Business Strategy and the Environment

WILEY | Business Strategy and the Environment

RESEARCH ARTICLE OPEN ACCESS

Organizational Resilience to Exogenous Shocks: The Role of Environmental Performance

Tim Schroll

Centre for Sustainability Management (CSM), Leuphana University Lüneburg, Lüneburg, Germany

Correspondence: Tim Schroll (tim.schroll@leuphana.de)

Received: 3 November 2024 | **Revised:** 5 January 2026 | **Accepted:** 13 January 2026

Keywords: corporate sustainability | environmental performance | natural resource–based view | organizational resilience

ABSTRACT

This research examines the influence of environmental performance on organizational resilience during an exogenous shock. Drawing on the natural resource–based view, a sample of 3920 firms from 11 sectors and 19 countries is analyzed. This study employs OLS regressions and Cox proportional hazard models to test the effect of environmental performance on the severity of loss and time to recovery following an exogenous shock. The findings reveal that higher levels of environmental performance mitigate the severity of loss but prolong the time to recovery. These results provide important insights into how environmental performance shapes organizational resilience during exogenous shocks and highlight the need for further research to better understand the temporal dimension of its effects, specifically when and how environmental performance translates into resilience benefits.

1 | Introduction

Recent exogenous shocks, such as the COVID-19 pandemic and the Russia–Ukraine war, pose a persistent threat to firms, prompting increased attention in management literature to the factors that enhance organizational resilience (e.g., Hillmann 2021; Hillmann and Guenther 2021; Su and Junge 2023). This has led to a significant increase in the number of publications and calls for papers in high-impact journals on this topic (e.g., Borah et al. 2023; Ciasullo et al. 2024; Duchek 2020).

Previous studies have identified a variety of factors influencing organizational resilience, including resource availability (Pal et al. 2014), slack resources (Mithani et al. 2021), positive relationships (Gittell et al. 2006), and social and environmental practices (DesJardine et al. 2019). Organizational resilience has been examined from various theoretical perspectives, such as the resource-based view (RBV; Barney 1991), dynamic capabilities view (Teece et al. 1997), and organizational learning (Huber 1991). However, there remains limited understanding about the factors that enhance organizational resilience, and empirical studies on this subject are still scarce (Hillmann and Guenther 2021)

An important perspective that has received limited attention in scientific literature is the environmental perspective on organizational resilience. This perspective is particularly relevant, as higher levels of environmental performance can be associated with enhanced resource efficiency, reduced costs, and decreased reliance on external resources (Hart 1995), which, in turn, can strengthen organizational resilience (Kennedy and Linnenluecke 2022). Additionally, the growing awareness of environmental concerns among stakeholders is increasing the pressure on firms to adopt environmentally friendly practices (Hörisch and Schaltegger 2019).

Therefore, the purpose of this paper is to examine the role of environmental performance in enhancing organizational resilience during an exogenous shock, by addressing the following research question: *Do higher levels of environmental performance increase organizational resilience during an exogenous shock?* To address this research question, this research draws on the natural resource–based view (NRBV), which argues that a firm's competitive advantage is significantly shaped by its relationship with the natural environment (Hart 1995).

This analysis is based on a quantitative approach, drawing on a sample of 3920 firms from 11 sectors and 19 countries. Following the methodology by DesJardine et al. (2019), organizational resilience is assessed through two dimensions: the severity of loss of stock prices and their time to recovery.

Whereas prior research has predominantly examined the relationship between environmental performance and financial performance, the present study shifts the focus to the influence of environmental performance on organizational resilience. Moreover, whereas most existing studies investigate the broader concept of sustainability and its association with organizational resilience (e.g., DesJardine et al. 2019; Ortiz-de-Mandojana and Bansal 2016; Sajko et al. 2021), this research specifically emphasizes the role of environmental performance as well as its subdimensions, such as resource use, emissions, and environmental innovation.

The findings indicate that higher levels of environmental performance mitigate the severity of loss but prolong the time to recovery. These results offer valuable insights into how environmental performance influences organizational resilience during exogenous shocks and emphasize the need for further research to clarify the temporal dimension of this relationship, particularly regarding when and how environmental performance translates into resilience benefits. Additionally, this study makes an important theoretical contribution by highlighting the need to specify the NRBV regarding exploring more deeply the temporal mechanisms through which environmental performance exerts its effects, as the longer time to recovery suggests that its benefits may materialize only over an extended period.

2 | Theoretical Background and Hypotheses Development

2.1 | The Natural Resource–Based View

The NRBV (Hart 1995) is an extension of the RBV of the firm (Barney 1991), incorporating the previously missing consideration of the natural environment and its role in achieving sustained competitive advantage. According to the theory, firms can achieve sustained competitive advantage by improving their environmental performance through three interconnected strategies: pollution prevention, product stewardship, and sustainable development (Hart 1995). These strategies can help to reduce emissions, effluents, and waste (pollution prevention), minimizing the environmental impacts products cause (product stewardship) and reconcile the conflict between business growth and environmental burden (sustainable development). Pollution prevention can enhance a firm's efficiency and productivity, leading to reduced costs, which in turn may improve cash flow and profitability. By following a product stewardship strategy, firms can strengthen stakeholder relationships, thereby enhancing reputation and legitimacy. The sustainable development strategy adopts a long-term perspective, involving investments that aim to enhance the future position (Hart 1995; Hart and Dowell 2011). To derive sustained competitive advantage from these strategies, firm resources must be valuable, rare, imperfectly imitable, and nonsubstitutable (Barney 1991; Hart 1995). In recent years, numerous studies have examined the relationship between environmental and financial performance from a NRBV perspective. Most of these studies have found a positive relationship, which supports the assumptions of the NRBV (e.g., Boakye et al. 2020; Brahmana and Kontesa 2021; Danso et al. 2019).

2.2 | Environmental Performance and Organizational Resilience

The term "environmental performance" can be defined as "a firm's effectiveness in meeting and exceeding society's expectations with respect to concerns for the natural environment" (Judge and Douglas 1998, 245). Environmental performance has been measured in various ways, such as carbon emissions (Aslam et al. 2021), waste generated (Iwata and Okada 2011), water use (Hoang et al. 2020), and environmental scores (Cao et al. 2019). Many recent studies have focused on the relationship between environmental and financial performance, with most finding a positive relationship (e.g., Elmghaamez and Olarewaju 2022; Hanjani and Kusumadewi 2023; Le and Nguyen-Phung 2024). However, traditional approaches such as the shareholder value concept assume the opposite effect, arguing that investments in sustainability increase costs and should only be made if they enhance shareholder value (Friedman 1970; Hassel et al. 2005; Sundaram and Inkpen 2004).

Organizational resilience refers to "the firm's ability to sense and correct maladaptive tendencies and cope positively with unexpected situations" (Ortiz-de-Mandojana and Bansal 2016, 1615). Although research interest in this field has grown significantly in recent years, relatively little is known about the factors that enhance organizational resilience. Furthermore, organizational resilience cannot be measured directly, which may explain the limited number of empirical studies in this area (Duchek 2020). DesJardine et al. (2019) suggest that organizations can be characterized as resilient if they are able to mitigate the severity of loss (stability dimension) and reduce the time to recovery (flexibility dimension) following an environmental disturbance. In this context, previous studies have found that sustainable business practices can have a positive impact on organizational resilience (DesJardine et al. 2019; Ortiz-de-Mandojana and Bansal 2016; Sajko et al. 2021). In the recent past, exogenous shocks, such as the COVID-19 pandemic and the Russia–Ukraine war, have posed significant challenges to the resilience of many firms. These shocks had significant negative effects on the global economy, causing disruptions in supply chains, reductions in revenue, and cash-flow problems (Ciravegna et al. 2023). To survive such a shock, firms need substantial financial resources (Hitt et al. 2021). Therefore, the assumption of the NRBV that improved environmental performance can increase cash-flow and profitability (Boakye et al. 2020; Hart 1995) might play a vital role in enhancing organizational resilience. Furthermore, the strategies proposed by the NRBV encompass many aspects that are likely to contribute to organizational resilience. For example, previous analyses underscore not only the importance of reputation and legitimacy as a crucial asset for firms (e.g., Gangi et al. 2020; Reihlen et al. 2022; Roberts and Dowling 2002) but also that firms use their environmental management to improve reputation and legitimacy (Schaltegger and Hörisch 2017). Thus, when an exogenous shock occurs, enhanced reputation and legitimacy of firms with better environmental performance could help mitigate the severity of loss (stability dimension of organizational resilience). In addition, increased efficiency and productivity through higher environmental performance might enable firms to recover from an exogenous shock more quickly (flexibility dimension of organizational resilience). This stems from the argument that increased efficiency and productivity can lead to material and cost savings (Ortiz-de-Mandojana and Bansal 2016; Sajko et al. 2021). Furthermore, the increasing number of investors factoring in environmental considerations intensifies the pressure to improve environmental performance (Garel and Petit-Romec 2021). In summary, there is ground to believe that higher levels of environmental performance can positively impact both dimensions of organizational resilience (severity of loss and time to recovery). Building on this, the following hypotheses are proposed:

