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Corporate responsibility towards employees and innovation: Evidence from an emerging market☆

Tao Li [a,c], Yan Wang [b,c,*]

[a] School of International Economics, China Foreign Affairs University, 24 Zhanlan Road, Xicheng District, Beijing 100037, China
[b] School of Accounting, Guangdong University of Foreign Studies
[c] Research Center for Accounting and Economic Development of Guangdong-Hong Kong-Macao Greater Bay Area, Guangdong University of Foreign Studies, 2 Baiyun Avenue, Baiyun District, Guangzhou 510420, China

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ABSTRACT

Against a background of rising labor costs and the need to build a harmonious labor–capital relationship in China, this paper focuses on non-pecuniary incentives for employees and discusses the impact of corporate social responsibility (CSR) towards employees on innovation performance. The empirical results show that CSR towards employees significantly promotes corporate innovation, and that this effect remains robust after accounting for alternative proxies and endogeneity issues. In addition, the positive effect of CSR towards employees on innovation is more significant for firms in high-tech industries, with high levels of R&D inputs and high valuation of employee collaboration. Further analysis indicates that CSR towards employees does not promote R&D investment, but does significantly improve innovation efficiency and the marginal output of R&D investment and reduces the turnover rate of management-level staff with production and R&D backgrounds, which is conducive to stability of the innovation team. In addition, this paper also finds that for companies with high R&D expenditures, CSR towards employees significantly eases the sensitivity between executive turnover and performance, which helps executives resist pressure arising from a decline in short-term performance. The findings of this paper have implications for improving labor–capital relations and enhancing firm innovation capabilities.

1. Introduction

Innovation is a significant source of long-term economic growth (Arrow, 1962; Schumpeter, 1942; Solow, 1957) and core competitiveness of firms (Porter, 1992). As significant micro-subjects and direct participants in innovation and research and development (R&D) activities, firm employees play a crucial role in the generation of innovative ideas and the implementation of and feedback regarding innovation activities (Bradley, Kim, & Tianc, 2017). However, the principal–agent problem between the firm (employers) and employees and the specificity of human capital are likely to lead to insufficient motivation for and input into innovation and R&D activities (Malcomson, 1997; Wang, He, & Mahoney, 2009). Therefore, how to stimulate employees' willingness to innovate and improve innovation efficiency from the perspective of employee governance is a very important research question.

Previous studies investigate the effect of employees on corporate innovation mainly from the angle of labor unions and compensation schemes (Bradley et al., 2017; Chang, Fu, Low, & Zhang, 2015), which mainly affect pecuniary incentives for employees. However, compensation contracts between firms and employees are usually incomplete (Hart, 1988), and innovation activities are full of uncertainty; hence, the compensation contract cannot completely avoid employee shirking in the production and innovation process (Malcomson, 1997). In this study, we propose that the non-pecuniary incentives provided by firms – namely corporate responsibility towards employees – can promote corporate innovation. In particular, we investigate how corporate responsibility towards employees influences corporate innovation in China.

There are several reasons why we investigate the impact of corporate responsibility towards employees on innovation in China. First, although scholars hold the view that the relatively low cost of labor has

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* Corresponding author at: School of Accounting, Guangdong University of Foreign Studies, 2 Baiyun Avenue, Baiyun District, Guangzhou 510420, China.
E-mail addresses: litao@cfau.edu.cn (T. Li), yan.wang@gdufs.edu.cn (Y. Wang).

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contributed much to economic growth over past decades, China is now facing a rising cost of labor, with more and more serious regulation to protect labor and wages. Second, in the context of building a harmonious labor-employer relationship, non-remuneration incentives have become increasingly important in management practice in China. In April 2015, the State Council issued the *Opinions on Building Harmonious Labor Relations*, which pointed out that, in this period of economic and social transformation, firms should actively fulfil responsibilities to employees in addition to paying their wages. Meanwhile, the *Best Employers List in 2019*, jointly released by Zhaopin and Social Research and Research Center, Peking University, includes employees' work environment and employer culture (which constitutes an important dimension of responsibility towards employees) as well as salaries into its evaluation of best employers. For example, Hikvision (002415.SZ), a high-tech enterprise on the list, clarified in its 2019 corporate social responsibility (CSR) report its responsibility towards employees, such as guaranteeing production safety and providing career development and vocational training.

Considering the rising cost of labor and increasing emphasis on corporate responsibility towards employees, this paper focuses on non-remuneration incentives for employees, and discusses the possible impact of corporate responsibility towards employees on corporate innovation in China. However, in this regard, a thorough evaluation of the literature suggests two contrary viewpoints. On the one hand, compared with the relationship established by firms with employees through compensation incentives, the relationship established through corporate responsibility towards employees is more lasting and more stable (Coff, 1997; Flammer & Luo, 2017; Gottschalg & Zollo, 2007). Therefore, actively undertaking responsibility towards employees is conducive to stabilising the production and R&D team and accumulating knowledge regarding production and innovation, thereby increasing the efficiency of collaborative production and innovation, and reducing the risk of knowledge spillovers faced by firm innovation. Further, this paper argues that management can build a good relationship with employees through CSR, which can help resist external pressure caused by a performance decline and overcome myopia (Kraft, Vashishtha, & Venkatachalam, 2018; Stein, 1988), and thus improve their willingness to engage in innovative activities. Therefore, it is likely an effective measure to promote innovation for firms to undertake responsibility towards employees.

