

Article

Employee Satisfaction, Crisis Resilience, and Corporate Innovation: Evidence from Employer Review Data in China

Yujiao Shang ¹, Yuhai Wu ², Tuan Pan ³ and Yuping Shang ^{2,*} 

¹ School of Mathematics and Statistics, Guilin University of Technology, Guilin 541004, China; 1020242023@glut.edu.cn

² School of Economics, Hefei University of Technology, Hefei 230601, China; 2023212743@mail.hfut.edu.cn

³ School of Finance, Hefei University of Economics, Hefei 230031, China; pantuan1991@163.com

* Correspondence: shangyuping@hfut.edu.cn

Abstract

Employee satisfaction, as a critical form of organisational social capital, represents a significant interdisciplinary topic in management and finance. A key question is whether it can be transformed into sustainable innovation momentum for corporates amid extreme crisis shocks. This study examines Chinese A-share listed corporates, utilising large-scale anonymous employee evaluation data from the Chinese employer review platform ‘KanZhun.com’, to construct corporate-level employee satisfaction indicators. Through econometric modelling, it investigates the impact of employee satisfaction on corporate innovation output during major crises and its underlying mechanisms. Findings reveal that during crises, employee satisfaction significantly enhances overall corporate innovation levels, with a particularly pronounced effect on green innovation. Mechanism analysis indicates that high employee satisfaction primarily drives innovation, especially green innovation, through two channels. These channels include reducing internal governance costs and alleviating external financing constraints. Heterogeneity tests further reveal that this effect is particularly pronounced in high-tech industries, technology-intensive sectors, non-state-owned corporates, and corporates under strong external institutional constraints or with relatively weak innovation capabilities. This study expands the theoretical boundaries of employee satisfaction’s economic value from an innovation perspective. It further provides Chinese empirical evidence for corporates seeking to enhance innovation resilience in complex environments via employee feedback and quality labour relations.

Keywords: employee satisfaction; crisis resilience; corporate innovation; green innovation; employer review data



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1. Introduction

Is treating employees well a worthwhile strategic investment? This classic management question remains unresolved in contemporary business practice. Enhancing employee satisfaction frequently entails significant direct costs and potential management challenges. There is even evidence suggesting that corporates committed to providing safer working environments may paradoxically face heightened survival risks [1]. Yet equally compelling arguments support employee welfare, positing that it creates long-term value by attracting talent, improving retention rates, and boosting productivity [2]. Under normal economic conditions, the complex trade-offs between costs and benefits render the net economic effect of employee satisfaction unclear. The outbreak of the COVID-19 global pandemic,

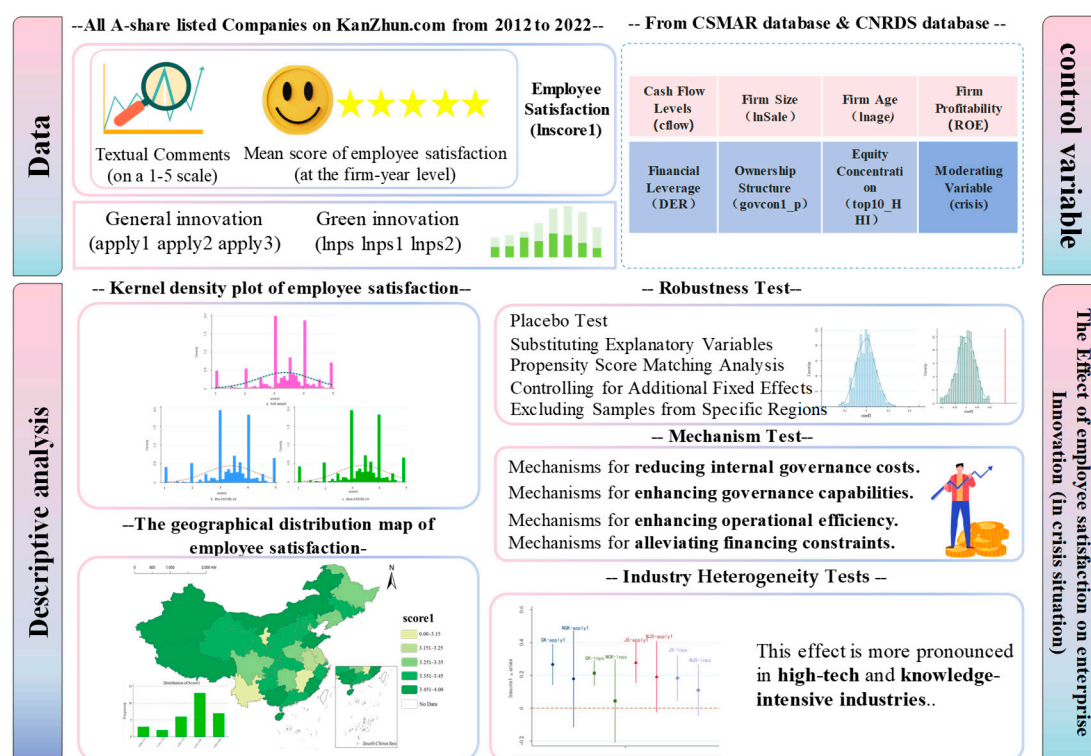
with its unprecedented exogenous nature, sudden onset, and disruptive impact, has provided an almost ideal ‘natural experiment’ scenario for re-examining this fundamental question. This crisis instantly pushed countless corporates to the brink of survival, fundamentally undermining traditional employment models and organisational collaboration logic [3]. Under this extreme stress test, the true value of social capital and human capital quality faced a critical verification moment. This value has long been cultivated by organisations and epitomised by employee satisfaction. This study aims to move beyond analyses of short-term financial performance or stock price volatility and explore a more profound question. Whether and how employee satisfaction can translate into innovation capacity—a core driver of an organisation’s long-term survival and development—with a specific focus on future-oriented green innovation under extreme crisis shocks. Resolving this question not only deepens our theoretical understanding of the dynamic interplay between organisational resilience, social capital, and strategic investment. It also offers crucial practical insights for corporates navigating adversity. It demonstrates how investing in their core asset, their people, can cultivate innovative resilience and achieve sustainable transformation.

Academic discourse on the economic value of employee satisfaction has long been marked by theoretical divisions and empirical disagreements. One perspective, grounded in human capital and organisational behaviour theories, emphasises that employee satisfaction reduces turnover rates while enhancing productivity and organisational citizenship behaviour. Pioneering research by [2] revealed that America’s ‘Best Employers’ achieved significant excess stock returns, indicating the market’s failure to adequately and promptly price this intangible asset. A recent 30-country study further reveals that this value creation effect is highly contingent on institutional contexts. The positive correlation between employee satisfaction and stock returns is stronger in flexible labour markets with fewer hiring and firing constraints, whereas it is weaker or even insignificant in rigid ones [4]. This finding resonates with research on the economic consequences of labour market regulations [5,6] and supports the notion that the value of employee satisfaction is context-dependent. An alternative perspective challenges this from the angles of agency costs and cost control. Classical scientific management theory views labour as an optimisable production factor [7]. Modern corporate finance theory suggests that management may overinvest in employee benefits to construct management moats [8] or as anti-takeover strategies [9], thereby harming shareholder value. Empirical research also indicates that higher internal pay inequality is sometimes associated with better corporate performance [10]. Concurrently, literature examines the role of corporate social capital and organisational resilience during crises. Research indicates that corporates demonstrating strong social responsibility during the 2008 financial crisis exhibited greater resilience, partly attributable to accumulated social capital securing stakeholder support [11]. Research during the COVID-19 pandemic further confirms that corporates with high ESG ratings [12] or strong organisational cultures [13] demonstrated superior resilience to the shock [14].

Despite substantial achievements, existing literature exhibits notable limitations. Firstly, most studies focus solely on financial performance or market valuation as end-points. While some research has begun linking employee satisfaction to future profit expectations [4], it has failed to delve into how this directly influences core factors of corporate innovation. Secondly, while crises are widely acknowledged as ‘trials by fire’, few studies systematically examine how this specific form of social capital—employee satisfaction—specifically alters corporate innovation resource allocation and outputs during global crises such as COVID-19. Finally, as green innovation is an activity characterised by both ethical complexity and strategic foresight, whether and how employee satisfaction-

fostered internal identification and long-term orientation drive corporates to sustain or deepen green technology investments amid adversity remains an under-explored domain.

Therefore, this study employs unique data from Chinese A-share listed corporates to conduct an in-depth analysis of how employee satisfaction influences corporate innovation during the COVID-19 crisis (Figure 1). We draw upon extensive, fine-grained employee satisfaction data provided by the Chinese employer review platform ‘Kanzhun.com’. This data source offers greater objectivity and immediacy compared to traditional surveys [15]. Our empirical analysis will progressively demonstrate that, under normal circumstances, employee satisfaction may not significantly influence general innovation. However, during the pandemic shock, its value is strongly ‘activated’, markedly boosting overall corporate innovation output, with a particularly pronounced effect on green innovation. We shall conduct a series of robustness tests to ensure the reliability of our conclusions. Furthermore, we will empirically examine the underlying mechanisms through which employee satisfaction drives innovation during crises via four channels: governance cost savings, governance level enhancement, financing constraint alleviation, and operational efficiency improvement. Finally, we will explore the heterogeneity of this effect, anticipating it to be more pronounced in high-tech industries, knowledge-intensive sectors, non-state-owned corporates, and corporates facing stronger external constraints or possessing robust innovation capabilities.



to traditional questionnaire surveys, this data offers real-time, spontaneous, extensive coverage and strong continuity, providing a reliable foundation for related research. Third, at the practical level, based on empirical findings from the Chinese context, the study offers concrete and actionable recommendations for corporates designing crisis-oriented human resource policies, regulatory bodies integrating employee sentiment data into ESG assessments, and governments implementing targeted incentive policies. As underscored by [16] in their crisis-driven innovation logic and [17] in their green strategy-governance integration framework, this study further illuminates the pivotal role of ‘people’ in crisis innovation, offering fresh perspectives for corporate sustainable transformation.

2. Literature Review and Research Hypotheses

2.1. Literature Review

Existing research has amassed substantial evidence concerning the economic value of employee satisfaction, organisational impacts during crises, and drivers of innovation. This section will examine three core issues: the relationship between employee satisfaction and overall corporate innovation; the connection between employee satisfaction and green innovation; and the effects of public crises on innovation.

2.1.1. Employee Satisfaction and Overall Corporate Innovation

Regarding whether and how employee satisfaction influences corporate innovation, academic research exhibits theoretical divergence and contextual dependency. Supportive perspectives, grounded in human capital theory and organisational behaviour theory, emphasise that employee satisfaction constitutes a vital implicit resource driving innovation. Reference [2] pioneering study revealed that ‘best employer’ corporates with high employee satisfaction demonstrated significantly higher long-term stock returns. The core rationale lies in satisfaction’s capacity to reduce turnover among key talent. It also enhances organisational citizenship behaviour and intrinsic work motivation, providing sustained human capital support for innovation. Mechanistically, employee satisfaction aligns with the ‘gift exchange’ theory [18]. When employees perceive favourable treatment from their organisation, they reciprocate through extra effort. Behaviours essential to innovation such as risk-taking and knowledge sharing are key manifestations of this heightened commitment. Reference [19] further substantiated that employee trust in the organisation underpins engagement in high-risk innovation activities, with trust mitigating internal collaborative friction to significantly enhance innovation efficiency.