Hypothesis 1. *Higher levels of environmental performance mitigate the severity of loss after an exogenous shock.*

Hypothesis 2. *Higher levels of environmental performance reduce the time to recovery following an exogenous shock.*

Earlier research on the influence of environmental performance on financial performance found that not only environmental performance as a whole influences financial performance but that specific subdimensions of environmental performance are particularly decisive for this influence (e.g., Busch et al. 2022). Given the similarities of the findings between studies on the influence of environmental performance on financial performance (e.g., Boakye et al. 2020; Brahmana and Kontesa 2021; Danso et al. 2019) and organizational resilience (e.g., DesJardine et al. 2019; Ortiz-de-Mandojana and Bansal 2016; Sajko et al. 2021), it is worthwhile to further explore Hypotheses 1 and 2, by also analyzing the effect of the subdimensions of environmental performance on organizational resilience.

3 | Methodology

3.1 | Sample

The financial and environmental data were collected from LSEG (formerly Refinitiv/Thomson Reuters) and includes firms from Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, South Korea, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, and the United States. These countries were selected because they represent many publicly traded firms worldwide and have been used in many studies (al Amosh and Khatib 2023; el Khoury et al. 2022; Paramati et al. 2017; Yao and Tang 2021). The initial dataset included the 5000 largest firms from G20 countries. After firms with missing values were excluded from the sample, the final sample comprises 3920 firms from 11 sectors and 19 countries.

3.2 | Dependent Variables

Organizational resilience is assessed based on the severity of loss, reflected in the absolute percentage change of the stock price after the exogenous shock (COVID-19 pandemic), and the time to recovery, which is the time it takes for a stock to return to its preshock level (DesJardine et al. 2019; Engelen et al. 2024; Sajko et al. 2021). The COVID-19 pandemic has been chosen as the exogenous shock of interest due to its severe negative impact on the global economy, driven by various factors such as high supply and demand uncertainty, which challenged the resilience of many firms. February 17, 2020, has been selected as the preshock level (cf. Azeem et al. 2023), and the observations window spans 1 year (cf. DesJardine et al. 2019).

3.3 | Independent Variable

This study builds on the work of Cao et al. (2019), Flammer (2021), and Hsu et al. (2023) by using the environmental pillar score from LSEG to assess the environmental performance of firms. According to Bendig et al. (2023), the environmental pillar score encompasses all dimensions of the NRBV, comprising the categories of emissions (corresponding to pollution prevention), resource usage (aligned with product stewardship), and environmental innovation (reflecting sustainable development). To further explore the effect of environmental performance on organizational resilience, an exploratory test furthermore used these single subdimensions of the environmental pillar score as independent variables. This allows testing whether not only environmental performance as a whole influences severity of loss but also whether these specific subdimensions of environmental performance are particularly decisive for severity of loss and time to recovery.

3.4 | Control Variables and Instrumental Variables for Endogeneity Tests

The analysis controls for firm age, firm size, profitability, financial leverage, intangible assets, operational efficiency, capital intensity, and industry (cf. DesJardine et al. 2019). To account for the possibility that firms differed in their risk profiles prior to the pandemic, which may have influenced their resilience, the analysis controls for beta (β), following prior research (Peng and Jiang 2010; Wang et al. 2017). In line with previous studies, it also controls for the region in which the firm's headquarters is located. The individual countries are grouped according to the geographical regions defined by the United Nations (Flores et al. 2013; Lee et al. 2023).

According to Semadeni et al. (2014), even low levels of endogeneity can substantially distort empirical findings by producing statistically significant but spurious coefficients. Studies that fail to account for endogeneity therefore risk reporting biased results. Endogeneity arises when an explanatory variable is correlated with the error term in an OLS regression, which may occur due to omitted variables, simultaneity, measurement error, or selection processes (Hill et al. 2021; Wooldridge 2016). In such cases, OLS estimates are inconsistent because the estimated effect of the regressor is contaminated by its correlation with the unexplained component of the dependent variable.

To rule out potential endogeneity concerns, an extensive analysis was conducted. Consistent with DesJardine et al. (2019), analyst coverage and number of employees were employed as instrumental variables, whereas R&D expenditure was excluded due to limited data availability. The analysis used a Wu–Hausman test to check for potential endogeneity, following established practice in the management literature (e.g., Abdi and Aulakh 2018; Marshall et al. 2019; Racine et al. 2020).

Table 1 displays the operationalization of the different variables included in the study.

4 | Analysis and Results

Table 2 presents the descriptive statistics and the correlation matrix of the dataset. The correlation matrix indicates the absence of multicollinearity, as none of the coefficients exceed the threshold of 0.80 (Kennedy 1992). Exceptions are the correlations between environmental performance and its subdimensions.

4.1 | OLS and 2SLS Results

To test Hypothesis 1, ordinary least squares (OLS) and two-stage least squares (2SLS) regression analyses were conducted (Table 3). Model 1, which includes only the control variables, shows that firm size and profitability are positively associated with the severity of loss, whereas financial leverage, capital intensity, and beta are negatively associated. The main model

TABLE 1 | Description of key variables.

Variable	Description	Source
Dependent variables		
Severity of loss	Measures the absolute percentage decline in a firm's stock price during the 1-year period following the onset of the COVID-19 pandemic, capturing the stability dimension of organizational resilience.	Data: LSEG; approach: DesJardine et al. (2019)
Time to recovery	Captures the number of days required for a firm's stock price to return to its preshock level, representing the flexibility dimension of organizational resilience.	Data: LSEG; approach: DesJardine et al. (2019)
Independent variables		
Environmental performance	Operationalized as the Environmental Pillar Score provided by LSEG, which reflects a firm's overall environmental impact across domains such as resource use, emissions, and innovation. The score captures how effectively a firm manages environmental risks and opportunities to enhance long-term value creation.	Data: LSEG; approach: Cao et al. (2019); Flammer (2021); Hsu et al. (2023)
Resource use score	Reflects a firm's ability to reduce material, energy, and water consumption and implement eco-efficient solutions in operations and supply chains.	Data: LSEG; used in: Orazalin and Mahmood (2021)
Emissions score	Measures a firm's commitment and performance in reducing greenhouse gas emissions and other pollutants.	Data: LSEG; used in: Tanthanongsakkun et al. (2023)
Environmental innovation score	Captures a firm's capacity to develop and apply environmental technologies and eco-innovative processes that lower environmental burdens.	Data: LSEG; used in: Albitar et al. (2023)
Instrumental variables		
Analyst coverage	Number of financial analysts providing active coverage for a firm, reflecting information transparency and market visibility.	Data: LSEG; approach: DesJardine et al. (2019)
Number of employees	Total number of employees (full- and part-time), used to approximate organizational capacity and scale.	Data: LSEG; approach: DesJardine et al. (2019)
Control variables		

(Continues)