On the other hand, corporate responsibility towards employees may also be an excuse for company management to obtain private benefits (Kruger, 2015). Previous studies have found that by maintaining good relations with employees, management can strengthen its power (Cennamo, Berrone, & Gomez-Mejia, 2008; Cronqvist, Heyman, Nilsson, Svaleryd, & Vlachos, 2009). In addition, Bertrand and Mullainathan (2003) and Hart (1983) find that executives tend to enjoy a "quiet life" when they have greater power and take on less risk. This paper argues that it is also possible for management to collude with employees by undertaking responsibilities towards employees to strengthen management's power and aid its pursuit of a quiet life. Therefore, CSR towards employees may reduce the willingness of management to participate in innovation activities and hinder corporate innovation.

In response to the above two contrary viewpoints, this paper employs A-share listed companies in China from 2010 to 2017 as a sample to investigate how CSR towards employees affects innovation performance. We find that corporate responsibility towards employees has a positive effect on firm innovation, and that this positive effect remains robust after accounting for alternative measurement and endogeneity concerns, indicating that CSR towards employees significantly promotes corporate innovation. In addition, this positive effect is more pronounced in firms in high-tech industries, with high levels of R&D inputs and with high valuation of employee collaboration. Furthermore, we find that CSR towards employees does not promote a company's R&D inputs, but does significantly improve the marginal output and innovation efficiency of its R&D inputs. Besides, CSR towards employees reduces the turnover tendencies of management team members with production and R&D backgrounds, which implies a more stable innovation team in firms with higher performance of CSR towards employees. Moreover, CSR towards employees significantly lessens the sensitivity between CEO turnover and firm performance in firms with high R&D inputs, which means CSR towards employees helps CEOs to shelter from pressures arising from a disappointing short-term performance and thereby increases CEOs' willingness to support innovation.

Compared with previous studies, the main contributions of this paper are as follows. First, this paper enriches the related research on employee motivation. Previous studies have pointed out that employee incentives are divided into pecuniary and non-pecuniary incentives (Akerlof & Kranton, 2005; Flammer & Luo, 2017; Wang et al., 2009). In addition, innovation incentives provided by pecuniary contracts in traditional theories may have certain defects (Manso, 2011), while firms can establish a lasting and stable relationship with employees through non-remuneration incentives to motivate employees to innovate (Coff, 1997). Previous studies mainly focus on the economic consequences of employee compensation incentives (Chang et al., 2015), and scant research has paid attention to the impact of non-remuneration incentives on firm innovation except Liu, Sun, and Zeng (2020) and Mao and Weathers (2019). As an important form of non-remuneration incentive (Flammer & Luo, 2017), CSR towards employees is becoming more and more important in the context of building harmonious labor relations in China. Thus, this paper deeply explores the impact of CSR towards employees on innovation performance, and finds that it plays a significant role in promoting corporate innovation.

Although Liu et al. (2020) and Mao and Weathers (2019) find employee-related CSR promotes firm innovation, our paper is different from theirs. Their explanation mainly focus on the effect of CSR towards employees on employee incentives and neglect the interaction of the employee and management incentives. Aghion, Van Reenen, and Zingales (2013) show that as the management make decisions on innovation policies, their career concerns have important impact on firm innovation. Besides the effect on employee incentives, this paper provides an additional explanation that CSR towards employees can also alleviate management career concerns and help management resist the pressure of short-term performance declines, which promotes firm innovation. Therefore, our paper further contributes to the study on the effect of employee-related CSR on firm innovation.

Second, this paper enriches the research on the determinants of firm innovation. Previous studies on corporate innovation mainly focus on the impact of institutional environment (Moser, 2005; Moshirian, Tian, Zhang, & Zhang, 2021; Wang, 2021), financial markets and financial intermediaries (Fang, Tian, & Tice, 2014; Hsu, Tian, & Xu, 2014; Tian & Wang, 2014), management incentives (Lerner & Wulf, 2007; Zhou, Li, Sun, & Zhou, 2021) and employee compensation incentives (Chang et al., 2015). By focusing on the impact of CSR towards employees on corporate innovation, this paper further expands the research on the determinants of corporate innovation, especially the related research on the effect of employee incentives and management career concerns on corporate innovation.