Recent empirical research further elaborates this mechanism. Reference [20], utilising Australian corporate data, found that green human resource management indirectly fosters employee innovation by enhancing job satisfaction, while inclusive leadership strengthens this transmission pathway, confirming satisfaction’s mediating role in innovation-driven processes. Reference [21] demonstrate in a study of Chinese high-tech corporates that employee satisfaction provides a collaborative foundation for innovation by enhancing green organisational commitment and willingness to share knowledge. This newly supplemented literature further enriches this logic. Reference [22], utilising Chinese corporate data, confirmed that employee-friendly corporates promote innovation by enhancing internal control quality and increasing employee competence, revealing a governance pathway through which employee satisfaction influences innovation. Reference [23] observed in French corporates that innovation activities exhibit a significant positive correlation with employee job satisfaction, while corporate downsizing decisions weaken this association. This indicates that stable employment environments and satisfaction jointly underpin innovation. Reference [24], adopting a performance transmission perspective, indicate that employees’ subjective perceptions of performance influence subsequent behaviour through

economic and non-economic satisfaction, offering fresh corroboration for the indirect link between satisfaction and innovation. Critics contend that excessively elevating employee satisfaction may induce cost rigidity [7]. However, such perspectives fail to adequately account for situational heterogeneity. In contexts where innovation relies on collaboration and intrinsic motivation, the value of satisfaction substantially outweighs short-term cost expenditures.

Overall, the relationship between employee satisfaction and corporate innovation is not linear but highly context-dependent. Under normal economic conditions, innovation is predominantly driven by explicit factors such as R&D investment and market competition, obscuring the impact of employee satisfaction. However, when external environments undergo drastic shifts such as during crisis shocks, the latent value of employee satisfaction may be activated, becoming a core pillar of innovation resilience. This provides theoretical justification for this study's focus on crisis scenarios.

2.1.2. Employee Satisfaction and Green Innovation

Green innovation, as a strategic activity characterised by ethical attributes, long-term orientation, and cross-departmental collaboration requirements, exhibits a more intrinsic and robust correlation with employee satisfaction than conventional innovation. This distinctiveness is comprehensively explained by stakeholder theory and intrinsic motivation theory, and is robustly supported by recent empirical research.

From a stakeholder theory perspective, the core objective of green innovation is to balance corporate economic interests with environmental and social benefits. As key internal stakeholders, employees' value alignment and active participation are prerequisites for green innovation success. Reference [25], using Chinese corporate data, found that both transactional and transformational leadership enhance green innovation performance by boosting employees' organisational citizenship behaviour. Employee satisfaction serves as a crucial antecedent to organisational citizenship behaviour. Reference [26], utilising Malaysian university data, confirmed that corporate social responsibility influences employee green satisfaction through green human resource management practices, thereby underpinning sustainability-related innovation. Reference [27] further indicated that green human resource management impacts sustainable performance via the mediating effect of green employee empowerment, with employee satisfaction serving as the foundational psychological condition for the empowerment mechanism to take effect.

The theory of intrinsic motivation reveals that the essence of green innovation lies in 'value-driven innovation,' whose success is highly contingent upon employees' genuine commitment to sustainable development objectives. Reference [28] demonstrate that environmental commitment mediates the relationship between green human resource management and employees' green innovation behaviour, whilst employee satisfaction significantly enhances environmental commitment. Reference [29] found in textile corporates that green culture influences green innovation performance by enhancing employee commitment, with employee satisfaction being pivotal for internalising green culture. Reference [30] confirmed in China's hospitality sector that green inclusive leadership fosters green service innovation by satisfying employees' basic psychological needs, which form the core component of employee satisfaction. Reference [31], based on Vietnamese manufacturing corporates, found that corporate social responsibility indirectly influences organisational citizenship behaviour by affecting employees' perceptions of fairness and satisfaction, thereby providing a collaborative foundation for green innovation.

Existing research has preliminarily examined the relationship between ESG practices and green innovation [32], yet it has not yet thoroughly elucidated the specific role of employee satisfaction as a core element within the 'Social (S)' dimension of ESG. Particularly,

how employees drive green innovation through mechanisms such as value alignment, fulfilment of psychological needs, and willingness to collaborate. Concurrently, current discourse has failed to investigate the dynamic shifts in the strength of this connection during crisis situations. This is precisely the gap this study aims to address.

2.1.3. The Role of Public Crises

Public crises, with their sudden onset, disruptive nature and inherent uncertainty, exert complex and far-reaching impacts on corporate innovation whilst providing a unique setting for examining the latent value of employee satisfaction. On the one hand, crises frequently lead to a contraction of external resources and internal operational disruption, directly suppressing innovation investment and output [33]. Empirical studies on both the 2008 financial crisis and the COVID-19 pandemic indicate that corporates generally reduce R&D budgets during the initial crisis phase, prioritising short-term survival [11,34].

Conversely, crises may also catalyse innovation through a ‘forced effect,’ wherein such resilient innovation heavily relies on internal organisational resources and social capital, with employee satisfaction playing a pivotal moderating role. Reference [35] found in their study of Malaysian corporates during COVID-19 that green innovation significantly enhances corporate sustainability performance, while corporates with high employee satisfaction experienced less disruption to their green innovation activities during the crisis. Reference [36] demonstrated in their study of Indian manufacturing corporates that employee satisfaction with remuneration and benefits during the pandemic bolstered trust and commitment through reduced psychological distance and heightened perceived fairness, thereby providing psychological support for crisis-driven innovation. Reference [37], drawing on empirical data from Polish, Italian, and American corporates, indicated that crisis management influences employee performance through organisational trust and knowledge sharing, with employee satisfaction serving as the core enabler for cultivating these critical factors.

It is noteworthy that crisis situations significantly alter the operational mechanisms of employee satisfaction. Satisfaction, which remains dormant under normal conditions, transforms into a core asset of innovation resilience during crises through pathways such as reducing governance costs and enhancing decision-making quality [38]. Reference [30] found in their study of Chinese corporates that green inclusive leadership fosters green service innovation behaviour by satisfying employees’ fundamental psychological needs, with employee satisfaction serving as a direct indicator of such fulfilment. During crises, the resilience derived from meeting these needs becomes particularly crucial, aiding corporates in sustaining their innovative vigour.

In conclusion, there are three significant deficiencies in the existing literature. Firstly, most studies focus on the relationship between employee satisfaction and financial performance. While some research touches upon innovation, it fails to delve into its specific impact on green innovation and its underlying mechanisms, and lacks systematic examination of crisis contexts. Second, discussions on green innovation have failed to fully elucidate its essential connection with employee satisfaction, overlooking the unique demands of green innovation regarding value alignment, psychological needs fulfilment, and cross-departmental collaboration. While recent research has examined the roles of green HRM and green leadership, it has not analysed employee satisfaction as a core antecedent variable. Thirdly, although crises are widely acknowledged as a ‘touchstone’, few studies systematically examine how employee satisfaction can be activated to foster innovation resilience during systemic crises. Furthermore, there is a lack of large-sample empirical support grounded in the Chinese context.

2.2. Research Hypotheses

The core theoretical contribution of this study lies in constructing an integrated transmission framework instead of simply applying a single theory. Conservation of resources theory and situational power theory serve as the foundation for the entire research, while agency theory, signalling theory, and other related theories play pivotal roles in explaining specific mechanisms. Drawing on conservation of resources theory and situational power theory, crises are defined as high-intensity external shocks that suddenly amplify organisational resource scarcity and environmental uncertainty [33]. Under normal economic conditions, employee satisfaction often exists as a dormant asset. Its potential value for innovation is overshadowed by visible factors, such as routine R&D expenditure and market competitive pressures, which prevent the full realisation of its value. When crises erupt, external resource supply shrinks, supply chains break down, and market demand fluctuates sharply. These changes force corporates to rely much more heavily on internal resources. At this juncture, the implicit psychological resources contained in employee satisfaction, including trust, psychological safety, and organisational commitment, are strongly activated. They then transform into core resilience assets that help enterprises withstand shocks and underpin innovation [38–40].

The unique nature of crisis situations provides critical triggering conditions for this ‘activation effect’. On the one hand, the survival pressures brought by crises reinforce the alignment of employee and corporate interests. The organisational identification cultivated by high satisfaction prompts employees to proactively invest additional effort [41]. Conversely, the failure of conventional management mechanisms during crises elevates informal governance structures rooted in emotion and trust to become the core support sustaining organisational operations [42,43]. Research by [44] confirms that human capital influences organisational performance by affecting social capital, with employee satisfaction serving as the pivotal starting point in this transmission chain.

Based on the integrated transmission pathway of ‘human capital–social capital–organisational capital’ [44,45], employee satisfaction (a core indicator of human capital quality) is first transformed into internal organisational trust, collaboration, and information sharing (social capital). This subsequently influences organisational capital (governance costs, governance quality, financing capacity, operational resilience) through four complementary pathways, ultimately empowering the allocation and output of innovation resources. These four paths have their own focuses and complement each other. They respectively cover four indispensable dimensions: ‘cost savings’ in internal governance, ‘information optimization’ in decision support, ‘signal acquisition’ of external resources, and ‘resilience enhancement’ of the operational system. Together, they form a complete logic for driving innovation through employee satisfaction during crises. The theoretical framework of this study, illustrated in Figure 2, aims to elucidate the intrinsic logic by which employee satisfaction drives innovation resilience during crises.

First, the mechanism for reducing governance costs. In crisis situations, the challenges of enterprise governance have significantly intensified. Both the principal-agent theory and the theory of incomplete contracts indicate that crises not only amplify information asymmetry and moral hazard but also exacerbate the incompleteness of contracts. Crises lead to the failure of traditional supervision and formal contracts as conventional governance methods [33,39,46,47]. This has also been empirically confirmed. Under external shocks, enterprises need to adjust debt contracts to reduce agency costs, indirectly highlighting the limitations of formal governance in crises [48]. In this context, employee satisfaction builds a key transmission bridge of ‘human capital—social capital—organizational capital’, ultimately achieving a reduction in governance costs.