Variable	Description	Source
Firm size	Natural logarithm of total assets, indicating firm scale and resource availability.	Data: LSEG; approach: DesJardine et al. (2019)
Firm age	Natural logarithm of years since incorporation, capturing organizational maturity and experience.	Data: LSEG; approach: DesJardine et al. (2019)
Intangible assets	Ratio of price to book value per share, reflecting the proportion of intangible value in market valuation.	Data: LSEG; approach: DesJardine et al. (2019)
Operational efficiency	Ratio of sales to total assets (asset turnover), indicating how efficiently a firm uses its resources to generate revenue.	Data: LSEG; approach: DesJardine et al. (2019)
Profitability	EBITDA as a percentage of total assets, capturing operational profitability independent of financing and accounting effects.	Data: LSEG; approach: DesJardine et al. (2019)
Financial leverage	Long-term debt as a percentage of total assets, representing financial risk exposure.	Data: LSEG; approach: DesJardine et al. (2019)
Capital intensity	Ratio of total capital expenditures to total assets, indicating investment intensity in long-term capacity.	Data: LSEG; approach: DesJardine et al. (2019)
Beta	CAPM beta measuring a firm's sensitivity to overall market movements, capturing systematic risk exposure.	Data: LSEG; approach: Peng and Jiang (2010); Wang et al. (2017)
Industry dummies	Based on the Global Industry Classification Standard (GICS) to control for sector-specific effects.	Classification: GICS; approach: Damianov and Elsayed (2020)
Regional dummies	Countries grouped by UN regional classifications to control for geographic variation.	Classification: UN; approach: Flores et al. (2013); Lee et al. (2023)

(Model 2), which adds environmental performance as the independent variable, exhibits a good model fit ($R^2 = 0.529$; F statistic = 47.334**). In addition, the maximum generalized variance inflation factors (GVIFs; Fox and Monette 1992) indicate that multicollinearity is not a concern, as none of the values exceed the commonly accepted threshold of 10 (Kennedy 1992). In the main model (Model 2), environmental performance significantly reduces severity of loss ($b = -0.012$, $p < 0.01$), thereby supporting Hypothesis 1. The pattern of control variable effects remains largely consistent with Model 1.

To further explore the effect of environmental performance on severity of loss, it is worthwhile to test not only whether environmental performance as a whole influences severity of loss but also whether specific subdimensions of environmental performance are particularly decisive for severity of loss.

To test for potential problems connected to endogeneity, endogeneity tests were performed (see Table A3). The results indicate that endogeneity is not present in the main model (i.e., if environmental performance is used as an independent variable). Therefore, the OLS estimates can be interpreted as unbiased. For completeness, the full set of OLS regression results is reported in the appendix (Table A7). In contrast, the Wu–Hausman test shows significant values if selected subdimensions of environmental performance were used (i.e., resource use and emissions; see the appendix) due to the presence of endogeneity. For this reason, the 2SLS estimates are preferred for analyzing the effect of resource use and emissions on the severity of loss. Furthermore, the subdimension environmental innovation can also be interpreted as unbiased, because the Wu–Hausman test indicated no evidence of endogeneity. Detailed results, including first-stage regressions (Tables A1 and A2), second-stage regressions (Tables A5 and A6), and instrumental variable test statistics (Tables A3 and A4), are reported in the appendix.

Because based on the results of the endogeneity tests, standard OLS models using resource use and emissions as independent variables cannot be interpreted due to endogeneity concerns, corresponding 2SLS estimates were used to test the effects of resource use (Model 3) and emissions (Model 4) on the severity of loss. These models indicate that resource use and emissions have no statistically significant effect on the severity of loss. Model 5 uses the environmental innovation subdimension of environmental performance and shows that environmental innovation significantly decreases the severity of loss ($b = -0.007$, $p < 0.01$).

4.2 | Cox Proportional Hazard Models Results

To test Hypothesis 2, Cox proportional hazard models were used (Table 4). Consistent with DesJardine et al. (2019), endogeneity is not considered a concern in the Cox proportional hazard models.

TABLE 2 | Descriptive statistics and correlation matrix.

Research variable	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Severity of loss	0.423	0.180	1														
2. Environmental performance	38.175	28.761	0.006	1													
3. Resource use	41.628	32.943	−0.014	0.897**	1												
4. Emissions	43.211	32.953	0.002	0.897**	0.816**	1											
5. Environmental innovation	25.828	31.368	0.040**	0.709**	0.482**	0.479**	1										
6. Firm age	3.234	0.854	0.112**	0.235**	0.201**	0.206**	0.224**	1									
7. Firm size	22.507	1.557	0.096**	0.465**	0.443**	0.455**	0.366**	0.144**	1								
8. Profitability	0.100	0.082	0.083**	0.144**	0.162**	0.144**	0.014	0.074**	−0.171**	1							
9. Financial leverage	0.199	0.167	−0.299**	0.089**	0.090**	0.061**	0.036*	−0.133**	0.038*	0.021	1						
10. Intangible assets	3.630	16.358	0.026	0.003	0.012	0.007	−0.012	−0.004	−0.055**	0.129**	0.055**	1					
11. Operational efficiency	0.678	0.600	0.044**	0.077**	0.084**	0.066**	0.030	0.103**	−0.241**	0.383**	−0.088**	0.110**	1				
12. Capital intensity	0.044	0.049	−0.032*	0.049**	0.039*	0.052**	−0.031*	−0.052**	−0.157**	0.264**	0.173**	0.011	0.087**	1			
13. Beta	1.033	0.513	−0.168**	0.013	0.017	−0.006	0.040*	−0.001	0.025	−0.057**	0.014	−0.020	0.024	−0.023	1		
14. Analyst coverage	10.924	8.417	0.076**	0.397**	0.418**	0.392**	0.226**	0.032*	0.440**	0.213**	−0.028	0.058**	0.090**	0.042**	0.068**	1	
15. Number of employees	8.746	1.867	0.178**	0.456**	0.455**	0.423**	0.323**	0.245**	0.535**	0.206**	−0.091**	0.012	0.303**	−0.075**	0.071**	0.463**	1

*$p < 0.05$ (two-tailed correlations).
**$p < 0.01$.

TABLE 3 | Effect of environmental performance and its subdimensions on severity of loss: OLS and 2SLS results.

Variables	Model 1 OLS	Model 2 OLS	Model 3 2SLS	Model 4 2SLS	Model 5 OLS
Environmental performance		−0.012**			
		(0.003)			
Resource use			0.020		
			(0.014)		
Emissions				0.033	
				(0.020)	
Environmental innovation					−0.007**
					(0.002)
Firm size	0.016**	0.023**	0.006	−0.001	0.019**
	(0.002)	(0.003)	(0.008)	(0.011)	(0.002)
Firm age	0.000	0.001	−0.002	−0.003	0.001
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Intangible assets	0.002	0.002	0.002	0.002	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Operational efficiency	−0.003	−0.003	−0.005	−0.006	−0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Profitability	0.022**	0.023**	0.018**	0.017**	0.022**
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Financial leverage	−0.027**	−0.027**	−0.026**	−0.026**	−0.027**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Capital intensity	−0.006*	−0.006*	−0.006*	−0.007*	−0.006*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Beta	−0.031**	−0.031**	−0.032**	−0.032**	−0.031**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Constant	−0.619**	−0.614**	−0.626**	−0.627**	−0.617**
	(0.027)	(0.027)	(0.028)	(0.028)	(0.027)
Industry dummies	Included	Included	Included	Included	Included
Regional dummies	Included	Included	Included	Included	Included
Number of firms	3920	3920	3668	3668	3920
F tatistic	47.446**	47.334**			47.072**
Wald $\chi 2$			372.633**	366.157**	
R^2	0.527	0.529	0.537	0.520	0.528
GVIFmax	1.470	1.473	1.481	1.481	1.471

Note: Values are presented as *b* (SE) unless indicated otherwise. Model 1 = controls only; Model 2 = environmental performance; Model 3 = resource use score; Model 4 = emissions score; Model 5 = environmental innovation score.
*$p < 0.05$.
**$p < 0.01$.

