

Organizational Slack and CSR Disclosure Reshaping the Impact of CSR Gaps on Technological Innovation Performance

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ABSTRACT

Internal and external stakeholders of a corporation often impose conflicting expectations regarding corporate social responsibility (CSR) initiatives. Such contradictory demands may create a CSR gap, resulting in an imbalance between internal and external CSR engagement that can undermine firms' capacity for technological innovation. Drawing on stakeholder theory and resource allocation perspectives, this study investigates the impact of the CSR gap on technological innovation performance using a panel dataset of 3,270 Chinese listed enterprises, comprising 23,764 firm-year observations from 2012 to 2021. Technological innovation performance is measured by both patent output and R&D expenditure to capture innovation outcomes and innovation input. In addition, this study explores whether organizational slack and CSR disclosure quality mitigate the adverse consequences of the CSR gap. The empirical findings indicate that the CSR gap significantly reduces technological innovation performance, suggesting that an unbalanced allocation of CSR resources weakens firms' innovation capability. Further analysis demonstrates that greater organizational slack and higher-quality CSR disclosure effectively alleviate the negative impact of the CSR gap by providing additional resources and enhancing stakeholder trust. These findings enrich the literature on the CSR-technology innovation nexus by highlighting the detrimental effects of CSR imbalances and identifying two important boundary conditions that buffer these effects. The study offers practical implications for managers, emphasizing the importance of balancing CSR investments across stakeholder groups while strengthening resource flexibility and disclosure transparency to support sustainable technological innovation.

1. Introduction

CSR, as a fundamental driver for sustainable corporate practices, has become a strategic priority for global companies to attain their sustainability objectives. Despite the significant number of studies assessing the influence of CSR on business, most of these researchers consider all CSR efforts collectively (Al-Shammari et al., 2022). However, this approach fails to adequately account for differences in CSR activities that enterprises implement for different stakeholders. These differences may have a unique impact on enterprises (Ye & Li, 2021).

Stakeholder theory provides a framework to categorize CSR into distinct internal and external dimensions. Researchers argue that internal CSR drives organizational structural change and relates to workers' immediate interests (Farooq et al., 2017). It includes activities promoting diversity and employee well-being, helping enhance employee satisfaction and optimize the labor climate. In contrast, external CSR focuses on external audiences through environmental and social practices, which include customers, suppliers, financiers, communities, governments, and non-governmental organizations (NGOs) (Hawn & Ioannou, 2016). This dimension encompasses environmental and broader social initiatives aimed at bolstering the company's legitimacy and reputation among these external stakeholders.

A company experiences a CSR gap when its emphasis significantly differs between external CSR initiatives and internal initiatives (Hawn & Ioannou, 2016). Prior research, however, has concentrated on how the CSR gap could improve overall firm performance (Cao et al., 2023; Xie et al., 2019). Some studies have also identified CSR as a driver of innovation outcomes (e.g., patent generation or R&D efficiency) (Ruan et al., 2022; Wang et al., 2021), but the CSR gap in fostering technological innovation remains under-explored (Anzola-Román et al., 2024; Liu et al., 2021). Technological innovation requires substantial and focused resource investment. However, conflicting demands from stakeholders often pressure firms to prioritize external CSR activities (e.g., environmental protection) over internal ones (e.g., employee welfare) (Uyar et al., 2023). This imbalance in resource allocation creates conflicting priorities within the firm. Managing these competing demands consumes critical resources that would otherwise be available for innovation. Consequently, the CSR gap undermines technological innovation performance by diverting essential resources away from it (Cao et al., 2023).

The CSR gap essentially reflects a strategic trade-off: overinvesting in external CSR often comes at the expense of internal practice initiatives such as employee engagement and operational efficiency (Lee, Liu & Yu, 2021; Symeou, Zyglidopoulos & Gardberg, 2019). For example, Wang, Zhang, and Chun (2021) note that companies allocating 60% of their CSR budgets to external initiatives reported a 15% reduction in the number of patents per year compared to their evenly distributed peers. This imbalance can trigger resource conflicts that undermine innovation. Recent research has highlighted organizational slack as uncommitted resources may buffer such conflicts by enabling flexibility to address competing priorities (Dang et al., 2019; Khan & Mir, 2019). However, empirical evidence on organizational slack's moderating role within CSR gap contexts remains scarce (Leyva-de La Hiz et al., 2019). This leaves a gap in how organizational slack can be utilized to coordinate CSR strategies and thus increase technological innovation performance. Meanwhile, CSR disclosure can demonstrate a commitment to transparency and reduce stakeholder skepticism about the CSR gap

(Anzola-Román et al., 2024; Kim et al., 2019). By articulating strategic alignment between external CSR initiatives and long-term innovation goals, such disclosure mitigates perceptions of resource diversion (Al-Shammari et al., 2019). For example, Gonzalez-Ramos et al. (2014) note that firms publishing detailed CSR reports achieved 20% greater R&D efficiency than non-disclosing peers, demonstrating how transparency fosters innovation. Nevertheless, research has yet to examine how CSR disclosure interacts with organizational slack to mitigate the CSR gap's adverse effects on technological innovation.