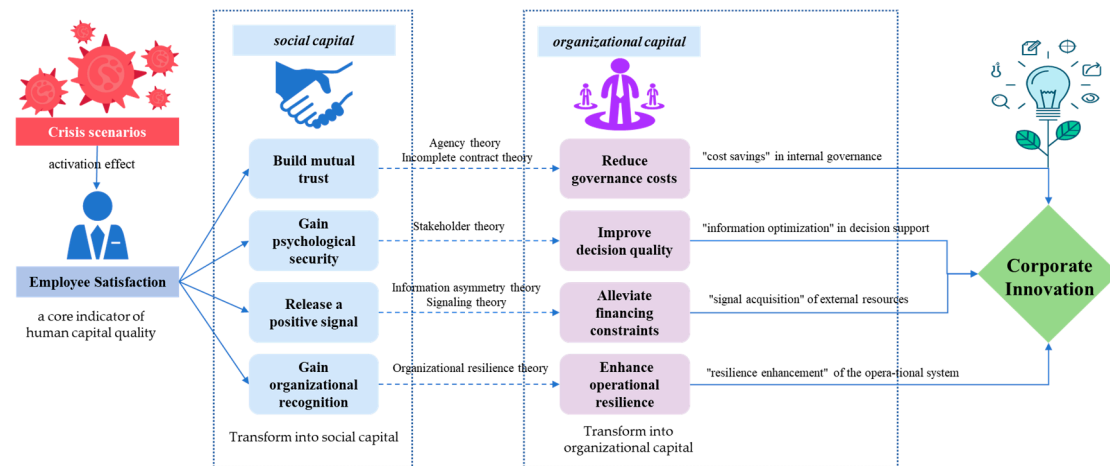


Figure 2. Theoretical Mechanism Diagram.

Employee satisfaction is essentially a form of implicit ‘self-enforcing’ contract [18], aligning individual objectives with the organisation’s long-term interests by enhancing employees’ organisational identification and intrinsic motivation [49]. This relational governance mechanism, grounded in emotion and trust, effectively reduces corporate reliance on formal oversight systems. Empirical research by [39] reveals that organisational trust serves as the pivotal link between culture and psychological safety, with the trust-nurturing atmosphere fostered by high satisfaction significantly curbing opportunistic employee behaviour. Reference [43] integrated trust into agency theory and incomplete contract theory, confirming that trust mitigates governance challenges arising from moral hazard and contractual incompleteness, thereby conserving oversight costs and conflict resolution resources. This proves particularly valuable in crisis scenarios where contractual incompleteness intensifies.

In crisis scenarios where formal governance is increasingly ineffective, the governance cost savings generated by high employee satisfaction can be reallocated to high-risk, high-return innovation initiatives. This creates the essential resource buffer for enterprises to sustain innovation investment amid adversity. Accordingly, the following research hypothesis is proposed:

Hypothesis 1. *In crisis scenarios, employee satisfaction promotes corporate innovation by reducing internal governance costs.*

Second, the mechanism for improving decision quality. In crisis situations, the uncertainty of enterprise innovation decisions significantly increases, and the reliance on high-quality and diversified internal information sharply rises [19]. From the perspectives of stakeholder theory and organisational information processing, employees are the core carriers of frontline knowledge, tacit skills, and market dynamics of the enterprise, and psychological security is the key prerequisite for employees to actively share information and participate in collaboration. Empirical studies related to the conservation of resources theory have confirmed that psychological capital and social capital will influence performance through organisational trust as an intermediary, and this effect is more significant in high-pressure environments. Employee satisfaction is precisely the key precursor for cultivating psychological capital and social capital [50].

High employee satisfaction can foster a strong organisational trust atmosphere, thereby enhancing employees’ psychological security, laying the foundation for the ‘transformation of human capital to social capital’ [44]. Under the impact of crisis uncertainty, employees

with high satisfaction are more willing to engage in candid hierarchical communication, share tacit knowledge, and participate in cross-departmental collaboration. Domestic empirical research on enterprises also indicates that organisational identification and trust will mediate the relationship between authentic leadership and employee resilience [51], and this identification and trust is the direct product of high satisfaction, which can significantly optimise the organisational information flow. Psychological security will also prompt employees to actively seek feedback, further enriching the diversity of decision-making information [52].

In crisis scenarios, the trust network derived from employee satisfaction transforms into high-quality decision-making information, which can help management more accurately identify innovation opportunities and assess technical risks [33]. Accordingly, the following research hypothesis is proposed:

Hypothesis 2. *In crisis scenarios, employee satisfaction promotes corporate innovation by improving decision quality.*

Thirdly, the mechanism for alleviating financing constraints. The theory of information asymmetry indicates that the information gap between enterprises and external investors will lead to severe financing constraints for enterprises when investing in intangible assets [53]. Moreover, as signalling theory indicates, information chaos intensifies within capital markets during crises. Investors exhibit heightened risk aversion, significantly increasing their focus on firms' 'soft information' [54]. At such junctures, enterprises must convey their long-term resilience through credible signals.

Employee satisfaction, as an intangible asset deeply embedded in organisational culture, has the characteristics of being difficult to imitate and not easily manipulated. It is an effective signal for transmitting the quality of enterprise human capital, the health of the organisation, and the crisis response capabilities. The trust, collaboration, and other social capital cultivated by high employee satisfaction can become important carriers for transmitting the stability of enterprise operations to the market [55]. And employee satisfaction, as the key antecedent of core dimensions such as employee resilience and collaboration capabilities [56], can release positive signals of stable enterprise operations to the market. At the same time, the effective utilisation of human capital requires the realisation of value transformation through social capital [45], and the social capital derived from employee satisfaction can enhance the credibility of these signals and thereby alleviate investors' concerns. Moreover, the internal harmony embodied by high employee satisfaction can directly reduce financing costs [32,39].

Innovation is long-term and requires high levels of capital sustainability. In crisis scenarios, the financing constraints alleviated by employee satisfaction can precisely provide stable external financial guarantees for such innovation activities. Accordingly, the following research hypothesis is proposed:

Hypothesis 3. *In crisis scenarios, employee satisfaction promotes corporate innovation by alleviating financing constraints.*

Fourthly, the mechanism for enhancing operational resilience. The conservation of resources theory posits that distinctive organisational resources and capabilities constitute the core source of competitive advantage for enterprises [57]. Employee satisfaction, as a critical social resource, can be directly converted into staff commitment, collaborative efficiency, and proactive problem-solving behaviours, thereby forming a central element of organisational resilience. The latter refers to the capacity to maintain operational continuity and rapidly adapt to environmental changes in the face of crises.

During crises, disrupted production operations and supply chain interruptions become the norm. Yet organisational resilience underpinned by high employee satisfaction enables staff to proactively overcome difficulties and flexibly adapt their working methods [38]. Reference [38] emphasises that social capital, as a mechanism, aids human resource practices in adapting to crises, thereby achieving resilience at the employee, organisational, and interface levels. The social capital cultivated through employee satisfaction serves as the core support for this adaptation process. Reference [58] confirms that employee resilience influences organisational resilience through problem-focused and emotion-focused coping mechanisms, with employee satisfaction being a key antecedent of employee resilience. Empirical research grounded in resource conservation theory [41] further reveals that employees' behavioural and situational resilience mediate the relationship between leadership behaviour and organisational resilience, with high satisfaction significantly enhancing both forms of resilience. Additionally, research on incomplete contracts [59] indicates that fostering innovation requires granting employees autonomy and incentives; the trust and intrinsic motivation derived from employee satisfaction align precisely with this logic. Research [60] further confirms that fulfilling psychological contracts encourages employees to engage in extra-role behaviours, directly enhancing operational efficiency. Such proactivity not only mitigates the negative impact of crises on productivity but can even improve operational efficiency through process optimisation, thereby safeguarding the stable generation of internal cash flow. As the most flexible financial source for autonomous innovation investment [61], internal cash flow ensures enterprises can sustain continuous innovation investment even when external resource acquisition becomes challenging. Accordingly, the following research hypothesis is proposed:

Hypothesis 4. *In crisis scenarios, employee satisfaction promotes corporate innovation by enhancing operational resilience.*

3. Materials and Methods

3.1. Descriptive Statistics for Employee Satisfaction

Table 1 reports the descriptive statistics and distribution of employee satisfaction indicators. Panel A shows that the overall satisfaction mean for the full sample is 3.38, indicating a level slightly above 'moderately satisfied'. By sample cohort, the pre-COVID-19 period sample exhibited a slightly higher mean satisfaction score (3.39) than the post-COVID-19 period sample (3.25), with the latter also displaying a greater standard deviation. This suggests the crisis may have exacerbated disparities in employee satisfaction across corporates.

Panel B illustrates the industry distribution of employee satisfaction. Sectors with higher satisfaction levels include Information Transmission, Software and Information Technology Services (Industry J, mean 3.71), the financial sector (Industry J, certain sub-categories), and scientific research and technical services (Industry M, certain sub-categories). Industries with lower satisfaction levels were predominantly concentrated in residential services, repairs, and other services (Industry O, mean 2.00) and the education sector (Industry P, mean 2.76). This preliminary finding suggests that employee satisfaction tends to be higher across knowledge-intensive, high-tech industries, while remaining relatively low in certain traditional service sectors.

Figure 3 depicts the kernel density curves for employee satisfaction across the pre-COVID-19 and post-COVID-19 periods. Comparison reveals two key observations: Firstly, the post-COVID-19 kernel density curve exhibits a more 'flattened' profile with a pronounced 'right-tailing' characteristic compared to its pre-COVID-19 counterpart. This indicates that post-COVID-19, the proportion of enterprises with low satisfaction levels has increased, while the share of those with exceptionally high satisfaction has also risen,

widening the satisfaction gap between enterprises. Secondly, the pre-COVID-19 satisfaction distribution was predominantly concentrated within the 3.4–3.6 range, whereas the post-COVID-19 peak shifted leftwards, clustering within the 3.2–3.4 range. This visually corroborates the descriptive statistics finding of a decline in post-COVID-19 satisfaction mean. An independent samples t-test further substantiates this conclusion, yielding a t-value of 6.34 with $p < 0.001$. This indicates the decline in mean satisfaction is highly statistically significant, demonstrating that the pandemic shock exerted a pervasive negative impact on overall employee wellbeing. Thirdly, the variance in the post-COVID-19 period distribution is markedly greater than that observed pre-COVID-19, further supporting the conclusion that ‘the crisis has exacerbated differentiation among enterprises’.

Table 1. Analysis of the Current State of Employee Satisfaction.

Panel A. Summary Stats of Employ Satisfaction Scores						
	Variable	Observations	Mean	SD	Min	Max
Pre-COVID-19	score1	10,134	3.3758	0.9199	1	5
	score1	9256	3.3881	0.8910	1	5
	score1	878	3.2461	1.1750	1	5
Panel B. Sample distribution by industry						
Industry	Number	Mean	Total number	Proportion		
A	58	3.2762	10,134	0.57%		
B	109	3.5816	10,134	1.08%		
C	6266	3.3286	10,134	61.83%		
D	104	3.5091	10,134	1.03%		
E	264	3.4458	10,134	2.61%		
F	395	3.4222	10,134	3.90%		
G	166	3.4350	10,134	1.64%		
H	2	3.5000	10,134	0.02%		
I	1407	3.3958	10,134	13.88%		
J	506	3.7112	10,134	4.99%		
K	223	3.4825	10,134	2.20%		
L	140	3.5194	10,134	1.38%		
M	201	3.3168	10,134	1.98%		
N	117	3.3824	10,134	1.15%		
O	6	2.0000	10,134	0.06%		
P	10	2.7645	10,134	0.10%		
Q	15	3.6742	10,134	0.15%		
R	108	3.2018	10,134	1.07%		
S	14	3.8929	10,134	0.14%		
-	23	3.7697	10,134	0.23%		

Moreover, given the ample sample size and absence of missing values in the t-tests, the observed data fluctuations stem primarily from the external pandemic shock rather than intrinsic biases. This indicates robust representativeness of the data at the industry level.