The Wald χ^2 statistics indicate that all model specifications are jointly significant. Moreover, the maximum generalized variance inflation factors (GVIFs) indicate that multicollinearity is not an issue in any of the models. The results of Model 1, which includes only control variables, show that firm size, firm age, and operational efficiency are negatively associated with time

TABLE 4 | Effect of environmental performance on time to recovery: Cox proportional hazard models.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Environmental performance		−0.060*			
		(0.024)			
Resource use			−0.049*		
			(0.023)		
Emissions				−0.041	
				(0.023)	
Environmental innovation					−0.052*
					(0.021)
Firm size	−0.043*	−0.009	−0.015	−0.020	−0.024
	(0.022)	(0.026)	(0.025)	(0.025)	(0.023)
Firm age	−0.074**	−0.065**	−0.068**	−0.069**	−0.068**
	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)
Intangible assets	0.007	0.007	0.007	0.007	0.007
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Operational efficiency	−0.097**	−0.090**	−0.091**	−0.093**	−0.092**
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Profitability	0.005	0.010	0.010	0.009	0.005
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Financial leverage	−0.043	−0.042	−0.043	−0.043	−0.041
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Capital intensity	0.047*	0.048*	0.048*	0.047*	0.048*
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Beta	−0.025	−0.023	−0.024	−0.024	−0.024
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Industry dummies	Included	Included	Included	Included	Included
Regional dummies	Included	Included	Included	Included	Included
Number of firms	3920	3920	3920	3920	3920
Number of firms recovered	3469	3469	3469	3469	3469
Wald $\chi 2$	346.270**	352.720**	351.180**	349.620**	351.610**
GVIFmax	1.470	1.473	1.473	1.473	1.471

Note: Values are presented as b (SE) unless indicated otherwise. Model 1 = controls only; Model 2 = environmental performance; Model 3 = resource use score; Model 4 = emissions score; Model 5 = environmental innovation score.
*$p < 0.05$.
**$p < 0.01$.

to recovery, whereas capital intensity is positively related. In the main model (Model 2), environmental performance significantly increases the time to recovery ($b = -0.060$, $p < 0.05$). Thus, Hypothesis 2 cannot be supported, as the direction of the effect is opposite to the expected relationship. Among the control variables, firm age and operational efficiency remain negatively associated with time to recovery, whereas capital intensity continues to show a positive relationship. Furthermore, the results indicate that resource use ($b = -0.049$, $p < 0.05$; Model 3) and environmental innovation ($b = -0.052$, $p < 0.05$; Model 5) also significantly increase time to recovery whereas emissions do not show significant effects on time to recovery ($b = -0.041$; $p = 0.076$; Model 4).

4.3 | Robustness Checks for Severity of Loss and Time to Recovery

To test the robustness of the results across different contexts, an additional analysis was conducted excluding US firms from the sample, as these make up an overproportioned share of the sample. This approach has been applied in numerous studies, such as

An et al. (2018), Ferris et al. (2009), and Frijns et al. (2013). The results remain robust when US firms are excluded. Environmental performance continues to significantly reduce the severity of loss ($b = -0.021$, $p < 0.01$) (Table A8) and to prolong the time to recovery ($b = -0.137$, $p < 0.01$) (Table A9). Endogeneity does not appear to be a concern in this subsample (Table A4). Detailed results for the robustness check are provided in the appendix.

5 | Discussion and Conclusion

This study examined the relationship between environmental performance and organizational resilience from a NRBV perspective (Hart 1995) using the context of the COVID-19 pandemic as an example of an exogenous shock. Consistent with DesJardine et al. (2019), organizational resilience was measured through two dimensions: the severity of loss (stability dimension) and the time to recovery (flexibility dimension).

The findings reveal that higher environmental performance significantly reduces the severity of loss (Hypothesis 1) aligning with the NRBV's theoretical assumptions (Hart 1995; Hart and Dowell 2011) and with DesJardine et al. (2019), who found that social and environmental business practices mitigated the severity of loss of US firms during the 2008 global financial crisis. In contrast to previous studies that reported a positive link between sustainability and recovery speed (cf. DesJardine et al. 2019; Sajko et al. 2021), the results of this study show that higher environmental performance prolongs the time to recovery, which contradicts Hypothesis 2.

A key distinction between this study and earlier studies lies in its focus on the environmental dimension of sustainability, whereas prior studies examined broader constructs such as social and environmental business practices (DesJardine et al. 2019) or CSR (Sajko et al. 2021). This narrower operationalization may partly explain why the present study yields different results compared to previous research. The focus on individual subdimensions of environmental performance (i.e., emissions, resource use, and environmental innovation) even allows specifying which aspects of environmental performance are particularly relevant for enhancing organizational resilience (i.e., environmental innovation).

The finding that firms with higher environmental performance experience smaller financial losses during exogenous shocks may stem from the long-term investments these firms have made in environmental sustainability, which can strengthen stakeholder relationships and enhance corporate reputation and legitimacy (Hart 1995; Hart and Dowell 2011; Schaltegger and Hörisch 2017). These factors likely buffer the initial impact of an exogenous shock. Because severity of loss is measured via stock price reactions, it can be argued that investors initially perceived environmentally responsible firms as more stable and credible, thereby mitigating the market's immediate negative response. This interpretation is consistent with studies emphasizing the long-term benefits of sustainability for resilience and value creation (Ortiz-de-Mandojana and Bansal 2016).

In contrast, the finding that higher environmental performance is associated with a longer time to recovery may reflect short-term trade-offs. Firms with lower environmental commitments may respond more flexibly to exogenous shocks by prioritizing immediate profitability and cost-saving measures, whereas environmentally responsible firms might adhere to sustainability principles or maintain cost-intensive sustainable operations even under pressure. Such behavior can limit short-term adaptability but supports long-term stability. This argument aligns with prior research suggesting that sustainable business practices yield primarily long-term rather than short-term resilience benefits (Ortiz-de-Mandojana and Bansal 2016).

The robustness of the findings was confirmed through additional analyses using alternative samples and endogeneity tests. To further explore which specific dimensions of environmental performance drive these results, the subdimension resource use, emissions, and environmental innovation were analyzed separately. The results indicate that, alike the overall environmental performance, higher environmental innovation significantly reduces the severity of loss, underscoring the importance of innovation-oriented environmental strategies in enhancing stability during exogenous shocks. However, the subdimensions resource use and environmental innovation are associated with a longer time to recovery, suggesting that although environmental performance enhances resilience in terms of stability, it simultaneously imposes short-term constraints on flexibility. Overall, these findings underscore the multidimensional nature of environmental performance (Busch et al. 2022) and highlight the value of examining both its aggregate level and its subdimensions.

Differences between this study and earlier findings may also result from contextual factors, as exogenous shocks vary considerably in their nature and mechanisms. Whereas DesJardine et al. (2019) and Sajko et al. (2021) focused on the 2008 global financial crisis, a predominantly financial disruption, this study examines the COVID-19 pandemic, a global health crisis that disrupted supply chains, caused resource shortages, and led to widespread business closures. Although both exogenous shocks severely tested firms' resilience, their underlying dynamics differ substantially. Hence, it is reasonable to assume that the determinants of resilience may vary depending on the nature of the shock.

Overall, the results suggest that during exogenous shocks, higher environmental performance contributes to stability but may reduce short-term flexibility. The NRBV (Hart 1995) provides a useful theoretical foundation for explaining these mechanisms; however, the findings indicate that the temporal dynamics of environmental investments, including when and how sustainability efforts translate into resilience, require further conceptual refinement. Although both the severity of loss and time to recovery capture short-term resilience outcomes, the former likely reflects the long-term benefits of accumulated sustainability investments, whereas the latter is more influenced by short-term trade-offs inherent in maintaining environmental commitments.

From a theoretical perspective, this study demonstrates the applicability of the NRBV (Hart 1995) in explaining how higher environmental performance can reduce the severity of loss during an exogenous shock. Firms that have developed strong environmental capabilities benefit from enhanced reputation, legitimacy, and stakeholder relationships, which can increase their initial stability when facing an exogenous shock. At the same time, the findings reveal the limits of the NRBV in the context of organizational resilience, as environmental performance is associated with a longer time to recovery. This indicates that the temporal mechanisms through which environmental investments contribute to resilience require further conceptual clarification, particularly regarding the distinction between short-term and long-term effects. For practitioners, the findings of this study suggest that firms should pursue long-term investments in environmental sustainability to strengthen stakeholder relationships, enhance reputation and legitimacy, and thereby increase their stability during exogenous shocks. At the same time, firms should be aware that such investments may entail higher short-term costs and reduced profitability, which can temporarily constrain organizational flexibility in times of exogenous shocks.