The following three questions are the focus of this study: 1) What effects does the CSR gap have on technological innovation performance? 2) What impact does CSR disclosure have in the relationship above? 3) How does organizational slack influence the impact? This study makes the following contributions. Firstly, it provides previously underexplored novel empirical evidence on the direct negative effect of the CSR gap on technological innovation. We demonstrate how prioritizing external CSR over internal initiatives harms employee interests and, consequently, impedes innovation. Second, we identify organizational slack and a high-quality CSR gap as critical buffers that significantly weaken the CSR gap's adverse impact on innovation. This extends stakeholder theory by revealing how firms can strategically reconcile conflicting CSR demands.

2. Literature Review and Hypotheses Development

2.1 CSR Gap

CSR encompasses corporate actions that extend beyond legal obligations to protect or promote societal welfare, even when doing so exceeds the direct interests of firms (Xie et al., 2020). Scholarly consensus holds that stakeholders form the core focus of CSR (Al-Shammari et al., 2022; Anzola-Román et al., 2024; Cao et al., 2023; Lin et al., 2019), which mainly include employees, customers, suppliers, creditors, communities and the environment. Because these groups hold divergent expectations, firms must strategically balance distinct responsibilities toward each stakeholder to fulfil their broader CSR mandate (Wang & Huang, 2018).

Stakeholders, based on whether they are involved in the realization of the firm's benefit objectives, can be divided into internal and external. Internal stakeholders participate directly in organizational decision-making and benefit from CSR initiatives targeting employees (Nejati & Shafaei, 2023). These mainly include employee training, continuing education, a safe working environment, and diverse employee policies. It is worth stating that these internal CSRs go beyond strategic employee training initiatives and aim to provide more opportunities for employees. This improves employees' capabilities without requiring them to provide specific benefits to the organization (Su, Xu, Lin & Xu, 2019). Those who are strongly tied to the externalities of the business operations of the organization but do not participate directly in its decision-making processes are referred to as external stakeholders. They mainly include suppliers, customers, society, environment, etc. (Wang, Du, Sun & Wang, 2014; Bi, Liu, Fu & Xing, 2022). Specifically, external CSR is committed to humanitarian cause support, charitable donations, community development investments, and NGOs cooperation. These divergent stakeholder demands often lead to imbalanced resource allocation between internal and external CSR initiatives. For example, firms facing intense pressure from external stakeholders may prioritize visible external CSR (Crilly et al., 2012), thereby neglecting

internal CSR. Conversely, companies overemphasizing internal CSR without external engagement risk appearing insular (Neubaum & Zahra, 2006). These inconsistent CSR strategies lead to the CSR gap.

2.2 CSR Gap and Technological Innovation Performance

Stakeholder theory posits that sustainable development requires firms to balance competing stakeholder demands. If a firm neglects internal CSR (e.g., poor employee welfare), it will directly exacerbate conflict among internal stakeholders. Namely, employees, as core internal stakeholders, respond to perceived unfair resource allocation or stunted career development by reducing their engagement in technological innovation (Cao et al., 2023). Meanwhile, the lack of external CSR (e.g., weak environmental investment or community collaboration) can damage the company's reputation. This, in turn, affects cooperation with external innovation actors such as research institutions. Since most firms rely on external resources (e.g., technological knowledge, co-operation networks) to drive technological innovation, a CSR gap undermines this dependency (Ruan et al., 2022). This double constraint of internal motivation and external collaboration resources makes it difficult for firms to integrate the various conditions required for technological innovation effectively.

In addition, a pronounced CSR gap can generate negative feedback from multiple stakeholders. Specifically, when firms prioritize internal CSR, external stakeholders (investors) may interpret this as strategic insularity, reducing their confidence in funding long-term technology projects (Anzola-Román et al., 2024). Whereas excessive focus on external CSR risks undermining perceived authenticity among employees. Internal stakeholders may question organizational values when external commitments overshadow their welfare, weakening cohesion and indirectly impairing collaborative innovation efforts (Gonzalez-Ramos et al., 2014). Resource dependence theory further explains that capital markets provide critical funding for technological innovation (Yang et al., 2024). If the CSR gap causes negative evaluations from stakeholders (e.g., withdrawal of institutional investors, increase in financing costs), it will directly constrain the innovation budget. For example, firms failing to demonstrate environmental responsibility risk ESG rating downgrades, jeopardizing long-term R&D funding (Hazbi & Mounir, 2023). Therefore, enterprises that can coordinate relationships will obtain better innovation opportunities and enhance success in technological innovation. Conversely, significant CSR gaps systematically undermine technological innovation. Based on this, hypothesis 1 is proposed:

H1: An increasing CSR gap results in lower technological innovation performance.