Figure 4 illustrates the distribution characteristics of employee satisfaction. The data reveals significant regional disparities in employee satisfaction levels. Overall, coastal regions characterised by economic prosperity and talent concentration (such as Fujian, Hainan, and Shandong), alongside certain frontier provinces (such as Inner Mongolia and Xinjiang), exhibit comparatively higher satisfaction levels. Conversely, average satisfaction scores remain relatively low in some central and western provinces (including Ningxia, Yunnan, and Jiangxi). These geographical disparities may be attributed to local economic

development levels, industrial structures, employment market conditions, and pressures from the cost of living.

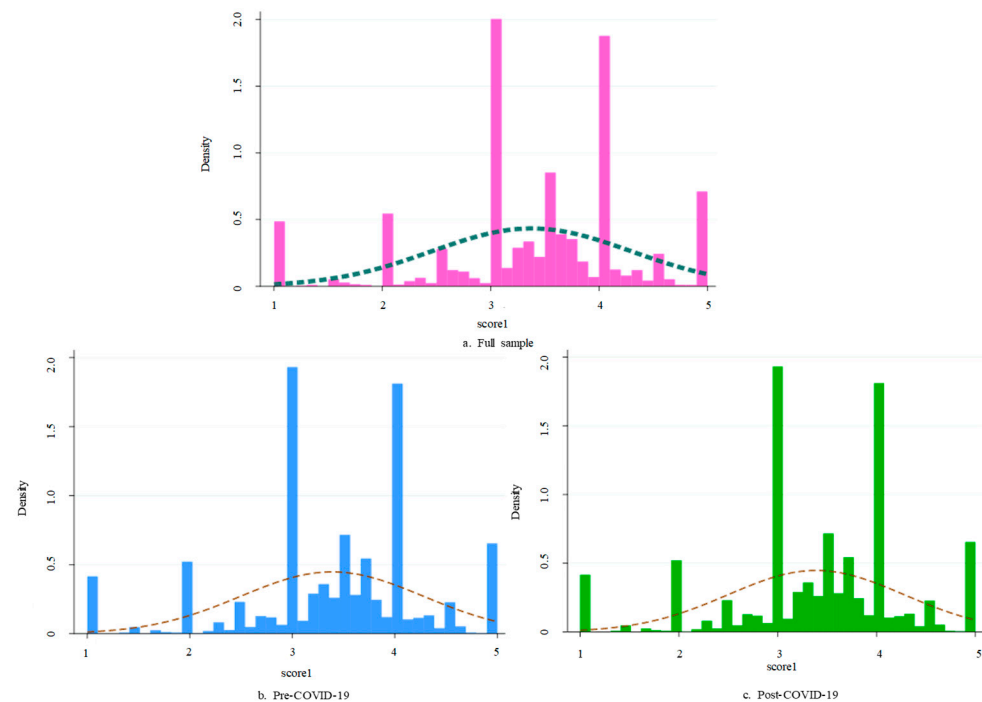


Figure 3. Kernel density plots of employee satisfaction. (a) represents the full sample period, (b) denotes pre-COVID-19 period, and (c) indicates the post-COVID-19 period.

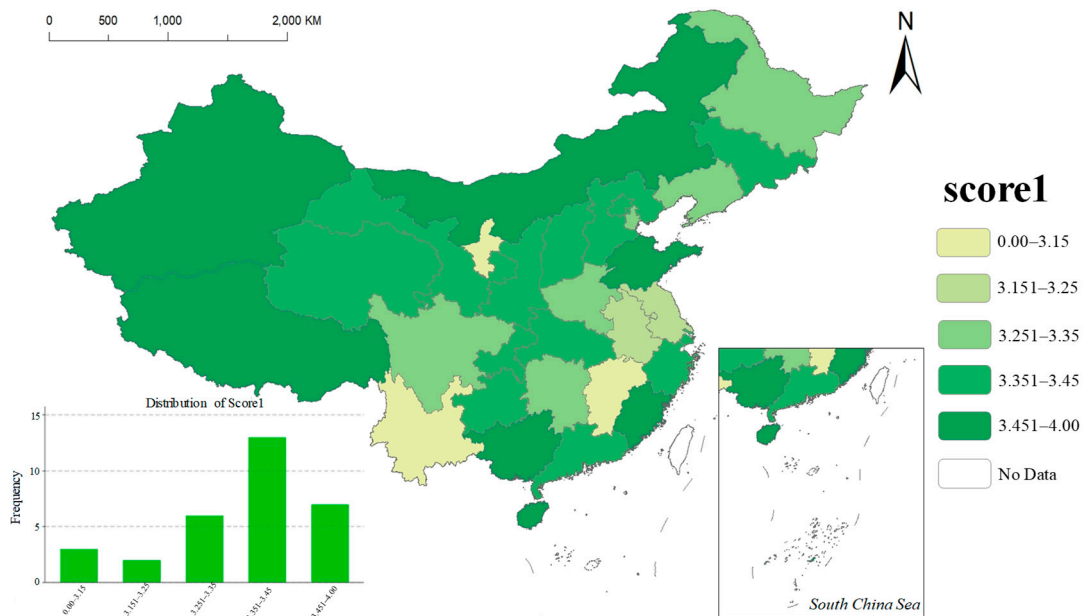


Figure 4. Geographical Distribution Map of Employee Satisfaction.

3.2. Model Construction

To test the theoretical hypotheses proposed earlier, this study constructs the following benchmark regression model. To eliminate the combined effects of individual heterogeneity that does not change over time and time trends, both year fixed effects and corporate fixed effects are controlled for simultaneously.

$$\text{apply1}_{it} = \alpha_0 + \alpha_1 \text{lnscore1}_{it} + \alpha_2 \text{lnscore1}_{it} \times \text{criss}_{it} + \beta Y_{it} + \text{FE}_{\text{year}} + \text{FE}_{\text{corporate}} + \varepsilon_{it} \quad (1)$$

In this study, the dependent variable is innovation output, measured by the number of patent applications. To prevent the logarithmic transformation from becoming meaningless when the total number of patent applications is zero, all dependent variables are generated by taking the natural logarithm of the total number of corresponding patent applications plus one. Innovation output specifically encompasses total patent applications (apply1), invention patent applications (apply2), and utility model patent applications (apply3). To specifically examine the green innovation dimension, this study additionally constructs green innovation output indicators, specifically covering total green patent applications (lnps), green invention patent applications (lnps1), and green utility model patent applications (lnps2). The core explanatory variable is employee satisfaction, derived by taking the natural logarithm of the average anonymous corporate-year level score from KanZhun.com (lnscore1). The key moderating variable is crisis, a dummy variable defined as 1 for years 2020 and thereafter (crisis period) and 0 for all preceding years (normal period).

To control for other potential influencing factors, the model incorporates a series of control variables: corporate size is measured using the natural logarithm of operating revenue (lnSale), cash flow levels are assessed by the ratio of operating cash flow to total assets (cflow), ownership structure is gauged via a dummy variable (govcon1_p) (assigned a value of 1 for state-owned corporates), corporate age is measured by taking the natural logarithm of the number of years since establishment plus one (lnage), equity concentration is measured by the Herfindahl index of the top ten shareholders' holdings (top10_HHI), financial leverage is represented by the debt-to-equity ratio (DER), and corporate profitability is measured by return on equity (ROE). ε_{it} denotes the random error term. Descriptive statistics for the main variables are detailed in Table 2.

Table 2. Descriptive statistics results of main variables.

Variable	Observations	Mean	Standard Deviation	Min	Max
apply1	8590	3.2307	1.8451	0.0000	9.6105
apply2	8590	2.5873	1.7315	0.0000	9.0873
apply3	8590	2.4119	1.8162	0.0000	8.9049
lnps	8590	1.2372	1.3938	0.0000	7.5240
lnps1	8590	0.9207	1.2335	0.0000	7.5235
lnps2	8590	0.7757	1.0935	0.0000	6.3026
lnscore1	10,134	1.1661	0.3503	0.0000	1.6094
lnSale	8294	21.8165	1.5202	17.6185	28.8063
cflow	8687	0.0487	0.0739	−0.6498	0.5410
govcon1_p	9604	0.2804	0.4492	0.0000	1.0000
lnage	8590	1.9880	0.8962	0.0000	3.4657
top10_HHI	8654	0.3944	0.1832	0.1024	0.9609
DER	8084	1.2073	8.0034	−340.1706	416.2532
ROE	8077	0.0693	0.2104	−9.3836	1.3317

3.3. Data Sources

The employee satisfaction data for this study originates from the Chinese employer review platform ‘Kanzhun.com’. This data source offers greater objectivity and immediacy compared to traditional surveys. Launched in 2013, it continued to provide public, anonymous employee evaluation services until 30 September 2024. KanZhun enables current employees and those who left within the past two years to anonymously eval-

uate corporates across multiple dimensions, including overall rating, remuneration and benefits, career development, corporate culture, and work–life balance, supplemented by detailed textual comments. Its nature and functionality are comparable to the internationally renowned Glassdoor platform. Compared to traditional questionnaire survey data, KanZhun’s data originates from spontaneous, anonymous employee evaluations, thereby better reflecting genuine sentiments and reducing social desirability bias. At the same time, it has achieved extensive company coverage and temporal consistency. Its industry distribution is extensive and relatively uniform, spanning 19 sectors from traditional manufacturing to high-tech services, broadly aligning with the A-share market structure.

To ensure data representativeness and reliability, this study implemented the following procedures: Firstly, we collected employee evaluation data for all A-share listed corporates on KanZhun.com, covering the period from 2012 to 2022. For each corporate, we obtained all available anonymous employee ratings (on a 1–5 scale) and corresponding textual comments. Second, we constructed corporate-level indicators. We averaged each employee’s overall satisfaction rating at the corporate-year level to derive the core explanatory variable—corporate employee satisfaction (score1). The final panel data comprises 10,134 corporate-year observations.

4. Results

4.1. Employee Satisfaction and Innovation Performance

Table 3 reports the benchmark regression results for employee satisfaction on corporate innovation performance and green innovation performance. Analysis using a two-way fixed effects model indicates that employee satisfaction does not exert a significant influence on general technological innovation, but demonstrates a stable promotional effect on green innovation.

Table 3. The results of employee satisfaction on innovation performance.