Besides the insights this research generates, it comes along with limitations that should be addressed in future studies. First, although this study focused on environmental performance and its impact on organizational resilience, other aspects of the NRBV, such as increased efficiency and reputation, which were not directly analyzed in the study at hand, may also play an important role. Therefore, future studies could include these dimensions in their empirical analyses to gain a deeper understanding of the implications that the NRBV has for organizational resilience. Moreover, future research could examine more precisely the temporal dimension of environmental investments and explore when and how environmental sustainability initiatives begin to generate resilience benefits. This could involve investigating the long-term effects of environmental performance, as demonstrated by Ortiz-de-Mandojana and Bansal (2016). Another limitation of this study is that several firms had to be excluded from the sample due to missing data, which may negatively affect the generalizability of the results. Furthermore, stock prices are highly sensitive and can be influenced by a range of factors that may not have been captured in this analysis. For instance, stock prices are influenced by external factors such as investor sentiment, market speculation, and broader macroeconomic conditions that extend beyond firm-level environmental performance. Future studies could better account for these factors to more accurately isolate the specific effects of environmental performance on organizational resilience by employing alternative measures beyond stock prices. In addition to addressing these limitations, future studies could also consider the political context, as environmental regulations vary significantly across countries. As a final limitation, because there is no consensus in research on how to measure environmental performance, future studies could employ different metrics to assess it. Together with the present analysis, such research will further clarify the role of environmental performance in enhancing organizational resilience and help businesses better prepare for future exogenous shocks.

Acknowledgments

I am deeply grateful to my doctoral supervisor, Jacob Hörisch, for his invaluable guidance, insightful feedback, and continuous support throughout the development of this article. Open Access funding enabled and organized by Projekt DEAL.

References

Abdi, M., and P. S. Aulakh. 2018. "Internationalization and Performance: Degree, Duration, and Scale of Operations." *Journal of International Business Studies* 49, no. 7: 832–857.

al Amosh, H., and S. F. Khatib. 2023. "COVID-19 Impact, Financial and ESG Performance: Evidence From G 20 Countries." *Business Strategy & Development* 6, no. 3: 310–321. https://doi.org/10.1002/bsd2.240.

Albitar, K., H. Borgi, M. Khan, and A. Zahra. 2023. "Business Environmental Innovation and CO2 Emissions: The Moderating Role of Environmental Governance." *Business Strategy and the Environment* 32, no. 4: 1996–2007.

An, Z., Z. Chen, D. Li, and L. Xing. 2018. "Individualism and Stock Price Crash Risk." *Journal of International Business Studies* 49: 1208–1236. https://doi.org/10.1057/s41267-018-0150-z.

Aslam, S., M. H. Elmagrhi, R. U. Rehman, and C. G. Ntim. 2021. "Environmental Management Practices and Financial Performance Using Data Envelopment Analysis in Japan: The Mediating Role of Environmental Performance." *Business Strategy and the Environment* 30, no. 4: 1655–1673. https://doi.org/10.1002/bse.2700.

Azeem, N., M. Ullah, and F. Ullah. 2023. "Board Gender Diversity and Firms' Financial Resilience During the Covid-19 Pandemic." *Finance Research Letters* 58: 104332. https://doi.org/10.1016/j.frl.2023.104332.

Barney, J. 1991. "Firm Resources and Sustained Competitive Advantage." *Journal of Management* 17, no. 1: 99–120. https://doi.org/10.1177/014920639101700108.

Bendig, D., C. Schulz, L. Theis, and S. Raff. 2023. "Digital Orientation and Environmental Performance in Times of Technological Change." *Technological Forecasting and Social Change* 188: 122272. https://doi.org/10.1016/j.techfore.2022.122272.

Boakye, D. J., I. TIngbani, G. Ahinful, I. Damoah, and V. Tauringana. 2020. "Sustainable Environmental Practices and Financial Performance: Evidence From Listed Small and Medium-Sized Enterprise in the United Kingdom." *Business Strategy and the Environment* 29, no. 6: 2583–2602. https://doi.org/10.1002/bse.2522.

Borah, P. S., C. S. K. Dogbe, M. D. Dzandu, and W. W. K. Pomegbe. 2023. "Forging Organizational Resilience Through Green Value Co-Creation: The Role of Green Technology, Green Operations, and Green Transaction Capabilities." *Business Strategy and the Environment* 32, no. 8: 5734–5747. https://doi.org/10.1002/bse.3446.

Brahmana, R. K., and M. Kontesa. 2021. "Does Clean Technology Weaken the Environmental Impact on the Financial Performance? Insight From Global Oil and Gas Companies." *Business Strategy and the Environment* 30, no. 7: 3411–3423. https://doi.org/10.1002/bse.2810.

Busch, T., M. P. Johnson, and M. Schnippering. 2022. "A Change Will Do You Good: Does Continuous Environmental Improvement Matter?" *Organization & Environment* 35, no. 4: 551–578.

Cao, J., H. Liang, and X. Zhan. 2019. "Peer Effects of Corporate Social Responsibility." *Management Science* 65, no. 12: 5487–5503. https://doi.org/10.1287/mnsc.2018.3100.

Ciasullo, M. V., A. Chiarini, and R. Palumbo. 2024. "Mastering the Interplay of Organizational Resilience and Sustainability: Insights From a Hybrid Literature Review." *Business Strategy and the Environment* 33, no. 2: 1418–1446. https://doi.org/10.1002/bse.3530.

Ciravegna, L., D. Ahlstrom, S. Michailova, C. H. Oh, and A. Gaur. 2023. "Exogenous Shocks and MNEs: Learning From Pandemics, Conflicts, and Other Major Disruptions." *Journal of World Business* 58, no. 6: 101487. https://doi.org/10.1016/j.jwb.2023.101487.

Damianov, D. S., and A. H. Elsayed. 2020. "Does Bitcoin Add Value to Global Industry Portfolios?" *Economics Letters* 191: 108935.

Danso, A., S. Adomako, J. Amankwah-Amoah, S. Owusu-Agyei, and R. Konadu. 2019. "Environmental Sustainability Orientation, Competitive Strategy and Financial Performance." *Business Strategy and the Environment* 28, no. 5: 885–895. https://doi.org/10.1002/bse.2291.

DesJardine, M., P. Bansal, and Y. Yang. 2019. "Bouncing Back: Building Resilience Through Social and Environmental Practices in the Context of the 2008 Global Financial Crisis." *Journal of Management* 45, no. 4: 1434–1460. https://doi.org/10.1177/0149206317708854.

Duchek, S. 2020. "Organizational Resilience: A Capability-Based Conceptualization." *Business Research* 13, no. 1: 215–246. https://doi.org/10.1007/s40685-019-0085-7.

el Khoury, R., N. Nasrallah, E. Harb, and K. Hussainey. 2022. "Exploring the Performance of Responsible Companies in G20 During the COVID-19 Outbreak." *Journal of Cleaner Production* 354: 131693. https://doi.org/10.1016/j.jclepro.2022.131693.

Elmghaamez, I. K., and J. I. Olarewaju. 2022. "Corporate Social Responsibility and Financial Performance of Product and Service-Based Firms Listed on London Stock Exchange." *Corporate Social Responsibility and Environmental Management* 29, no. 5: 1370–1383. https://doi.org/10.1002/csr.2275.

Engelen, A., C. Huesker, V. Rieger, and V. Berg. 2024. "Building a Resilient Organization Through a Pre-Shock Strategic Emphasis on Innovation." *Journal of Product Innovation Management* 41, no. 1: 36–61. https://doi.org/10.1111/jpim.12697.

Ferris, S. P., N. Jayaraman, and S. Sabherwal. 2009. "Catering Effects in Corporate Dividend Policy: The International Evidence." *Journal of Banking & Finance* 33, no. 9: 1730–1738. https://doi.org/10.1016/j.jbankfin.2009.04.005.

Flammer, C. 2021. "Corporate Green Bonds." *Journal of Financial Economics* 142, no. 2: 499–516. https://doi.org/10.1016/j.jfineco.2021.01.010.

Flores, R., R. V. Aguilera, A. Mahdian, and P. M. Vaaler. 2013. "How Well Do Supranational Regional Grouping Schemes Fit International Business Research Models?" *Journal of International Business Studies* 44: 451–474. https://doi.org/10.1057/jibs.2013.16.

Fox, J., and G. Monette. 1992. "Generalized Collinearity Diagnostics." *Journal of the American Statistical Association* 87, no. 417: 178–183.

Friedman, M. 1970. "The Social Responsibility of Business. The New York Times Magazine, September 13th." In *An Economist's Protest: Columns on Political Economy*, edited by M. Friedman, 177–184. Thomas Horton & Daughters, 1972.

Frijns, B., A. Gilbert, T. Lehnert, and A. Tourani-Rad. 2013. "Uncertainty Avoidance, Risk Tolerance and Corporate Takeover Decisions." *Journal of Banking & Finance* 37, no. 7: 2457–2471. https://doi.org/10.1016/j.jbankfin.2013.02.010.