2.3 The Moderating Effect of CSR Disclosure

The relationship between CSR and technological innovation performance is largely contingent upon information accessibility (Dahlsrud, 2006; Giannarakis et al., 2016; Kiss, 2018; Kun-Hsiang, 2020). Stakeholders' interpretations and reactions to a firm's CSR gap depend critically on how transparently and comprehensively the firm communicates its commitments. High-quality disclosure reframes stakeholder perceptions by contextualizing resource allocation decisions and demonstrating strategic coherence. CSR disclosure's core function is mitigating information asymmetry between firms and stakeholders through systematic reporting (e.g., sustainability reports, third-party certifications) (Chalmers & Viinikka, 2017). Systematic disclosure can convey

information about CSR practices externally and enhance stakeholders' ability to assess the firm (Giannarakis et al., 2016). When the disclosed information is more comprehensive, it represents a high degree of information transparency, and stakeholders (e.g., employees, investors, consumers, etc.) can more accurately assess the enterprise's CSR inputs and implementations. It in turn creates external supervisory pressure.

This external pressure can affect firms' technological innovation performance in the following ways: firstly, stakeholder scrutiny of CSR gaps translates into market reputation risk. Firms facing transparency-induced pressure may prioritize technological innovation to rebuild legitimacy and offset reputational damage through technological innovation (Rehman et al., 2022). Second, high transparency of information disclosure can enhance stakeholders' trust (Giannarakis et al., 2016). This can not only provide firms with the necessary resources for technological innovation but also provide legitimate support for the market acceptance of innovation results. However, the form of disclosure is as critical as its quality. Fragmented CSR disclosure may undermine the credibility of the information and lead to high stakeholder perceptions of the CSR gap (Hajawiyah et al., 2020). For example, when firms only emphasize environmental technology breakthroughs and ignore whether carbon emission targets are met, stakeholders underestimate the severity of the CSR gap (Ikhsan et al., 2021). This, in turn, reduces the monitoring of firms' technological innovations. Therefore, comprehensive disclosure reframes stakeholder interpretations of CSR imbalances, reducing reputational penalties and preserving innovation resources. Consequently, the following hypothesis was proposed by the authors:

H2: High-quality CSR disclosure weakens the negative relationship between the CSR gap and technological innovation performance.

2.4 The Moderating Effect of Organizational Slacks

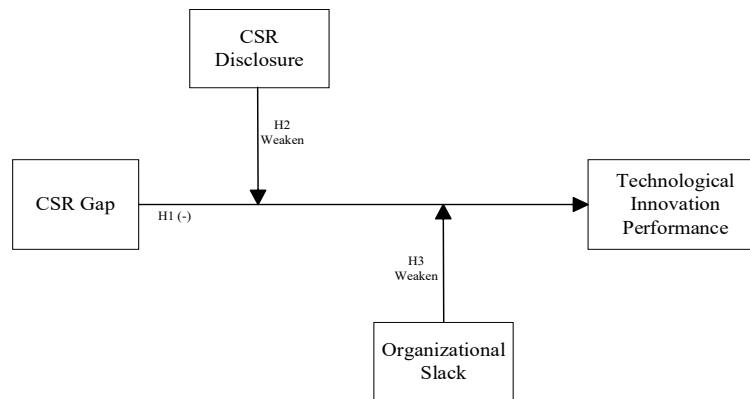
Based on resource dependence theory, firms' ability to cope with challenges depends on the adequacy and heterogeneity of organizational slacks. Financial slack can provide firms with direct innovation support (Tista et al., 2021), enabling them to quickly initiate innovation projects or bring in external technical support when facing a CSR gap. At the same time, human and technological slacks can enhance the flexibility and fault-tolerance of technology through cross-functional collaboration or knowledge reserves (Wan et al., 2023). For example, companies with cross-disciplinary innovation teams are more likely to integrate different technological paths to bridge the CSR gap with innovative solutions.

In addition, the size of slack resources, as a strategic reserve of an enterprise, directly affects the flexibility of an enterprise to respond to CSR challenges. When the level of slack resources is low, enterprises are limited by resource constraints (Wasiuzzaman et al., 2021). They find it challenging to implement extensive innovation initiatives although they can identify CSR gaps. As slack resources accumulate, the amount of capital, human resources and technology available for deployment increases accordingly. Enterprises can plan long-term R&D more systematically, undertake high-risk technology experiments, or quickly integrate internal and external knowledge (Ellili et al., 2024) to narrow the CSR gap. Thus, adequate organizational slack enhances a firm's capacity to absorb resource shocks strategically (Wasiuzzaman et al., 2021). This enables the reallocation of resources toward innovation, even amid divergent

stakeholder demands, without compromising core operational stability. Therefore, the subsequent hypothesis is proposed by the authors and the conceptual framework of the research is shown in Figure 1.

H3: Organizational slack weakens the negative relationship between the CSR gap and technological innovation performance.