	General Innovation			Green Innovation		
	(1) apply1	(2) apply2	(3) apply3	(4) lnps	(5) lnps1	(6) lnps2
lnscore1	−0.0299	−0.0138	−0.0193	0.0802 **	0.0639 *	0.0438 *
lnSale	0.3536 ***	0.3286 ***	0.3126 ***	0.2682 ***	0.1969 ***	0.2190 ***
cflow	−0.6037 ***	−0.5738 **	−0.3468 *	−0.4229	−0.4048	−0.1733
govcon1_p	−0.0634	−0.0359	−0.1952 *	−0.0962	−0.0613	−0.1491
lnage	0.0635	0.0711	0.0202	−0.0622	−0.0861	−0.0618 *
top10_HHI	−0.1427	−0.1793	−0.2113	−0.0309	−0.1501	0.0212
DER	−0.0025	−0.0024	−0.0025	−0.0000	−0.0004	0.0002
ROE	0.0521	0.0095	0.0755 *	0.1026 ***	0.0415	0.0949 ***
Constant	−4.3413 ***	−4.4935 ***	−4.1395 ***	−4.4977 ***	−3.1645 ***	−3.8569 ***
Observations	7257	7257	7257	7257	7257	7257
R-squared	0.8801	0.8702	0.8733	0.8417	0.8249	0.8167
Corporate	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. Values in parentheses are robust standard errors. The following table follows the same convention.

Specifically, regarding general innovation, the regression coefficients for employee satisfaction (lnscore1) across three patent application outputs, total patent applications (apply1), invention patent applications (apply2), and utility model patent applications (apply3) were all negative, none of which passed statistical significance tests ($p > 0.05$). This indicates that under normal operating conditions, employee satisfaction itself is not a key driver of conventional technological innovation within corporates. Such innovation may rely more heavily on external motivators such as R&D investment and market competitive pressures.

In stark contrast, regarding green innovation, employee satisfaction exerts a significant positive influence on the total volume of green patent applications (lnps), green invention patent applications (lnps1), and green utility model patent applications (lnps2), with coefficients of 0.0802 ($p < 0.05$), 0.0639 ($p < 0.1$), and 0.0438 ($p < 0.1$), respectively. Although the coefficient values are relatively small, their consistent statistical significance indicates that green innovation, as a strategic activity highly dependent on employees' intrinsic value alignment, voluntary effort and cross-departmental collaboration, exhibits a more fundamental and resilient connection with employee satisfaction.

4.2. Employee Satisfaction and Innovation Performance: The Moderating Effect of Crisis Context

Table 4 reports the regression results after introducing the interaction term between employee satisfaction and the pandemic shock (lnscore1 $\times$ crisis) into the baseline regression model. These findings clearly reveal the critical moderating role of the crisis context. Analysis indicates that the exogenous shock of the COVID-19 pandemic significantly altered the relationship between employee satisfaction and corporate innovation.

Table 4. The results of employee satisfaction's impact on innovation performance in crisis situations.

	General Innovation			Green Innovation		
	(1) apply1	(2) apply2	(3) apply3	(4) lnps	(5) lnps1	(6) lnps2
lnscore1	−0.0671 ***	−0.0404	−0.0558 **	0.0554 *	0.0471	0.0219
lnscore1 $\times$ crisis	0.2464 ***	0.1763 ***	0.2419 ***	0.1643 **	0.1111 *	0.1451 ***
lnSale	0.3529 ***	0.3281 ***	0.3119 ***	0.2678 ***	0.1966 ***	0.2186 ***
cflow	−0.6007 ***	−0.5717 **	−0.3439 *	−0.4209	−0.4035	−0.1716
govcon1_p	−0.0622	−0.0351	−0.1940 *	−0.0954	−0.0608	−0.1484
lnage	0.0653	0.0724	0.0219	−0.0610	−0.0853	−0.0608 *
top10_HHI	−0.1386	−0.1763	−0.2072	−0.0281	−0.1482	0.0237
DER	−0.0025	−0.0024	−0.0025	−0.0000	−0.0004	0.0002
ROE	0.0510	0.0087	0.0744 *	0.1019 ***	0.0410	0.0942 ***
Constant	−4.3119 ***	−4.4724 ***	−4.1107 ***	−4.4781 ***	−3.1512 ***	−3.8396 ***
Observations	7257	7257	7257	7257	7257	7257
R-squared	0.8803	0.8703	0.8735	0.8418	0.8250	0.8168
Corporate	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. Values in parentheses are robust standard errors.

Specifically, regarding general innovation, the interaction term (lnscore1 $\times$ crisis) exhibits highly significant positive coefficients at the 1% level for all three patent application categories (apply1, apply2, apply3). Concurrently, the main effect coefficient for employee satisfaction (lnscore1) shifted to become significantly negative or remained insignificant. This pattern indicates that under normal conditions, employee satisfaction itself exerts limited or even negative direct promotion on innovation activities. However, during crises, corporates with high employee satisfaction demonstrate significant innovation resilience, where patent application activities are not only uninhibited but enhanced.

Regarding green innovation, the interaction term exhibits positive coefficients at the 5% and 1% significance levels for total green patent applications (lnps) and green utility model patent applications (lnps2), respectively. It also demonstrates a positive coefficient at the 10% significance level for green invention patent applications (lnps1). This confirms that the promotional effect of employee satisfaction on green innovation is similarly 'activated' during crises, with a more robust impact.

These findings remain highly robust after controlling for a range of variables including corporate size, cash flow, governance structure, financial leverage, and profitability, while

accounting for corporate and year fixed effects. This empirical evidence strongly supports the core hypothesis of this study. Under the high-intensity external pressure of a crisis, the value of organisational social capital and psychological capital embodied in employee satisfaction is significantly ‘activated’. The trust, commitment, and collaborative capabilities fostered by highly satisfied employees become crucial resilience assets for corporates to withstand shocks, maintain, and even enhance innovation investment. This is particularly true for long-term green innovation.

5. Robustness Test

To ensure the reliability of the benchmark regression results, this study conducted a series of robustness tests.

5.1. Endogeneity Test

Given the potential bidirectional causal relationship between employee satisfaction and corporate innovation, the instrumental variables approach is employed to address the endogeneity issue arising from reverse causality. This study selects the industry-year average employee satisfaction score excluding the focal firm itself as the instrumental variable (*iv_Inscore1*), based on two primary reasons. Firstly, a corporate’s employee satisfaction level is typically influenced by its specific industry environment (such as prevailing labour practices and compensation norms), leading to strong convergence in satisfaction levels among corporates within the same industry and year. This satisfies the requirement for correlation between the instrumental variable and the endogenous variable. Secondly, the industry-year average employee satisfaction reflects sector-wide characteristics rather than directly influencing individual corporates’ innovation decisions, thus satisfying the instrument variable’s exclusivity requirement.

Table 5 reports the two-stage IV regression results. First-stage tests show *iv_Inscore1* is significantly positive at the 1% level (coefficient = 0.6759, SE = 0.06445), with the Cragg-Donald Wald F statistic (154.69) far exceeding the 10% critical value (16.38) and the Kleibergen-Paap rk LM statistic (82.62, $p = 0.0000$), verifying instrument validity by rejecting weak instrumentation and identification insufficiency. Second-stage regressions indicate that after addressing endogeneity, the *Inscore1* $\times$ crisis coefficients are significantly positive at the 1% level for both innovation indicators, confirming the positive moderating effect of crisis shock. All regressions control for relevant variables with a sample size of 7964, and R-squared values demonstrate stronger explanatory power for general innovation and improved model fit with the interaction term, supporting the robust conclusion that employee satisfaction drives corporate innovation and crisis context amplifies this effect.

Table 5. The results of the instrumental variables regression.

	(1) apply1	(2) apply1	(3) lnps	(4) lnps
Inscore1	−4.4566 *** (0.6826)	−0.3608 *** (0.5890)	−2.8726 ** (0.4354)	−0.0702 (0.1747)
Inscore1 $\times$ crisis		0.1931 *** (0.0258)		0.2164 *** (0.0343)
Controls	YES	YES	YES	YES
Observations	7964	7964	7964	7964
R-squared	0.6325	0.8803	0.2245	0.8417
Result of First Stage				
iv_Inscore1	0.6759 *** (0.06445)	0.6759 *** (0.06445)	0.6759 *** (0.06445)	0.6759 *** (0.06445)
F statistic	109.71 ***	109.71 ***	109.71 ***	109.71 ***

Table 5. Cont.

	(1) apply1	(2) apply1	(3) lnps	(4) lnps
Kleibergen-Paap rk LM statistic	82.62 ***	82.62 ***	82.62 ***	82.62 ***
Cragg-Donald Wald F statistic	154.69 ***	154.69 ***	154.69 ***	154.69 ***

Note: *** and ** denote 1% and 5% significance levels, respectively. Values in parentheses are robust standard errors.

5.2. Substituting Explanatory Variables

Although the employee satisfaction score (lnscore1) used in the benchmark regression is a widely adopted metric, it may still be subject to common method bias or measurement error. To mitigate this concern, we constructed a more objective alternative variable based on employees' spontaneous comments. Specifically, we utilised text comments submitted by employees alongside their ratings on public platforms. Employing a pre-trained BERT (Bidirectional Encoder Representations from Transformers) model, we analysed the sentiment and content of these comments to predict a new satisfaction score (denoted as lnscore2). This approach transforms unstructured textual information into a structured measure of psychological perception, effectively capturing more nuanced and authentic sentiments and attitudes expressed by employees. It thus provides an additional valid measure of employee satisfaction.

Table 6 reports the results of repeating the benchmark regression using this alternative variable. Columns (1) and (3) show that, without the pandemic interaction term, the new employee satisfaction variable (lnscore2) has no significant effect on apply1 but a positive effect on lnps, closely mirroring the pattern of lnscore1 in the benchmark regression. Furthermore, columns (2) and (4) of Table 6 reveal that the coefficients for the interaction term between employee satisfaction and pandemic shock are both significantly positive. This result unequivocally confirms that even when the method of measuring satisfaction is altered, the core conclusion remains valid: the COVID-19 pandemic significantly amplifies the promotional effect of employee satisfaction on innovation, particularly green innovation.

Table 6. Robustness test results based on text analysis.

	(1) apply1	(2) apply1	(3) lnps	(4) lnps
lnscore2	−0.0299	−0.0473	0.0471	0.0247
lnscore2 × crisis		0.1266 **		0.1631 ***
Observations	7257	7257	7257	7257
R-squared	0.8801	0.8802	0.8415	0.8417
Corporate	YES	YES	YES	YES
Year	YES	YES	YES	YES

Note: *** and ** denote 1% and 5% significance levels, respectively. Values in parentheses are robust standard errors.

5.3. Excluding Samples from Specific Regions

The intensity of COVID-19 impacts and containment policies varied across Chinese regions. Notably, Hubei Province and its capital, Wuhan, as the earliest outbreak site and region subject to the strictest controls, may present unique challenges to business operations, policy support, and employee psychological resilience. To mitigate potential interference from these regional outliers on overall findings, we conducted exclusionary tests.