Gangi, F., L. M. Daniele, and N. Varrone. 2020. "How Do Corporate Environmental Policy and Corporate Reputation Affect Risk-Adjusted Financial Performance?" *Business Strategy and the Environment* 29, no. 5: 1975–1991. https://doi.org/10.1002/bse.2482.

Garel, A., and A. Petit-Romec. 2021. "Investor Rewards to Environmental Responsibility: Evidence From the COVID-19 Crisis." *Journal of Corporate Finance* 68: 101948. https://doi.org/10.1016/j.jcorpfin.2021.101948.

Gittell, J. H., K. Cameron, S. Lim, and V. Rivas. 2006. "Relationships, Layoffs, and Organizational Resilience: Airline Industry Responses to September 11." *Journal of Applied Behavioral Science* 42, no. 3: 300–329. https://doi.org/10.1177/0021886306286466.

Hanjani, A., and R. K. A. Kusumadewi. 2023. "Environmental Performance and Financial Performance: Empirical Evidence From Indonesian Companies." *Corporate Social Responsibility and Environmental Management* 30, no. 3: 1508–1513. https://doi.org/10.1002/csr.2433.

Hart, S. L. 1995. "A Natural-Resource-Based View of the Firm." *Academy of Management Review* 20, no. 4: 986–1014. https://doi.org/10.5465/amr.1995.9512280033.

Hart, S. L., and G. Dowell. 2011. "Invited Editorial: A Natural-Resource-Based View of the Firm: Fifteen Years After." *Journal of Management* 37, no. 5: 1464–1479. https://doi.org/10.1177/0149206310390219.

Hassel, L., H. Nilsson, and S. Nyquist. 2005. "The Value Relevance of Environmental Performance." *European Accounting Review* 14, no. 1: 41–61. https://doi.org/10.1080/0963818042000279722.

Hill, A. D., S. G. Johnson, L. M. Greco, E. H. O'Boyle, and S. L. Walter. 2021. "Endogeneity: A Review and Agenda for the Methodology-Practice Divide Affecting Micro and Macro Research." *Journal of Management* 47, no. 1: 105–143.

Hillmann, J. 2021. "Disciplines of Organizational Resilience: Contributions, Critiques, and Future Research Avenues." *Review of Managerial Science* 15, no. 4: 879–936. https://doi.org/10.1007/s11846-020-00384-2.

Hillmann, J., and E. Guenther. 2021. "Organizational Resilience: A Valuable Construct for Management Research?" *International Journal of Management Reviews* 23, no. 1: 7–44. https://doi.org/10.1111/ijmr.12239.

Hitt, M. A., J. L. Arregle, and R. M. Holmes Jr. 2021. "Strategic Management Theory in a Post-Pandemic and Non-Ergodic World." *Journal of Management Studies* 58, no. 1: 259–264. https://doi.org/10.1111/joms.12646.

Hoang, T. H. V., W. Przychodzen, J. Przychodzen, and E. A. Segbotangni. 2020. "Does It Pay to Be Green? A Disaggregated Analysis of US Firms With Green Patents." *Business Strategy and the Environment* 29, no. 3: 1331–1361. https://doi.org/10.1002/bse.2437.

Hörisch, J., and S. Schaltegger. 2019. "Business, the Natural Environment, and Sustainability." In *The Cambridge Handbook of Stakeholder Theory*, 132–143. Cambridge University Press.

Hsu, P. H., H. Liang, and P. Matos. 2023. "Leviathan Inc. and Corporate Environmental Engagement." *Management Science* 69, no. 12: 7719–7758. https://doi.org/10.1287/mnsc.2021.4064.

Huber, G. P. 1991. "Organizational Learning: The Contributing Processes and the Literatures." *Organization Science* 2, no. 1: 88–115. https://doi.org/10.1287/orsc.2.1.88.

Iwata, H., and K. Okada. 2011. "How Does Environmental Performance Affect Financial Performance? Evidence From Japanese Manufacturing Firms." *Ecological Economics* 70, no. 9: 1691–1700. https://doi.org/10.1016/j.ecolecon.2011.05.010.

Judge, W. Q., and T. J. Douglas. 1998. "Performance Implications of Incorporating Natural Environmental Issues Into the Strategic Planning Process: An Empirical Assessment." *Journal of Management Studies* 35, no. 2: 241–262. https://doi.org/10.1111/1467-6486.00092.

Kennedy, P. 1992. *A Guide to Econometrics*. 3rd ed. MIT Press.

Kennedy, S., and M. K. Linnenluecke. 2022. "Circular Economy and Resilience: A Research Agenda." *Business Strategy and the Environment* 31, no. 6: 2754–2765. https://doi.org/10.1002/bse.3004.

Le, H., and H. T. Nguyen-Phung. 2024. "Assessing the Impact of Environmental Performance on Corporate Financial Performance: A Firm-Level Study of GHG Emissions in Africa." *Sustainable Production and Consumption* 47: 644–654. https://doi.org/10.1016/j.spc.2024.04.024.

Lee, J. Y., D. Kim, B. Choi, and A. Jiménez. 2023. "Early Evidence on How Industry 4.0 Reshapes MNEs' Global Value Chains: The Role of Value Creation Versus Value Capturing by Headquarters and Foreign Subsidiaries." *Journal of International Business Studies* 54: 1–32. https://doi.org/10.1057/s41267-022-00596-6.

Marshall, D. R., W. D. Davis, C. Dibrell, and A. P. Ammeter. 2019. "Learning Off the Job: Examining Part-Time Entrepreneurs as Innovative Employees." *Journal of Management* 45, no. 8: 3091–3113.

Mithani, M. A., S. Gopalakrishnan, and M. D. Santoro. 2021. "Does Exposure to a Traumatic Event Make Organizations Resilient?" *Long Range Planning* 54, no. 3: 102031. https://doi.org/10.1016/j.lrp.2020.102031.

Orazalin, N., and M. Mahmood. 2021. "Toward Sustainable Development: Board Characteristics, Country Governance Quality, and Environmental Performance." *Business Strategy and the Environment* 30, no. 8: 3569–3588. https://doi.org/10.1002/bse.2820.

Ortiz-de-Mandojana, N., and P. Bansal. 2016. "The Long-Term Benefits of Organizational Resilience Through Sustainable Business Practices." *Strategic Management Journal* 37, no. 8: 1615–1631. https://doi.org/10.1002/smj.2410.

Pal, R., H. Torstensson, and H. Mattila. 2014. "Antecedents of Organizational Resilience in Economic Crises—An Empirical Study of Swedish Textile and Clothing SMEs." *International Journal of Production Economics* 147: 410–428. https://doi.org/10.1016/j.ijpe.2013.02.031.

Paramati, S. R., D. Mo, and R. Gupta. 2017. "The Effects of Stock Market Growth and Renewable Energy Use on CO2 Emissions: Evidence From G20 Countries." *Energy Economics* 66: 360–371. https://doi.org/10.1016/j.eneco.2017.06.025.

Peng, M. W., and Y. Jiang. 2010. "Institutions Behind Family Ownership and Control in Large Firms." *Journal of Management Studies* 47, no. 2: 253–273.

Racine, M., C. Wilson, and M. Wynes. 2020. "The Value of Apology: How Do Corporate Apologies Moderate the Stock Market Reaction to Non-Financial Corporate Crises?" *Journal of Business Ethics* 163, no. 3: 485–505.

Reihlen, M., J. F. Schlapfner, M. Seeger, and H. Trittin-Ulbrich. 2022. "Strategic Venturing as Legitimacy Creation: The Case of Sustainability." *Journal of Management Studies* 59, no. 2: 417–459. https://doi.org/10.1111/joms.12745.

Roberts, P. W., and G. R. Dowling. 2002. "Corporate Reputation and Sustained Superior Financial Performance." *Strategic Management Journal* 23, no. 12: 1077–1093. https://doi.org/10.1002/smj.274.

Sajko, M., C. Boone, and T. Buyl. 2021. "CEO Greed, Corporate Social Responsibility, and Organizational Resilience to Systemic Shocks." *Journal of Management* 47, no. 4: 957–992. https://doi.org/10.1177/0149206320902528.