Figure 1: Conceptual framework of the research



3. Research Methodology

3.1 Sample selection and data sources

The study utilizes a sample of A-share companies listed on China's Shanghai and Shenzhen Stock Exchanges. This sample selection captures firms subject to standardized disclosure requirements while representing diverse sectors critical to China's innovation ecosystem. The Hexun.com database provided CSR indicators. Additional information was obtained from the Chinese National Patent Office and the China Stock Market and Accounting Research (CSMAR). The sample period covered 2012–2021. There were 23764 observations and 3270 businesses in the final sample.

3.2 Variables

3.2.1 Dependent Variable (*Technological Innovation Performance*)

Patent counts and the ratio of new product output value to operating revenues are typically used as indices of technical innovation performance (Faems et al., 2005). Additionally, the ability and profitability dimensions are used to quantify it (Foss et al., 2011). In this study, invention patents, utility models and designs are employed in place of the actual performance indicator for measuring technical innovation. R&D expenditure is also included in the measurement of technological innovation performance.

The utilization of patent metrics and R&D expenditure offers three key advantages for measuring technological innovation performance. First, patents represent codified, novel knowledge assets; the quantity of enterprise applications and ownership may be interpreted as a measure of the industry's professional knowledge and technological advancements; and knowledge and technology are fundamental to innovation. Second, R&D expenditure is a financial indicator (quantifiable from audited financial statements) that can be gathered directly from an enterprise's financial statements. It quantifies in

monetary terms the resources invested by the enterprise in technological research and development and avoids the bias of subjective evaluation. Finally, practical data accessibility is ensured through comprehensive annual patent records from China's National Intellectual Property Administration (CNIPA), enabling systematic longitudinal analysis.

3.2.2 Independent Variable (CSR Gap)

The Hexun.com database as the professional evaluation system of CSR scores by 5 parts: shareholders responsibilities, employees' responsibilities, customers and suppliers' responsibilities, environment responsibilities and social responsibilities. Existing literature usually classifies internal CSR directly as employee responsibilities (Cao et al., 2023). Because financial performance calculated under the current accounting system inherently reflects responsibilities to shareholders, shareholder responsibilities are excluded. The mean value of external CSR, including suppliers and customers, environment, and social responsibilities, is known as external CSR. The CSR gap (henceforth GAP) was determined for this study using the following equation:

$$GAP = |External\ CSR - Internal\ CSR| \quad (1)$$

3.2.3 Moderating Variable (CSR Disclosure)

In this paper, the quality of CSR disclosure is referred to CSR disclosure. The fact that CSR itself involves multiple dimensions and is usually reported in textual form, which is difficult to quantify. Therefore, it has led to the fact that the theoretical community has lacked a unified and authoritative approach to measuring its quality. Stakeholder theory defines CSR as "practices demonstrating the firm's accountability to its stakeholders" (Clarkson, 1995), where social responsibility is achieved when stakeholder interests are fulfilled. Consequently, evaluating a firm's CSR performance requires verifiable disclosure of two critical dimensions: the status of stakeholder-specific responsibility fulfillment, and the authenticity of such disclosures.

This study chooses the 12 aspects from "Basic Information Sheet of Social Responsibility Report of Listed Companies" in the CSMAR database of social responsibility studies as the basic criteria for measuring the quality of CSR information (Li et al., 2024). These 12 aspects not only encompass almost all aspects of CSR to stakeholders but also measure the truthfulness and standardization of disclosure. In addition, each of these 12 dimensions is assigned a value from 0 to 1 in this study. For example, if stakeholder information is disclosed, it is assigned a value of 1, otherwise it is 0. These 12 criteria scores were then summed for each company, with a score range of 0 to 12. To make the data more useful for the research, it was further divided by 12 to standardize the values and finally get the measure of social responsibility disclosure (CSRSD), which is a larger indicator of higher quality of social responsibility disclosure.

3.2.4 Moderating Variable (Organizational Slacks)

We divide the organizational slack (OS) into three categories: available slack (AS), recoverable slack (RS), and potential slack (PS) (Duan et al., 2020). The ratio of current assets to current liabilities was used to determine available slack. Additionally, the ratio of sales, general, and administrative expenditures (SG&A) was used to calculate recoverable slack. Lastly, the ratio of total debt to entire equity was used to determine

potential slack. To create a composite organizational slack index, we took the average of these three organizational slack categories (Dang et al., 2019).

3.2.5 Control Variables

To thoroughly and impartially assess the causal influenc, it is essential to account for factors that may affect technological innovation performance. Following Bai & Pan (2023); Nie (2023) and Li & Yang (2019), we control a set of variables, including ROE, ATO, fixed assets ratio (FIXED), sales growth rate (Growth) and ownership concentration (Top1). Furthermore, this is also the year fixed effect. Table 1 displays the variables definition and evaluation.

