LODR disclosures, BRR filings (2014–2022), BRSR filings (2022–2023), and annual reports. Regulatory standards include GRI Standards 302–413, the Companies Act of 2014 Section 135, and the SEBI BRSR Framework (2021).

In accordance with the equal-weighting method outlined in Section 3.2.2, the composite ESG score for each firm-year is calculated as the unweighted mean of the three-dimension values. The score distribution shown in Table 4.1 is obtained by keeping dimension scores as fractional values where the disclosure content justifies partial credit.

Appendix B

Crisis Dummy Construction

The baseline model includes an aggregate crisis dummy variable that equals 1 in years with considerable macroeconomic disturbance and 0 otherwise. To see if the ESG-risk relationship differs with different types of economic shocks, the aggregate indicator is replaced in the extended specification by three episode-specific dummy variables (Demo, NBFC, and COVID) and their interaction terms with ESG performance. Table B1 summarizes how these variables were constructed.

Table B1: Crisis Dummy Variable Definitions

Indicator	Variable Code	Years Coded as 1	Economic Rationale
Aggregate Crisis	Crisis	2016, 2018, 2019, 2020, 2021	Binary indicator equal to 1 during years characterized by significant macroeconomic disruption. It is used in baseline and robustness specifications.
Demonetization	Demo	2016	In November 2016, the elimination of ₹500 and ₹1,000 banknotes led to a liquidity shock.
NBFC Crisis	NBFC	2018, 2019	Credit shock caused by the IL&FS default and the resulting liquidity constraints in the non-banking financial sector.
COVID-19 Pandemic	COVID	2020, 2021	Economic disruption caused by the COVID-19 outbreak, lockdown measures, and related financial uncertainties.

Note: When any of the episode-specific crisis indicators is 1, the aggregate Crisis dummy equals one. The episode-specific dummies are non-overlapping and represent different macroeconomic shocks that occurred during the sample period. The authors build all crisis indicators based on publicly available economic data.

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