We implemented two distinct sample exclusion approaches. Firstly, we removed all annual observations from corporates registered in Wuhan. Secondly, we further excluded all annual observations from corporates registered in Hubei Province. Table 7 presents regression results based on these two subsamples. It can be observed that, after controlling

for other variables, the pattern of the main effect of employee satisfaction and the interaction effect with the pandemic is entirely consistent with the benchmark regression of the full sample. This result provides strong evidence that the ‘innovative activation effect of employee psychological capital in crisis situations’ revealed earlier is not a product of specific regional phenomena, but rather a more universal economic law. This further enhances the robustness and external validity of the research conclusions.

Table 7. Robustness test results excluding samples from specific regions.

	(1) apply1	(2) apply1	(3) lnps	(4) lnps	(5) apply1	(6) apply1	(7) lnps	(8) lnps
lnscore1	−0.0340	−0.0686 ***	0.0815 **	0.0577 *	−0.0372	−0.0727 ***	0.0763 **	0.0519
lnscore1 × crisis		0.2310 ***		0.1587 **		0.2349 ***		0.1614 **
Observations	7103	7103	7103	7103	7060	7060	7060	7060
R-squared	0.8796	0.8798	0.8425	0.8426	0.8794	0.8796	0.8422	0.8423
Corporate	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. Values in parentheses are robust standard errors.

5.4. Placebo Test

We further conducted a placebo test by randomly assigning 500 simulated ‘pandemic’ shock time points. As shown in Figure 5, the resulting interaction term coefficient estimates clustered densely around zero. The actual coefficients estimated in the benchmark regression (0.2464 for general innovation and 0.1643 for green innovation) were thus highly improbable events. This demonstrates that the observed effect is specifically driven by the genuine pandemic shock, rather than random factors or underlying trends. The promotional effect of employee satisfaction on corporate innovation was significantly amplified during the COVID-19 pandemic, with a particularly pronounced impact on green innovation. This conclusion remains highly robust after variable re-measurement, sample adjustment, and counterfactual testing, establishing a reliable empirical foundation for subsequent mechanism and heterogeneity analyses.

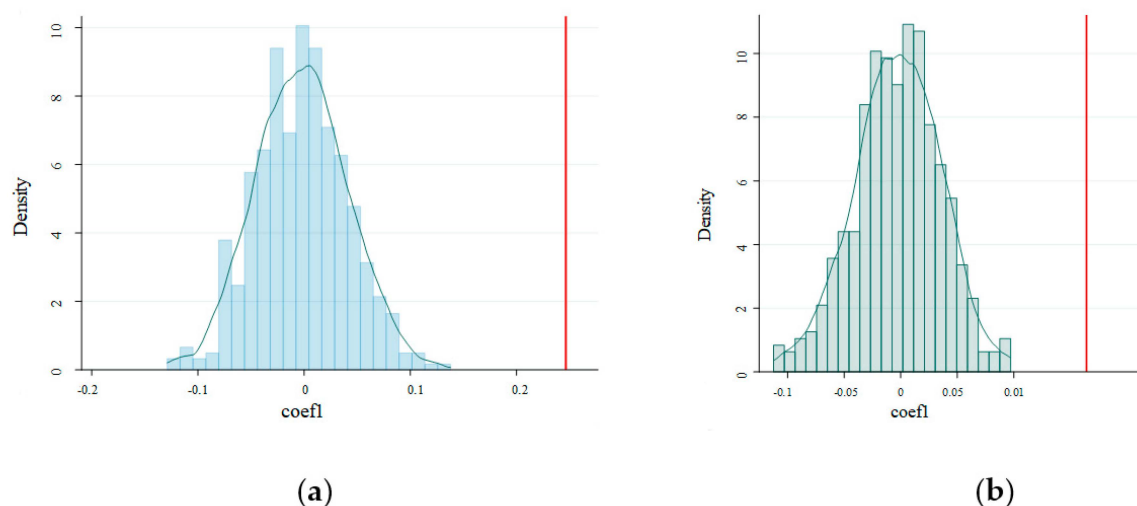


Figure 5. Placebo test results: (a) denotes general innovation; (b) denotes green innovation.

5.5. Controlling for Additional Fixed Effects

To further exclude potential interference from industry characteristics and geographical factors that do not vary over time, we incorporated industry-specific and city-specific fixed effects into the baseline model. Columns (1) to (4) in Table 8 present the correspond-

ing results. After simultaneously controlling for corporate, year, industry, and city fixed effects across multiple dimensions, the interaction term coefficient remains significantly positive. Its direction, significance, and economic interpretation are highly consistent with the benchmark regression. This indicates that the benchmark conclusions are not driven by unobservable, non-time-varying systematic factors such as industry technological trends or regional economic development levels.

Table 8. Robustness test results for controlling additional fixed effects and PSM.

	(1) apply1	(2) apply1	(3) lnps	(4) lnps	(5) apply1	(6) lnps
lnscore1	−0.0259	−0.0603 ***	0.0710 **	0.0508	−0.0663 ***	0.0557 *
lnscore1 × crisis		0.2330 ***		0.1372 **	0.2410 ***	0.1610 **
Observations	7248	7248	7248	7248	7254	7254
R-squared	0.8827	0.8829	0.8438	0.8439	0.8804	0.8419
Corporate	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	NO	NO
City	YES	YES	YES	YES	NO	NO

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. Values in parentheses are robust standard errors.

5.6. Propensity Score Matching (PSM) Analysis

To enhance the reliability of causal inference, we employ propensity score matching for robustness testing. The specific steps are as follows: First, using whether a corporate experienced a significant pandemic shock (i.e., whether it entered the ‘treatment group’) as the dependent variable and all control variables from the baseline regression as covariates, we estimated each corporate’s propensity score using a Logit model. Subsequently, we employed kernel matching to pair corporates in the treatment group with the most similar control group corporates, applying common support conditions to ensure matching quality. Finally, we conducted regression analysis again based on the matched balanced sample.

Columns (5) to (6) in Table 8 present the estimation results based on the PSM-matched sample. The coefficient for the core interaction term remains significantly positive in the matched sample. This finding indicates that after effectively mitigating sample selection bias arising from observable characteristic differences, the positive promotional effect of employee satisfaction on corporate innovation and green innovation during the pandemic shock remains robustly present.

5.7. Replacing Crisis Variable Indicators

To more precisely capture the geographical heterogeneity and intensity variations in the pandemic’s impact, thereby mitigating potential estimation biases arising from treating 2020 and subsequent years as a homogeneous crisis period, this study replaces the core crisis variable with a continuous intensity measure (crisis1). This new variable is constructed using the annual cumulative number of confirmed COVID-19 cases in the city where the corporate is registered. To eliminate the influence of dimension, this study divides the original case data by 1000 to obtain crisis1.

As shown in Table 9, the core findings remain robust when employing the new crisis variable crisis1. Specifically, the coefficient for the interaction term between employee satisfaction and crisis intensity (lnscore1 × crisis1) is significantly positive at the 1% or 5% level for most innovation output indicators. This indicates that in regions with higher numbers of confirmed cases, the positive impact of employee satisfaction on corporate innovation and green innovation is particularly pronounced. Although the interaction term coefficient was insignificant for a few individual indicators, the consistency of the main

findings is strongly supported. Consequently, this validation confirms that even when employing a more granular and direct measure of crisis impact, the core finding of this study namely, that employee satisfaction promotes innovation during crises remains reliable.

Table 9. Robustness test results for replacing Crisis Variable Indicators.

	(1) apply1	(2) apply2	(3) apply3	(4) lnps	(5) lnps1	(6) lnps2
lnscore1	−0.0466 ** (0.0198)	−0.0346 (0.0238)	−0.0195 (0.0259)	0.0641 ** (0.0275)	0.0431 (0.0280)	0.0437 ** (0.0172)
lnscore1 × crisis1	0.0576 ** (0.0232)	0.0721 *** (0.0206)	0.0006 (0.0198)	0.0557 *** (0.0156)	0.0718 *** (0.0200)	0.0001 (0.0209)
Observations	7257	7257	7257	7257	7257	7257
R-squared	0.8802	0.8703	0.8733	0.8418	0.8252	0.8167
Corporate	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES

Note: *** and ** denote 1% and 5% significance levels, respectively. Values in parentheses are robust standard errors.

6. Mechanism Test

This study uses a two-step approach incorporating mediation effects. It aims to systematically examine the latent mechanisms through which employee satisfaction influences corporate innovation (apply1) and green innovation (lnps) under pandemic shocks. Step one (Table 10) examines the influence of the core explanatory variable (the interaction term between employee satisfaction and pandemic impact: lnscore1 × crisis1) on the four mechanism variables. Step two (Tables 11 and 12) separately tests the impact of each mechanism variable on the two outcome variables (apply1 and lnps), after controlling for the core explanatory variable. The following section first clarifies the conceptual content of each mechanism variable before analysing the four transmission pathways in detail based on empirical findings.

Table 10. The result of the first mechanism test.

	Governance Costs		Decision Quality	Financing Constraints	Operational Resilience
	(1) cost1	(2) cost2	(3) govcon	(4) SA	(5) GPM
lnscore1	0.0100 (0.0061)	0.0085 (0.0056)	−0.0071 (0.0136)	0.0035 ** (0.0015)	−0.0056 * (0.0031)
lnscore1 × crisis1	−0.0430 *** (0.0158)	−0.0385 *** (0.0142)	0.0763 * (0.0440)	−0.0193 *** (0.0063)	0.0113 (0.0106)
Constant	−3.2917 *** (0.3003)	−3.2239 *** (0.2896)	2.7481 *** (0.4601)	3.9161 *** (0.0984)	0.3097 ** (0.1467)
Observations	7263	7263	6896	7263	7263
R-squared	0.9178	0.9267	0.9425	0.9823	0.9235
Corporate	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. Values in parentheses are robust standard errors.

First, the mechanism for reducing governance costs. The mechanism variables are represented by the ratios of total operating costs to total assets (cost1) and operating costs to total assets (cost2) to indicate the governance costs of the corporate. The results in columns (1) and (2) of Table 10 indicate that the coefficients for the interaction term across both cost variables are significantly negative at the 1% level. This demonstrates that, under pandemic pressures, corporates with high employee satisfaction exhibit markedly reduced governance costs. However, this mechanism is only significant in the presence of high employee satisfaction. (1) and (2) of Table 10 reveal that the interaction terms for both cost variables exhibit statistically significant negative coefficients at the 1% level. This

indicates that corporates with higher employee satisfaction experienced markedly reduced governance costs during the pandemic shock. Furthermore, as shown in Tables 11 and 12, lower governance costs significantly inhibited enterprise innovation (apply1) and green innovation (lnps). This indicates that the saved governance costs provided internal resources for long-term innovation. Therefore, Hypothesis 1 has been verified.

Table 11. The result of the second mechanism test (General Innovation).