Table 1: The evaluation of variable

Variable Name	Variable Symbol	Measurement
<i>Dependent variables</i>		
Enterprise innovation	LnPat	The natural log of the total number of patents granted for inventions (including inventions, utility models, and design patents), utility models, and designs is taken in the ratio of 3:2:1
R&D investment	LnRD	The natural log of the number of R&D expenditures
<i>Independent variable</i>		
CSR gap	GAP	Absolute value of internal and external CSR differentials
<i>Moderator variables</i>		
CSR disclosure	CSR D	Based on the scores of the indicators in the "Basic Information Sheet for Social Responsibility Reporting of Listed Companies" in the CSMAR database, obtained by standardizing the data.
Organizational slack	OS	The natural log of the means of available slack, recoverable slack, and potential slack
<i>Control variables</i>		
Return on equity	ROE	Net profit divided by equity
Asset turnover ratio	ATO	Net sales to total assets
Ratio of fixed assets	FIXED	Proportion of fixed assets in total assets
Sales growth rate	Growth	Growth rate of the total business revenue of enterprises
Ownership concentration	Top1	Shareholding ratio of the largest shareholder
<i>Others</i>		
Number of citations	Cite	Number of patent citations by year
Property rights	SOE	A dummy variable that equals 1 if the ultimate controller of the enterprise is the government, and 0 otherwise
Information disclosure methods	Exchange	A dummy variable that equals 1 if the companies are required to make mandatory disclosures, and 0 otherwise
Regulated industries	Reg	A dummy variable that equals 1 if the companies belong to regulated industries, and 0 otherwise

3.3 Empirical Model

To empirically examine the relationship between the CSR gap and technological innovation performance, we estimate the following fixed-effects panel regression model:

$$TIP_{i,t} = \beta_0 + \beta_1 GAP_{i,t} + \beta_2 ROE_{i,t} + \beta_3 ATO_{i,t} + \beta_4 FIXED_{i,t} + \beta_5 Growth_{i,t} + \beta_7 Top1_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where the subscripts *i* and *t* represent the firm and year respectively. β is the regression coefficient and ε signifies the error term. GAP was computed per [Eq. \(1\)](#). To address heteroskedasticity and autocorrelation concerns, this study adopted the cluster robust standard error of fixed effect model to estimate the regressions. Cluster robust standard errors were reported after clustering at the firm and year levels. Finally, all continuous variables were winsorized at the 1% level in each tail.

4. Results

4.1 Descriptive statistics

Table 2 presents the descriptive statistical results of the main variables in this study. The innovation output variable (LnPat) has a mean of 3.327 (SD = 2.011); 0 and 7.816 are the value of extremes. For the innovation input variable (LnRD), the mean is 15.458 (SD = 6.236), with maximum and minimum values of 0 and 24.104. This suggests disparities in both innovation inputs and outputs across Chinese organizations, as well as significant variations in the innovation capacity of individual enterprises. The average of CSR gap (GAP) is 2.466 with the value of standard deviation is 3.015, meaning significant differences in CSR discrepancies between companies in China. In addition, the mean value of ROE and ATO is 6.8% and 64.7% respectively, indicating capital utilization efficiency and operational capacity are not large. The average ownership concentration, measured by the largest shareholder's stake (Top1), is 34.6, which slightly exceeds one-third of total shares.

Table 1: Descriptive statistical results

Variable	Obs	Mean	Std. Dev.	Min	Max
LnPat	23764	3.327	2.011	0	7.816
LnRD	23764	15.458	6.236	0	24.104
GAP	23764	2.466	3.015	0	14.373
CSRD	23764	5.355	3.01	0	12
OS	23764	0.212	0.778	-1.465	2.406
ROE	23764	0.068	0.118	-0.578	0.34
ATO	23764	0.647	0.428	0.084	2.546
FIXED	23764	0.214	0.161	0	0.954
Growth	23764	0.159	0.384	-0.516	2.499
Top1	23764	0.346	0.147	0.089	0.746
Cite	22177	134.83	1212.228	0	52154
SOE	23764	0.387	0.487	0	1
Exchange	23764	0.609	0.488	0	1
Reg	23764	0.364	0.481	0	1

4.2 Correlation Analysis and Variance Inflation Factor

We carried out a correlation analysis before running our regressions. Table 3 presents the data, demonstrating that most correlation coefficients have low value. Table 3 also indicates that the independent variables are free from any presence of multicollinearity between themselves in Chinese firms. Also, we performed a VIF test to check the degree of correlation and found that there is no presence of multicollinearity.

Table 3: Correlation analysis and VIF results

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) GAP	1.000							
(2) CSRD	0.210***	1.000						
(3) OS	0.101***	0.123***	1.000					
(4) ROE	0.109***	0.051***	0.177***	1.000				
(5) ATO	0.041***	0.052***	0.165***	0.193***	1.000			
(6) FIXED	0.002	0.081***	0.263***	0.097***	0.017***	1.000		
(7) Growth	-0.007	0.038***	0.018***	0.247***	0.113***	0.072***	1.000	
(8) Top1	0.087***	0.045***	0.056***	0.131***	0.081***	0.091***	-0.008	1.000

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

4.3 CSR Gap and Technological Innovation Performance

The regression results of the influence of Eq. (2) are displayed in Table 4. At the 5% level, the calculated coefficient of the CSR gap (GAP), as indicated by columns (1) and (3), is substantial at -0.054 and -0.092, respectively. It indicates that the performance of technological innovation in Chinese A shares listed businesses is considerably lowered by the widening CSR disparity. In Columns (2) and (4), control variables were taken into consideration to ensure that other factors did not affect the findings. The results indicated a negative connection between the CSR gap (GAP) and LnPat ($\beta = -0.048$, $p < 0.05$) as well as LnRD ($\beta = -0.082$, $p < 0.05$).