Schaltegger, S., and J. Hörisch. 2017. "In Search of the Dominant Rationale in Sustainability Management: Legitimacy- or Profit-Seeking?" *Journal of Business Ethics* 145, no. 2: 259–276. https://doi.org/10.1007/s10551-015-2854-3.

Semadeni, M., M. C. Withers, and S. Trevis Certo. 2014. "The Perils of Endogeneity and Instrumental Variables in Strategy Research: Understanding Through Simulations." *Strategic Management Journal* 35, no. 7: 1070–1079.

Su, W., and S. Junge. 2023. "Unlocking the Recipe for Organizational Resilience: A Review and Future Research Directions." *European Management Journal* 41, no. 6: 1086–1105. https://doi.org/10.1016/j.emj.2023.03.002.

Sundaram, A. K., and A. C. Inkpen. 2004. "The Corporate Objective Revisited." *Organization Science* 15, no. 3: 350–363. https://doi.org/10.1287/orsc.1040.0068.

Tanthanongsakkun, S., S. Treepongkaruna, and P. Jiraporn. 2023. "Carbon Emissions, Corporate Governance, and Staggered Boards." *Business Strategy and the Environment* 32, no. 1: 769–780.

Teece, D. J., G. Pisano, and A. Shuen. 1997. "Dynamic Capabilities and Strategic Management." *Strategic Management Journal* 18, no. 7: 509–533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z.

Wang, H., J. Yan, and J. Yu. 2017. "Reference-Dependent Preferences and the Risk–Return Trade-Off." *Journal of Financial Economics* 123, no. 2: 395–414.

Wooldridge, J. M. 2016. *Introductory Econometrics a Modern Approach*. South-Western Cengage Learning.

Yao, X., and X. Tang. 2021. "Does Financial Structure Affect CO2 Emissions? Evidence From G20 Countries." *Finance Research Letters* 41: 101791. https://doi.org/10.1016/j.frl.2020.101791.

Appendix A

TABLE A1 | First-stage regression of environmental performance and subdimensions on instrumental variables.

Variables	Model 1	Model 2	Model 3	Model 4
Analyst coverage	0.015**	0.020**	0.016**	0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Number of employees	0.085**	0.094**	0.057**	0.052**
	(0.013)	(0.013)	(0.013)	(0.014)
Firm size	0.390**	0.353**	0.400**	0.306**
	(0.025)	(0.025)	(0.025)	(0.028)
Firm age	0.140**	0.118**	0.125**	0.120**
	(0.013)	(0.014)	(0.014)	(0.015)
Intangible assets	0.011	0.006	0.013	0.008
	(0.008)	(0.007)	(0.007)	(0.013)
Operational efficiency	0.028	0.023	0.039*	0.029
	(0.018)	(0.019)	(0.018)	(0.020)
Profitability	0.047**	0.054**	0.057**	−0.001
	(0.014)	(0.015)	(0.016)	(0.016)
Financial leverage	0.011	0.009	−0.016	0.026
	(0.015)	(0.016)	(0.016)	(0.017)
Capital intensity	−0.003	0.004	0.007	−0.025
	(0.015)	(0.016)	(0.016)	(0.015)
Beta	0.001	0.014	−0.008	0.008
	(0.013)	(0.013)	(0.013)	(0.014)
Constant	−0.578**	−0.627**	−0.364	−0.248
	(0.182)	(0.176)	(0.198)	(0.221)
Industry dummies	Included	Included	Included	Included
Regional dummies	Included	Included	Included	Included
Number of firms	3668	3668	3668	3668
Sargan $\chi 2$	7.386**	6.739**	5.733*	9.218**
F statistic	41.479**	36.589**	33.442**	20.965**
Adjusted R^2	0.504	0.472	0.449	0.334

Note: Values are presented as b (SE) unless indicated otherwise. Model 1 = environmental performance; Model 2 = resource use score; Model 3 = emissions score; Model 4 = environmental innovation score. Analyst coverage and the number of employees serve as instrumental variables.
*$p < 0.05$.
**$p < 0.01$.

TABLE A2 | First-stage regression of environmental performance and subdimensions on instrumental variables (excluding US firms).

Variables	Model 1	Model 2	Model 3	Model 4
Analyst coverage	0.014**	0.020**	0.013**	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
Number of employees	0.071**	0.079**	0.043*	0.048*
	(0.019)	(0.019)	(0.020)	(0.020)
Firm size	0.435**	0.397**	0.441**	0.301**
	(0.038)	(0.037)	(0.039)	(0.040)
Firm age	0.201**	0.163**	0.194**	0.163**
	(0.020)	(0.019)	(0.020)	(0.021)
Intangible assets	−0.014	−0.021	−0.002	0.002
	(0.021)	(0.022)	(0.022)	(0.020)
Operational efficiency	0.094**	0.080**	0.111**	0.066*
	(0.025)	(0.026)	(0.026)	(0.026)
Profitability	0.033	0.046	0.030	0.008
	(0.024)	(0.024)	(0.025)	(0.025)
Financial leverage	0.031	0.022	0.003	0.034
	(0.021)	(0.021)	(0.022)	(0.023)
Capital intensity	0.029	0.042	0.028	−0.025
	(0.023)	(0.024)	(0.022)	(0.022)
Beta	0.048**	0.061**	0.029	0.032
	(0.017)	(0.018)	(0.019)	(0.019)
Constant	−0.662**	−0.703**	−0.375	−0.443
	(0.252)	(0.238)	(0.277)	(0.290)
Industry dummies	Included	Included	Included	Included
Regional dummies	Included	Included	Included	Included
Number of firms	2187	2187	2187	2187
F statistic	18.817**	17.810**	14.899**	11.997**
Adjusted R^2	0.426	0.412	0.367	0.314

Note: Values are presented as *b* (SE) unless indicated otherwise. Model 1 = environmental performance; Model 2 = resource use score; Model 3 = emissions score; Model 4 = environmental innovation score. Analyst coverage and the number of employees serve as instrumental variables. In this sample, US firms are excluded.
*$p < 0.05$.
**$p < 0.01$.

TABLE A3 | Instrumental variables test statistics.

Test	Model 1	Model 2	Model 3	Model 4
Weak instruments *F*	53.759**	76.310**	37.006**	8.126**
Wu–Hausman *F*	3.463	4.350*	5.378*	0.029
Sargan $\chi 2$	7.386**	6.739**	5.733*	9.218**

Note: Model 1 = environmental performance; Model 2 = resource use score; Model 3 = emissions score; Model 4 = environmental innovation score.
*$p < 0.05$.
**$p < 0.01$.

TABLE A4 | Instrumental variables test statistics (excluding US firms).

Test	Model 1	Model 2	Model 3	Model 4
Weak instruments *F*	18.817**	17.810**	14.899**	11.997**
Wu–Hausman *F*	0.486	0.438	0.214	0.165
Sargan $\chi 2$	0.283	0.268	0.258	0.249

Note: Model 1 = environmental performance; Model 2 = resource use score; Model 3 = emissions score; Model 4 = environmental innovation score. In this sample, US firms are excluded.
*$p < 0.05$.
**$p < 0.01$.

TABLE A5 | Second-stage (2SLS) regression of severity of loss on environmental performance and subdimensions.

Variables	Model 1	Model 2	Model 3	Model 4
Environmental performance	0.021			
	(0.017)			
Resource use		0.020		
		(0.014)		
Emissions			0.033	
			(0.020)	
Environmental innovation				0.003
				(0.040)
Firm size	0.005	0.006	−0.001	0.016
	(0.010)	(0.008)	(0.011)	(0.016)
Firm age	−0.002	−0.002	−0.003	0.000
	(0.003)	(0.003)	(0.003)	(0.005)
Intangible assets	0.002	0.002	0.002	0.002
	(0.004)	(0.004)	(0.004)	(0.004)
Operational efficiency	−0.005	−0.005	−0.006	−0.004
	(0.004)	(0.004)	(0.004)	(0.005)
Profitability	0.019**	0.018**	0.017**	0.020**
	(0.003)	(0.003)	(0.004)	(0.003)
Financial leverage	−0.027**	−0.026**	−0.026**	−0.027**
	(0.003)	(0.003)	(0.003)	(0.003)
Capital intensity	−0.006*	−0.006*	−0.007*	−0.006*
	(0.003)	(0.003)	(0.003)	(0.003)
Beta	−0.032**	−0.032**	−0.032**	−0.032**
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	−0.624**	−0.626**	−0.627**	−0.616**
	(0.028)	(0.028)	(0.028)	(0.030)
Industry dummies	Included	Included	Included	Included
Regional dummies	Included	Included	Included	Included
Number of firms	3668	3668	3668	3668
Wald $\chi 2$	371.881**	372.633**	366.157**	371.658**
R^2	0.536	0.537	0.520	0.548

Note: Values are presented as *b* (SE) unless indicated otherwise. Model 1 = environmental performance; Model 2 = resource use score; Model 3 = emissions score; Model 4 = environmental innovation score. Analyst coverage and the number of employees serve as instrumental variables.
*$p < 0.05$.
**$p < 0.01$.