	Governance Costs (1) apply1	Governance Costs (2) apply1	Decision Quality (3) apply1	Financing Constraints (4) apply1	Operational Resilience (5) apply1
lnscore1	−0.0666 *	−0.0667 *	−0.0827 **	−0.0686 *	−0.0660 *
lnscore1 × crisis1	0.2414 **	0.2413 **	0.2609 **	0.2498 **	0.2457 **
cost1	−0.2426 **				
cost2	(0.0958)	−0.2748 **			
govcon		(0.1190)	0.0214		
SA			(0.0420)	−0.1056	
GPM				(0.3839)	0.5406 **
Constant	−5.4156 ***	−5.5032 ***	−5.0177 ***	−4.2037 **	−4.7846 ***
Observations	(1.0000)	(1.0192)	(0.9655)	(1.8334)	(0.9325)
R-squared	7263	7263	6896	7263	7263
Corporate	0.8804	0.8805	0.8838	0.8801	0.8803
Year	YES	YES	YES	YES	YES

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. Values in parentheses are robust standard errors.

Table 12. The result of the second mechanism test (Green Innovation).

	Governance Costs (1) lnps	Governance Costs (2) lnps	Decision Quality (3) lnps	Financing Constraints (4) lnps	Operational Resilience (5) lnps
lnscore1	0.0587 *	0.0583 *	0.0517	0.0586 *	0.0563 *
lnscore1 × crisis1	(0.0305)	(0.0305)	(0.0319)	(0.0305)	(0.0305)
cost1	0.1560 *	0.1572 *	0.1870 **	0.1534 *	0.1669 **
cost2	(0.0815)	(0.0815)	(0.0825)	(0.0815)	(0.0816)
govcon	−0.2661 ***				
cost2	(0.0627)	−0.2662 ***			
govcon		(0.0674)	0.0447		
SA			(0.0349)	−0.7308 **	
GPM				(0.3075)	0.0512
Constant	−5.7564 ***	−5.7386 ***	−5.2632 ***	−2.0185	−4.8964 ***
Observations	(0.8047)	(0.8108)	(0.7780)	(1.4028)	(0.7621)
R-squared	7263	7263	6896	7263	7263
Corporate	0.8422	0.8421	0.8436	0.8418	0.8415
Year	YES	YES	YES	YES	YES

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. Values in parentheses are robust standard errors.

Second, the mechanism for improving decision quality. This study adopts the principal component analysis method, selects seven indicators including executive compensation, executive shareholding ratio, independent director ratio, board size, institutional shareholding ratio, equity balance degree, and the duality of chairman and general manager to calculate principal components, and further combines them into a corporate comprehensive governance index (govcon). As a mediating variable, this index is used to measure the quality of corporate decision-making, with a higher score indicating a higher level of corporate decision-making quality. Column (3) of Table 10 indicates that the coefficient for the interaction term with this variable is significantly positive at the 10% level, suggesting

that employee satisfaction elevates governance standards during crises. However, in the second-step tests presented in Tables 11 and 12, the governance level variable exhibits non-significant coefficients for both ‘corporate innovation’ and ‘green innovation’. This indicates that while employee satisfaction may have optimised corporate governance structures and oversight processes, this improvement in governance level did not statistically translate into a direct, effective impetus for either type of innovation activity. Therefore, hypothesis 2 is proven to be incorrect.

Thirdly, the mechanism for alleviating financing constraints. The mechanism variable financing constraints were measured using the SA index (SA), with higher index values indicating greater external financing difficulties faced by corporates. The results in columns (4) of Table 10 reveal that the coefficient of the interaction term for the SA Index is significantly negative at the 1% level, indicating that high employee satisfaction helps alleviate corporates’ financing constraints during the pandemic. Regarding the transmission effect, Table 11 shows that the impact of various financing constraint indicators on corporate innovation (apply1) is not significant, meaning that the easing of financing constraints does not directly promote general innovation activities. However, Table 12 reveals that the SA Index exhibits significantly negative coefficients for green innovation (lnps), indicating that alleviated financing constraints substantially promote green innovation. This confirms that financing constraint relief constitutes an effective channel through which employee satisfaction influences green innovation, highlighting the high dependence of green innovation activities on external funding. Therefore, Hypothesis 3 has been verified.

Fourth, the mechanism for enhancing operational resilience. The mechanism variable employs gross operating profit margin (GPM) as a proxy for operational efficiency, reflecting the profitability of a corporate’s core business. Column (5) of Table 10 indicates that the interaction term has no significant effect on this variable. This implies that, within the study sample, employee satisfaction did not significantly enhance corporates’ short-term operational profitability during the pandemic shock. Consequently, the first mediating condition is not satisfied. Although Table 11 indicates that operational efficiency itself exerts a significant positive effect on corporate innovation (with a statistically significant positive coefficient), this efficiency is not driven by employee satisfaction during crises. Similarly, the effect of this variable on green innovation in Table 12 is also insignificant. Therefore, hypothesis 4 is proven to be incorrect.

In summary, this study’s mechanism testing reveals multiple and heterogeneous channels through which employee satisfaction influences corporate innovation during pandemic shocks. For general innovation, its impact primarily manifests as an inhibitory pathway: employee satisfaction may, by reducing governance costs, displace R&D resources in the short term. For green innovation, however, two significant promotional pathways exist. Firstly, by freeing up internal resources through reduced governance costs. Secondly, by alleviating financing constraints to secure external capital support.

7. Discussion

This study systematically examines the heterogeneous effects of employee satisfaction on driving corporate innovation (apply1) and green innovation (lnps) during crises across four dimensions: industry characteristics, corporate characteristics, external environment, and internal capabilities. The results (see Tables 13–16) indicate that these effects exhibit significant contextual dependence, revealing the differentiated value of ‘soft power’ under varying constraints.

Table 13. Results of Industry Heterogeneity Tests.

	GK (1) apply1	NGK (2) apply1	GK (3) lnps	NGK (4) lnps	JS (5) apply1	NJS (6) apply1	JS (7) lnps	NJS (8) lnps
Inscore1	−0.0424 (0.0428)	−0.1254 * (0.0649)	0.0591 (0.0345)	0.0369 (0.0436)	−0.0259 (0.0488)	−0.1242 ** (0.0500)	0.0685 (0.0475)	0.0261 (0.0444)
Inscore1 × crisis	0.2668 *** (0.0540)	0.1790 (0.1247)	0.2135 *** (0.0329)	0.0441 (0.1072)	0.2774 *** (0.0523)	0.1913 * (0.0919)	0.1836 ** (0.0587)	0.1097 (0.0665)
Observations	5072	2154	5072	2154	4425	2795	4425	2795
R-squared	0.8778	0.8617	0.8457	0.8182	0.8780	0.8634	0.8466	0.8155
Corporate	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. Values in parentheses are robust standard errors.

Table 14. Results of Corporate Capability Heterogeneity Test.

	HS (1) apply1	NHS (2) apply1	HS (3) lnps	NHS (4) lnps	SOE (5) apply1	NSOE (6) apply1	SOE (7) lnps	NSOE (8) lnps
Inscore1	−0.0489 ** (0.0198)	−0.0872 ** (0.0276)	0.0788 * (0.0402)	0.0191 (0.0255)	0.0096 (0.0552)	−0.0895 *** (0.0201)	0.0534 (0.0392)	0.0682 * (0.0315)
Inscore1 × crisis	0.2657 *** (0.0600)	0.2126 (0.1152)	0.1488 (0.0874)	0.1126 * (0.0477)	0.1695 ** (0.0697)	0.2474 *** (0.0394)	−0.0576 (0.0535)	0.1756 ** (0.0511)
Observations	3442	3540	3442	3540	1893	5168	1893	5168
R-squared	0.9068	0.8260	0.8702	0.7530	0.9227	0.8594	0.8872	0.8117
Corporate	YES	YES	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES

Note: ***, **, and * denote 1%, 5%, and 10% significance levels, respectively. Values in parentheses are robust standard errors.

Table 15. Results of External Environment Heterogeneity Tests.

	HL (1) apply1	NHL (2) apply1	HL (3) lnps	NHL (4) lnps	HSA (5) apply1	NHSA (6) apply1	HSA (7) lnps	NHSA (8) lnps
Inscore1	−0.0214 (0.0293)	−0.0976 ** (0.0302)	0.0890 ** (0.0324)	0.0004 (0.0398)	−0.1352 ** (0.0447)	0.0223 (0.0387)	0.0001 (0.0551)	−0.0214 (0.0293)
Inscore1 × crisis	0.0225 (0.0621)	0.4952 ** (0.1757)	0.0669 (0.0662)	0.1946 (0.1291)	0.3671 *** (0.0694)	0.1747 *** (0.0491)	0.2258 *** (0.0374)	0.0225 (0.0621)
Observations	3647	2416	3647	2416	3440	3456	3440	3456
R-squared	0.8942	0.8946	0.8453	0.8687	0.8979	0.8919	0.8728	0.8383
Corporate	YES	YES	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES

Note: *** and ** denote 1% and 5% significance levels, respectively. Values in parentheses are robust standard errors.

Table 16. Results of Corporate Capability Heterogeneity Tests.

	HG (1) apply1	NHG (2) apply1	HG (3) lnps	NHG (4) lnps	HIN (5) apply1	NHIN (6) apply1	HIN (7) lnps	NHIN (8) lnps
Inscore1	−0.1192 *** (0.0271)	−0.0396 (0.0288)	0.0335 (0.0523)	0.0484 (0.0318)	−0.0524 (0.0350)	−0.1223 ** (0.0402)	0.0146 (0.0465)	0.0672 ** (0.0252)
Inscore1 × crisis	0.2187 *** (0.0422)	0.4349 *** (0.0592)	0.1540 ** (0.0505)	0.2872 *** (0.0711)	0.1458 (0.0801)	0.4943 *** (0.0773)	−0.1096 (0.1230)	0.1930 ** (0.0572)
Observations	3372	3325	3372	3325	3276	2743	3276	2743
R-squared	0.8870	0.8937	0.8387	0.8630	0.8702	0.7855	0.8414	0.7209
Corporate	YES	YES	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES	YES	YES
Year	YES	YES	YES	YES	YES	YES	YES	YES

Note: *** and ** denote 1% and 5% significance levels, respectively. Values in parentheses are robust standard errors.

Firstly, at the industry characteristics level, the innovation-promoting effect of employee satisfaction is more pronounced in knowledge-intensive industries. Table 13 and Figure 6 results show that when grouped by ‘whether high-tech industry (GK = high-tech industry; NGK = otherwise)’ and ‘whether technology-intensive industry (JS = tech nology-intensive industry; NJS = otherwise)’, the positive impact of the employee

satisfaction-crisis interaction term ($\text{Inscore1} \times \text{crisis}$) on innovation is more significant in both the high-tech and technology-intensive groups. Specifically, in high-tech industries, the coefficients for this interaction term on apply1 and Inps were 0.2668 and 0.2135, respectively, both significant at the 1% level. In non-high-tech industries, the coefficients were smaller or non-significant. This indicates that when an organisation's core competitiveness relies heavily on employees' intellectual capital, knowledge, and collaborative capabilities, the organisational cohesion and proactivity fostered by employee satisfaction during crises can be more directly and effectively transformed into critical resilience assets that sustain and drive innovation activities.