There was no significant difference in the sign or the coefficients, suggesting that the calculated values were consistent. Furthermore, technological innovation is not significantly influenced by the control variables of ROE and Growth, which suggests that the CSR gap's potential to reduce innovation performance is not contingent upon the profitability of the companies. These findings collectively lend credence to hypothesis 1, which posits that a higher CSR gap value results in a decline in technological innovation performance.

Table 4: The impacts of CSR gap on technological innovation performance

	(1) LnPat	(2) LnPat	(3) LnRD	(4) LnRD
GAP	-0.054** (0.017)	-0.048** (0.015)	-0.092** (0.032)	-0.082** (0.028)
ROE		0.002 (0.081)		0.171 (0.354)
ATO		-0.377*** (0.091)		-0.476 (0.328)
FIXED		-1.014*** (0.249)		-1.440* (0.728)
Growth		0.105 (0.057)		0.132 (0.145)
Top1		-2.377*** (0.342)		-4.115*** (0.991)
_cons	15.682*** (0.285)	17.666*** (0.471)	17.019*** (0.473)	17.746*** (0.462)
Year	Yes	Yes	Yes	Yes
N	23726	23726	23726	23726
r2	0.812	0.813	0.816	0.814
F	8.206**	5.767**	11.456***	6.945***

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

4.4 Moderating Effects

How stakeholders respond to the CSR gap is influenced by the ease and quality of their access to CSR data. CSR disclosure (CSR D) was measured by the content of CSR information disclosure. It included 12 items, which equals 1 when the firms disclosed this item and 0 otherwise. Table 5 illustrates the regression findings. The findings indicate the coefficient of CSR D*GAP is significantly positive in relation to LnPat ($\beta=0.138$, $p<0.01$) and LnRD ($\beta=0.337$, $p<0.05$), which supporting hypothesis 2.

Table 5: The moderating role of CSR disclosure

	(1) LnPat	(2) LnRD
GAP	-0.047** (0.015)	-0.081** (0.028)
ROE	0.331*** (0.101)	0.480 (0.353)
ATO	-0.436*** (0.094)	-0.522 (0.328)
FIXED	-1.324*** (0.234)	-1.712** (0.741)
Growth	0.059 (0.055)	0.092 (0.146)
Top1	-2.137*** (0.312)	-3.879*** (0.991)
CSR D	0.051*** (0.015)	0.084** (0.034)
CSR D*GAP	0.138***	0.337**

	(0.037)	(0.108)
_cons	4.801***	17.746***
	(0.198)	(0.462)
Year	Yes	Yes
N	23726	23726
r2	0.772	0.814
F	31.964***	6.945***

In terms of OS (organizational slack), this study measured it as the natural log of the mean of available, recoverable, and potential slack. As shown in Table 6, the coefficient of OS*GAP is significantly positive. For LnPat, the coefficient is 0.01 at the 10% significance level. However, for LnRD, the coefficient is 0.046, with a higher significance level (1%) than that of LnPat. The findings show that OS mitigates the detrimental effects of the CSR gap on technological innovation performance, supporting H3.

Table 6: The moderating role of organizational slacks

	(1) LnPat	(2) LnRD
GAP	-0.079*** (0.021)	-0.158*** (0.049)
ROE	-0.041 (0.095)	0.033 (0.391)
ATO	-0.360*** (0.084)	-0.440 (0.316)
FIXED	-0.887*** (0.227)	-1.178 (0.697)
Growth	0.109* (0.050)	0.141 (0.131)
Top1	-1.923*** (0.295)	-3.211** (1.019)
OS	-0.406*** (0.050)	-0.433*** (0.121)
OS*GAP	0.010* (0.005)	0.046*** (0.013)
_cons	4.321*** (0.165)	17.019*** (0.473)
Year	Yes	Yes
N	23726	23726
r2	0.775	0.816
F	18.017***	11.456***

4.5 Endogeneity Test

This is even though we control for firm-level, industry-level, and province-level variables in our model design. However, there may still be unobservable omitted variables that affect the study's results. Therefore, to mitigate the endogeneity problem associated with omitted-variable bias, this paper uses the classic instrumental-variables approach to regression. According to Cao et al. (2023), in selecting instrumental variables, this paper first screens the peer group {Mn} of firms from different industries in the same province. Then, for each Mn, it screens its subgroup {Znm} of different provinces in the same industry. Since other firms will influence the CSR gap in the same province and the same industry, it satisfies the condition of relevance of instrumental

variables; however, the CSR gap of other enterprises in the same province and the same industry will not have a direct effect on the enterprise's technological innovation performance, which satisfies the condition of exogeneity of instrumental variables.