TABLE A6 | Second-stage (2SLS) regression of severity of loss on environmental performance and subdimensions (excluding US firms).

Variables	Model 1	Model 2	Model 3	Model 4
Environmental performance	−0.001			
	(0.025)			
Resource use		−0.002		
		(0.018)		
Emissions			−0.004	
			(0.031)	
Environmental innovation				0.016
				(0.059)
Firm size	0.018	0.018	0.019	0.011
	(0.015)	(0.012)	(0.018)	(0.023)
Firm age	−0.013*	−0.013**	−0.013*	−0.016
	(0.006)	(0.004)	(0.006)	(0.010)
Intangible assets	0.016**	0.016**	0.016**	0.016**
	(0.005)	(0.004)	(0.005)	(0.006)
Operational efficiency	−0.010	−0.009*	−0.009	−0.011
	(0.005)	(0.005)	(0.006)	(0.007)
Profitability	0.011*	0.011*	0.011*	0.010*
	(0.005)	(0.005)	(0.005)	(0.005)
Financial leverage	−0.020**	−0.020**	−0.020**	−0.020**
	(0.004)	(0.004)	(0.004)	(0.004)
Capital intensity	−0.003	−0.003	−0.003	−0.003
	(0.004)	(0.004)	(0.004)	(0.004)
Beta	−0.030**	−0.030**	−0.030**	−0.031**
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	−0.565**	−0.565**	−0.565**	−0.566**
	(0.034)	(0.033)	(0.034)	(0.034)
Industry dummies	Included	Included	Included	Included
Regional dummies	Included	Included	Included	Included
Number of firms	2187	2187	2187	2187
Wald $\chi 2$	179.527**	179.423**	180.238**	174.392**
R^2	0.593	0.594	0.595	0.584

Note: Values are presented as *b* (SE) unless indicated otherwise. Model 1 = environmental performance; Model 2 = resource use score; Model 3 = emissions score; Model 4 = environmental innovation score. Analyst coverage and the number of employees serve as instrumental variables. In this sample, US firms are excluded.
*$p < 0.05$.
**$p < 0.01$.

TABLE A7 | Effect of environmental performance on severity of loss: OLS estimates.

Variables	Model 1	Model 2	Model 3	Model 4
Environmental performance		−0.012**		
		(0.003)		
Resource use			−0.009**	
			(0.003)	
Emissions				−0.012**
				(0.003)
Environmental innovation				
Firm size	0.016**	0.023**	0.021**	0.023**
	(0.002)	(0.003)	(0.003)	(0.003)
Firm age	0.000	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Intangible assets	0.002	0.002	0.002	0.002
	(0.004)	(0.004)	(0.004)	(0.004)
Operational efficiency	−0.003	−0.003	−0.003	−0.003
	(0.004)	(0.004)	(0.004)	(0.004)
Profitability	0.022**	0.023**	0.022**	0.023**
	(0.003)	(0.003)	(0.003)	(0.003)
Financial leverage	−0.027**	−0.027**	−0.027**	−0.027**
	(0.003)	(0.003)	(0.003)	(0.003)
Capital intensity	−0.006*	−0.006*	−0.006*	−0.005*
	(0.003)	(0.003)	(0.003)	(0.003)
Beta	−0.031**	−0.031**	−0.030**	−0.031**
	(0.003)	(0.003)	(0.003)	(0.003)
Constant	−0.619**	−0.614**	−0.615**	−0.615**
	(0.027)	(0.027)	(0.027)	(0.027)
Industry dummies	Included	Included	Included	Included
Regional dummies	Included	Included	Included	Included
Number of firms	3920	3920	3920	3920
F statistic	47.446**	47.334**	47.148**	47.348**
R^2	0.527	0.529	0.528	0.530
GVIFmax	1.470	1.473	1.473	1.473

Note: Values are presented as *b* (SE) unless indicated otherwise. Model 1 = controls only; Model 2 = environmental performance; Model 3 = resource use score; Model 4 = emissions score; Model 5 = environmental innovation score.
*$p < 0.05$.
**$p < 0.01$.

TABLE A8 | Effect of environmental performance on severity of loss: OLS estimates (excluding US firms).

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Environmental performance		−0.021**			
		(0.003)			
Resource use			−0.016**		
			(0.003)		
Emissions				−0.020**	
				(0.003)	
Environmental innovation					−0.010**
					(0.003)
Firm size	0.015**	0.028**	0.025**	0.027**	0.019**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Firm age	−0.013**	−0.009**	−0.011**	−0.010**	−0.011**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Intangible assets	0.015**	0.015**	0.015**	0.015**	0.015**
	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)
Operational efficiency	−0.008	−0.005	−0.006	−0.005	−0.007
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Profitability	0.013**	0.014**	0.014**	0.014**	0.013**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Financial leverage	−0.021**	−0.020**	−0.021**	−0.021**	−0.020**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Capital intensity	−0.002	−0.001	−0.001	−0.001	−0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Beta	−0.027**	−0.027**	−0.027**	−0.027**	−0.027**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Constant	−0.576**	−0.572**	−0.571**	−0.572**	−0.576**
	(0.034)	(0.033)	(0.034)	(0.033)	(0.033)
Industry dummies	Included	Included	Included	Included	Included
Regional dummies	Included	Included	Included	Included	Included
Number of firms	2422	2422	2422	2422	2422
F statistic	33.355**	33.966**	33.598**	34.029**	33.237**
R^2	0.560	0.567	0.565	0.568	0.562
GVIFmax	1.454	1.587	1.580	1.548	1.457

Note: Values are presented as *b* (SE) unless indicated otherwise. Model 1 = controls only; Model 2 = environmental performance; Model 3 = resource use score; Model 4 = emissions score; Model 5 = environmental innovation score. In this sample, US firms are excluded.
*$p < 0.05$.
**$p < 0.01$.

TABLE A9 | Effect of environmental performance on time to recovery: Cox proportional hazard models (excluding US firms).

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Environmental performance		−0.137**			
		(0.030)			
Resource use			−0.097**		
			(0.028)		
Emissions				−0.119**	
				(0.028)	
Environmental innovation					−0.102**
					(0.028)
Firm size	−0.107**	−0.027	−0.051	−0.037	−0.072*
	(0.032)	(0.036)	(0.036)	(0.036)	(0.033)
Firm age	−0.117**	−0.093**	−0.103**	−0.099**	−0.102**
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Intangible assets	0.064**	0.061**	0.062**	0.065**	0.062**
	(0.021)	(0.022)	(0.022)	(0.022)	(0.022)
Operational efficiency	−0.154**	−0.133**	−0.141**	−0.138**	−0.142**
	(0.035)	(0.035)	(0.035)	(0.034)	(0.034)
Profitability	−0.028	−0.017	−0.021	−0.018	−0.024
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
Financial leverage	−0.030	−0.022	−0.028	−0.024	−0.022
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Capital intensity	0.010	0.014	0.014	0.015	0.009
	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Beta	−0.017	−0.014	−0.015	−0.016	−0.017
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Industry dummies	Included	Included	Included	Included	Included
Regional dummies	Included	Included	Included	Included	Included
Number of firms	2422	2422	2422	2422	2422
Number of firms recovered	2135	2135	2135	2135	2135
Wald $\chi 2$	322.080**	341.910**	333.240**	338.140**	334.060**
GVIFmax	1.454	1.587	1.580	1.548	1.457

Note: Values are presented as *b* (SE) unless indicated otherwise. Model 1 = controls only; Model 2 = environmental performance; Model 3 = resource use score; Model 4 = emissions score; Model 5 = environmental innovation score. In this sample, US firms are excluded.
$^{*}p < 0.05$.
$^{**}p < 0.01$.