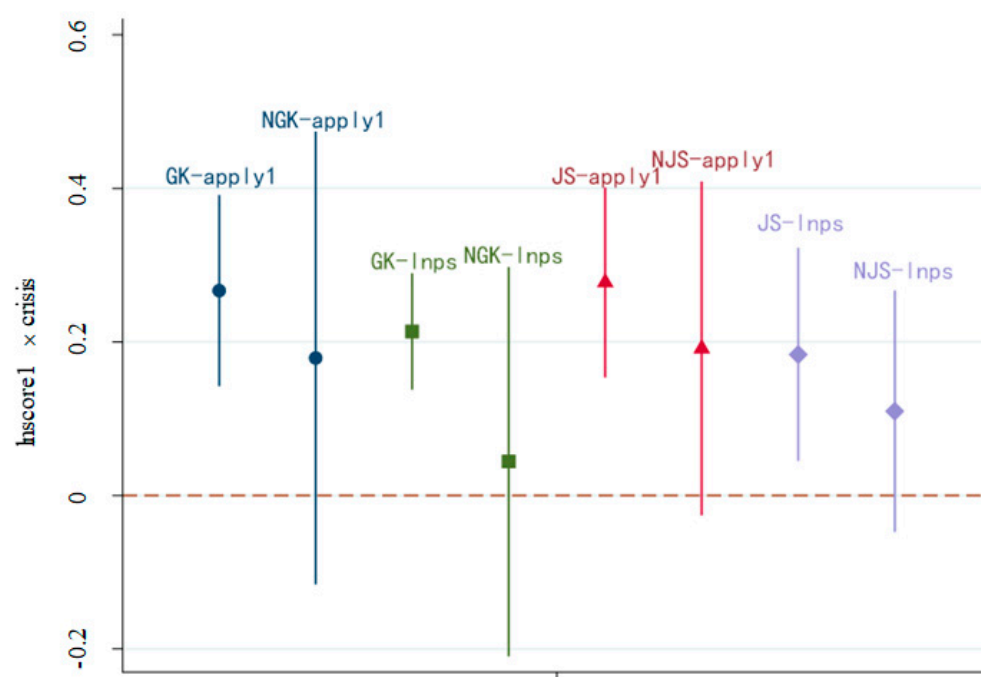


Figure 6. Distribution of Industry Heterogeneity Test Coefficients.

Secondly, at the organisational characteristic level, differing influence pathways emerge across corporates of varying scale and ownership structure. Table 14 reveals that, when grouped by corporate size (based on median total assets, HS = big size; NHS = otherwise), employee satisfaction during crises exhibits a stronger promote effect on apply1 for large corporates than for small and medium-sized corporates, yet its impact on Inps is only significantly positive for the latter. This reflects that large corporates may rely more on their normative frameworks to sustain routine innovation during crises, whereas the flexibility of SMEs enables them to better convert employee morale into momentum for green transformation. Furthermore, grouping by ownership structure reveals that this effect significantly promotes both apply1 and Inps in non-state-owned corporates, whereas in state-owned corporates it primarily influences apply1 with no significant impact on Inps (SOE = state-owned corporates; NSOE = otherwise). This highlights the market adaptability and organisational vitality of non-state-owned corporates in leveraging human capital for multidimensional innovation during crises.

Thirdly, at the external environment level, employee satisfaction plays a crucial compensatory role in scenarios with stronger institutional and resource constraints. Table 15 reveals that when corporates operate in regions with weaker legal environments or face higher financing constraints (SA index above the median, HSA = higher financing constraints; NHSA = otherwise), the driving effect of employee satisfaction on innovation significantly intensifies. We use the 'Market Intermediary Organization Development and

Legal System Environment Score’ index from the ‘China Provincial Marketization Index Report’ to measure the regional legal environment. The data was divided into two groups based on the median (HL = Higher legal environment, NHL = otherwise). For instance, in the group with a weaker legal environment, the coefficient of the interaction term for *apply1* is significant at the 5% level, whereas this result is not significant in the group with a stronger legal environment. This indicates that when formal external institutional safeguards are inadequate or access to financial resources is difficult, the efficient internal coordination mechanisms and organisational identification fostered by high employee satisfaction can effectively compensate for external deficiencies, becoming a crucial substitute resource for stimulating and sustaining innovation activities.

Fourth, at the organisational ability level, employee satisfaction generates a more pronounced marginal enhancement effect in corporates with relatively weak ‘hard capabilities’. Table 16 reveals that for corporates with lower digitalisation levels or innovation capabilities, employee satisfaction exerts a stronger promotional effect on innovation during crises. We measure a corporate’s digitalisation levels by calculating the proportion of keywords related to the digital economy in the annual reports. The data was divided into two groups based on the median (HG = Higher digitalisation level, NHG = otherwise). We measure a corporate’s innovation ability by using the average value of the total number of patents. Divided into two groups based on the median. (HIN = Higher innovation ability, NHIN = otherwise). For instance, in the low innovation ability group, the interaction term’s coefficient for *apply1* is significant at the 1% level, whereas it is insignificant in the high innovation ability group. This finding illuminates a crucial ‘substitution’ logic. When corporates exhibit deficiencies in ‘hard’ capabilities such as technological foundations or innovation accumulation, investments in ‘people’—namely enhancing employee satisfaction as a form of ‘soft’ organisational capital—yield higher marginal returns. This becomes a crucial pillar for driving innovation, particularly breakthroughs, during crises.

In summary, the innovation-driving effect of employee satisfaction during crises exhibits significant contextual dependence. Its effects are particularly pronounced in knowledge-intensive industries, non-state-owned corporates, and corporates facing stronger external institutional and financing constraints, or those with relatively weak digitalisation and innovation capabilities. This profoundly illustrates that, amidst adversities of technological, institutional, and financial constraints, cultivating positive human capital and organisational climate constitutes an especially critical and efficient strategy for achieving innovation resilience.

8. Conclusions and Policy Suggestions

8.1. Conclusions

This study constructs a corporate-level employee satisfaction metric based on employer review big data from China’s KanZhun.com platform. Using the COVID-19 pandemic as an exogenous shock, it systematically examines the impact of employee satisfaction on corporate innovation (encompassing both general and green innovation) during crises, along with its underlying mechanisms and boundary conditions. Key findings are as follows.

First, baseline regression indicates that the promotional effect of employee satisfaction on corporate innovation is significantly ‘activated’ during crises. Under normal conditions, the direct impact of employee satisfaction on general innovation is insignificant; however, under pandemic shock, the interaction term between employee satisfaction and crisis exerts a significant positive effect on both total patent applications and green patent applications. This indicates that crises, as high-intensity external pressures, transform organisational social capital—primarily represented by employee satisfaction—from a dormant asset into

a critical resilience asset, serving as the core driving force for sustaining and propelling innovation activities.

Secondly, the mechanism test reveals four parallel transmission pathways, though their effectiveness and directionality differ. Findings indicate that during crises, high employee satisfaction significantly promotes corporate innovation—particularly green innovation—primarily through two channels: reducing internal governance costs and alleviating external financing constraints. However, the pathways involving improved decision quality and operational resilience failed to receive empirical support in this study.

Thirdly, heterogeneity analysis further reveals the contextual dependence of this effect. The innovation-driving role of employee satisfaction is particularly pronounced in high-tech industries, technology-intensive sectors, non-state-owned corporates, and corporates facing stronger external institutional and financing constraints or possessing relatively weak digitalisation and innovation capabilities. This finding reinforces the ‘substitutive’ logic. When corporates face shortcomings in ‘hard’ conditions, investments in ‘soft’ strengths like human capital yield higher marginal returns, becoming a crucial strategy for achieving innovation resilience amid adversity.

In summary, this study’s core theoretical contribution lies in demonstrating that employee satisfaction is not merely a routine management objective but a critical resilience factor for ensuring innovation continuity—particularly in driving strategic green transformation—during extreme crises. Its efficacy manifests through resource optimisation channels such as reducing governance costs and alleviating financing constraints, with its effectiveness significantly modulated by industry characteristics, corporate attributes, and external environments.

8.2. Policy Suggestions

Based on this study’s findings that employee satisfaction during crises drives corporate innovation through specific mechanisms, the following policy recommendations are offered to corporates, market participants, and governments.

First, corporates should comprehensively upgrade employee satisfaction management into a core crisis-oriented strategy for ‘organisational resilience,’ focusing specifically on driving green innovation. Corporates must establish an integrated ‘monitor-respond-convert’ framework, proactively utilising third-party platform data to monitor real-time fluctuations in employee sentiment. Upon detecting crisis signals, they should immediately activate ‘green innovation task forces’ centred on high-satisfaction key personnel. Corporates should establish dedicated crisis resource pools, prioritising savings from reduced governance costs and eased financing pressures towards safeguarding team stability and rewarding innovative proposals aimed at energy conservation, emissions reduction, and developing eco-friendly technologies. This will enable the precise and agile conversion of organisational cohesion and collaborative intent forged during crises into tangible innovations that enhance operational resilience and pioneer green markets.

Secondly, regulators and investors must integrate high-frequency employee sentiment data as a key non-financial indicator for assessing corporate resilience, particularly green transition potential. Regulators should drive the development of guidelines requiring corporates to regularly disclose verified employee satisfaction data and its fluctuations during periods of stress. ESG rating agencies must reform their methodologies, substantially increasing the weighting of real-time employee sentiment data within the ‘social’ dimension. They should prioritise assessing its correlation with green innovation performance during crises, thereby identifying corporates that genuinely harness human agency to withstand risks and drive sustainable development. Investors and creditors should utilise this metric to optimise crisis-era investment decisions, granting more favourable

valuations and financing terms to corporates demonstrating pronounced synergies between employee satisfaction and green innovation. This will channel market resources towards resilient innovators.

Thirdly, government departments should devise targeted incentive policies to support corporates that translate employee wellbeing into green innovation advantages in practice. Policies should move beyond universal subsidies towards a ‘conditional incentive’ model. For instance, establishing a ‘Resilient Green Development Fund’ could provide matching R&D grants or loan interest subsidies to corporates demonstrating sustained high employee satisfaction alongside green innovation outputs during crises. In government procurement and major project tendering, the assessment criteria should incorporate a corporate’s historical record of ‘employee satisfaction-innovation continuity’ during past crises. Such policies would send a strong signal to society that ‘people-centred innovation alone can be sustainable,’ incentivising corporates to make long-term strategic investments in human capital and green innovation.

Employee satisfaction constitutes a multidimensional construct encompassing evaluations of remuneration, career development, management practices, and organisational culture. Future research may use finer-grained textual data, distinguish assessments of management, job content and compensation packages, and precisely dissect the critical satisfaction dimensions for corporate survival, innovation or performance during crises. Furthermore, this study focuses on short-term impacts during crises. Future research could employ longitudinal tracking data to investigate whether the innovation advantage underpinned by employee satisfaction persists post-crisis, and its role in shaping long-term corporate competitiveness.

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