Thus, the authors calculated the mean value of the pure industry peer group by averaging the CSR gaps. Ultimately, by calculating the mean Q of all pure industrial peer groups, an exogenous instrumental variable (GAPIV) that satisfies the exclusion constraints can be identified. After obtaining the instrumental variable from the previous procedure, the authors performed the weak instrumental variable test using the instrumental variable derived from the approach. The test result for the weak instrumental variable significantly exceeded 10, thereby rejecting the null hypothesis of weak instruments and aligning with the established rule of thumb. Subsequently, the authors performed the regression analysis. Columns (1) to (3) of Table 7 provide the outcomes of the first-stage and second-stage regression analyses. The CSR gap within the same industry demonstrates substantial peer effects ($p < 0.01$). In the second-stage regression, the coefficient for Instrument-GAP (GAPIV) is substantially positive at the 1% level. This indicates that the adverse effect of the CSR gap on technical innovation performance persists even after accounting for other potential geographical variables, as estimated using the instrumental variable.

Table 7: Instrumental variable approach

First_Stage	(1) GAP	Second_Stage	(2) LnPat	(3) LnRD
GAP ^{IV}	0.9209*** (0.0327)	Instrument-GAP	-0.3394*** (0.0592)	-0.6602*** (0.1335)
Controls	Yes	Controls	Yes	Yes
Year FE	Yes	Year FE	Yes	Yes
Obs	23716	Obs	23716	23716

4.6 Robustness Test

4.6.1 Adding fixed-effects models

The authors re-estimated the regressions with controls for province-level conditions and industry-specific variables to reduce the impact of issues caused by these factors. To verify the primary findings' robustness, the results are shown in Columns (1) and (2) of Table 8.

4.6.2 Considering the alternative proxies

According to Cao & Zhang (2020), the authors checked that different measures of technical innovation performance did not impact the findings. This study employed number of patent citations as an alternative proxy for the technical innovation performance. The findings in Columns (3) of Table 8 demonstrate that the primary results are robust.

4.6.3 Changing the time period

To exclude unusual interference due to the COVID-19 outbreak, samples from the year of the outbreak and after were removed. That is, the data for 2019-2021 are deleted. The

findings are shown in Columns (4) and (5) of Table 8. The findings indicate that the coefficients for LnPat ($\beta = -0.038$, $p < 0.05$) and LnRD ($\beta = -0.063$, $p < 0.05$) align with the baseline regression. This confirms the main results are robust.

Table 8: Robustness Check

	LnPat	LnRD	Cite	LnPat	LnRD
	(1)	(2)	(3)	(4)	(5)
	Added fixed effects	Added fixed effects	Number of citations	Change year	Change year
GAP	-0.046** (0.014)	-0.079** (0.026)	-25.490** (9.269)	-0.038** (0.015)	-0.063** (0.026)
ROE	-0.062 (0.084)	0.117 (0.302)	-18.098 (40.097)	-0.100 (0.083)	0.097 (0.389)
ATO	-0.383*** (0.089)	-0.450 (0.287)	-106.764* (51.278)	-0.389*** (0.089)	-0.368 (0.313)
FIXED	-1.008*** (0.238)	-1.527* (0.719)	-185.016** (59.289)	-0.814*** (0.208)	-0.940 (0.543)
Growth	0.114* (0.054)	0.121 (0.143)	-4.683 (14.120)	0.158*** (0.043)	0.228 (0.134)
Top1	-2.483*** (0.319)	-3.972*** (0.823)	-319.586*** (96.389)	-2.383*** (0.316)	-4.282*** (0.836)
_cons	4.748*** (0.206)	17.618*** (0.422)	417.726*** (64.068)	4.556*** (0.179)	17.266*** (0.399)
Year	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	No	No	No
Province	Yes	Yes	No	No	No
N	23726	23726	22148	20130	20130
r2	0.774	0.824	0.778	0.791	0.844
F	22.217***	7.798***	5.367**	24.982***	6.871**

5. Discussion

Extensive research has examined the impact of CSR on a company's innovation capacity, yet findings remain inconclusive (Kim et al., 2024; Fosu et al., 2023; Khan et al., 2021; León-Gómez et al., 2022; Zhou et al., 2020). According to this study, this inconsistency can result from failing to consider the conflicting link between internal and external CSR. When firms face resource constraints, the imbalance between investment in external CSR (e.g., environmental responsibility) and internal CSR (e.g., employee engagement) creates a CSR gap that triggers a systematic mismatch in innovative resources.

This study empirically confirms that CSR gaps exert a significant adverse effect on technological innovation performance. Hypothesis 1 is robustly supported, demonstrating that resource diversion toward stakeholder conflict resolution directly impedes the capacity for innovation. Specifically, the coefficient of GAP on LnPat (-0.048) was smaller than that on LnRD (-0.082) at the 5% significance level. This result aligns with the resource dependence theory: when firms overly put their resources towards external CSR (e.g., environmental and social responsibility) while neglecting internal CSR (e.g., employee rights and benefits) (Tran et al., 2018), they will occupy core innovative resources (e.g., R&D funds and human capital). Therefore, the inability to account for the conflicting linkages among the CSR aspects may be the root cause of the discrepancy.

This study empirically demonstrates that organizational slack significantly weakens the negative relationship between CSR gaps and technological innovation performance, which is consistent with H2. As argued by Duan (2020), organizational slack can serve as a “strategic buffer”. For example, highly redundant firms can maintain patent R&D using idle funds and avoid interruptions to the innovation process caused by competition for CSR resources. This mechanism provides new evidence for crisis management, demonstrating that organizational slack can reduce innovation risks derived from conflicts in CSR dimensions.

According to this study's findings on information interpretation, CSR disclosure supports H3 by mitigating the unfavorable correlation between the CSR gap and technological innovation performance. The findings indicate that higher-quality CSR disclosure may mitigate the adverse effects of the CSR gap and stakeholders' perceptions of inequities. As suggested by Anzola-Román et al. (2023), CSR disclosure can reduce the information asymmetry for stakeholders. Therefore, when companies disclose CSR information in a high-quality manner, even if there are internal and external CSR gaps, stakeholders are likely to interpret them as differences in strategic choices, thus maintaining their confidence and resources in the innovation program. This finding is in line with Shahzad et al. (2016) and Huo & Li (2022), who suggest that stakeholders may respond more positively to CSR gaps when disclosure quality is higher.

6. Conclusion

This study empirically confirms a significant adverse effect of CSR gaps on technological innovation performance. In addition, organizational slack and CSR disclosure weakened the relationship. This study employed the Instrumental Variables Estimation and lagged one year to mitigate endogeneity problems. Additionally, when the authors included additional fixed-effects models, the main conclusion remained robust when using alternative proxies for technological innovation performance and when changing the year.

There are theoretical implications. Firstly, this study focused on technological innovation performance and indicated that the different findings may be due to differences in CSR structure (internal and external CSR). The empirical results showed a negative impact of the CSR gap on patent output ($\beta = -0.048$, $p < 0.05$) and R&D expenditures ($\beta = -0.082$, $p < 0.05$). This result resolves the confusion in CSR and technological innovation performance: firms with equal CSR inputs perform very differently in terms of innovation. Therefore, shifting CSR research from aggregate to structural allocation is important. Second, this study extends prior research on the positive performance effects of organizational slack by revealing its critical role in mitigating CSR gap-induced innovation penalties. While slack resources are recognized as enhancers of innovation capacity, their true value emerges when firms face paradoxical pressures from competing stakeholder demands. By actively reconciling internal-external CSR trade-offs through strategic resource reallocation, slack transforms conflicting investments into coordinated innovation opportunities, turning stakeholder tensions into catalysts for technological advancement. Third, this study reveals that high-quality CSR disclosure significantly mitigates the adverse effects of CSR gaps on the innovation moderating mechanism, in contrast to previously examined firm-, industry-, and market-level contingencies. Unlike prior research focusing on structural moderators (e.g., firm size, industry regulation), we demonstrate that transparent communication realigns stakeholder perceptions: By articulating strategic coherence

between external CSR initiatives and long-term innovation goals, disclosure reduces skepticism about resource diversion and legitimizes trade-offs.

The most significant managerial implication underscores the necessity for executives to strategically balance CSR resource allocation between internal (employee-focused) and external (community or environment-focused) dimensions. Empirical evidence confirms that CSR structural imbalances directly impair patent output and R&D efficiency. Consequently, firms must abandon the practice of considering CSR as a whole or of making internal and external CSR efforts unbalanced. Furthermore, managers should leverage organizational slack and the quality of CSR disclosure as dual buffers against the risks of CSR imbalance. Firms are advised to secure sufficient resources and maintain a balanced approach to minimize the negative impact. To alleviate the potential negative impacts of the CSR gap on technical innovation performance, managers should focus on enhancing the quality of CSR information.

The study also has some limitations. Firstly, the measurement of the CSR gap is based on internal and external CSR, and future research could explore the CSR gap using alternative measures and considering additional aspects. Secondly, this study empirically demonstrates a significant negative impact of CSR gaps on firms' technological innovation performance. However, the mechanism of action between the two has not been studied. Therefore, the mechanisms of action of the two can be explored in depth in future research.

Ethics Approval and Consent to Participate

Permissions were obtained from all participants, and they agreed to take part in the research. The study was conducted in accordance with research ethical guidelines, without any conflicts of interest, and with proper ethical clearance.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the present research, authorship, or publication of this article.

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