Third, this paper enriches the related research on the economic consequences of CSR – a much-disputed topic. Some scholars believe that CSR can bring important strategic resources to companies and improve corporate transparency, performance, and value (Deng, Kang, & Low, 2013; Flammer, 2015; Ho, Bai, Lu, & Qin, 2021; Qian, Gao, & Tsang, 2014). Others believe that CSR has the function of reputation insurance, and serves as a tool for management to cover up unethical behavior or to seek personal gain (Masulis & Reza, 2015). Besides, Chkir, El Haj Hassan, Rjiba, and Saadi (2021) find that CSR has a positive effect on firm innovation in an international study, but the effect is more pronounced in developed markets. This paper mainly focuses on the specific dimension of CSR towards employees, and explores its possible impact on corporate innovation performance in China. Therefore, this paper further enriches the body of research on the economic

Table 1
Variable definitions.

Variable	Definition
Variables in baseline analyses and robustness tests	
PAT	The number of a firm's patent applications. Denoted as LNPAT when taking the natural logarithm of one plus PAT.
IPAT	The number of a firm's invention patent applications. Denoted as LNIPAT when taking the natural logarithm of one plus IPAT.
PATG	The number of a firm's patent applications granted by authorities in the current and following three years. Denoted as LNPATG when taking the natural logarithm of one plus PATG.
IPATG	The number of a firm's invention patent applications granted by authorities in the current and following three years. Denoted as LNIPATG when taking the natural logarithm of one plus IPATG.
LNCITE	The natural logarithm of one plus CITE, which is the sum of the citations of a firm's invention patents in the application and following three years.
LNCITEG	The natural logarithm of one plus CITEG, which is the sum of the citations of a firm's invention patents in the granting and following three years.
REMP	The score for a firm's CSR towards employees.
SIZE	The natural logarithm of total assets.
LEV	Financial leverage, calculated as total debt over total assets.
ROA	Return on assets, calculated as net income over total assets.
OCF	Net operating cash flow over total assets.
TOBINQ	The market value over the book value.
LNPAYE	The natural logarithm of total wages paid to employees.
SOE	An indicator that equals one when firms are state-owned enterprises (SOEs) and zero otherwise.
OWN	The ownership stake held by the firm's largest shareholder.
SEP	The controlling shareholder's controlling rights minus their cash flow rights.
DUAL	An indicator that equals one if the chair of the board holds the position of CEO, and zero otherwise.
BOARD	The natural logarithm of the number of directors on the board.
Variables in further analyses	
MTOV	An indicator that equals one if a top management team (TMT) member leaves the firm and zero otherwise.
PBTOV	An indicator that equals one if a TMT member with a production or R&D background leaves the firm and zero otherwise.
NPBTOV	An indicator that equals one if a TMT member with no production or R&D background leaves the firm and zero otherwise.
TURNOV	An indicator that equals one if a CEO leaves the firm and zero otherwise.
LNRD	The natural logarithm of one plus the R&D expenditure.
RDE	Per-employee R&D expenditure with the unit of ten thousand yuan per employee.
PATE	Total patent applications per 100 employees.
IPATE	Total invention patent applications per 100 employees.

consequences of CSR.

This paper has very important practical significance in the context of economic and social transformation and the construction of harmonious capital-labor relations. Specifically, this paper provides a mechanism that may hedge against the negative effects of rising labor costs from a micro perspective; that is, firms should actively undertake responsibilities towards employees, pay attention to their personal development and stimulate their participation in innovation activities, in addition to merely paying salaries.

2. Literature review and hypotheses

2.1. Literature review

Innovation is an important driving force for long-term economic growth (Solow, 1957), and an important source of firm core competitiveness (Porter, 1992). However, it is also a complex and risky activity for firms. The complexity of innovation is reflected in the fact that innovation requires long-term repeated experiments, much capital and resource investment, knowledge, experience, and human capital accumulation (Holmstrom, 1989). As the wait for a positive return to innovation investment is long, such investment may risk a short-term performance decline and uncertainty (Holmstrom, 1989; Tian & Wang, 2014).

Corporate innovation requires significant resource inputs, and the institutional environment and government policies significantly affect the ability of companies to obtain resources, thereby affecting innovation (Moser, 2005). In addition, performance pressures in capital markets and the supervision of financial intermediaries may lead to management myopia (Kraft et al., 2018; Stein, 1988), thereby inhibiting firms' innovative activities (Fang et al., 2014). He and Tian (2013) and Fang et al. (2014) find that analyst coverage and pressure from external acquisitions lead company management to focus excessively on short-term performance, thereby reducing innovation activities to avoid a decline and uncertainty in short-term performance. Tian and Wang (2014) reveal that the longer the investment period of venture capital and the higher the tolerance for failure, the better the innovation performance of firms.

Corporate governance and incentive schemes based on a long-term value orientation can significantly alleviate management myopia, thereby increasing the innovation of companies (Belloc, 2012). Francis and Smith (1995) show that external shareholder monitoring can alleviate the principal–agent problem and promote corporate innovation. Aghion et al. (2013) find that institutional ownership can significantly reduce the career risk of executives and improve the innovation performance of firms. Lerner and Wulf (2007) find that long-term performance orientation established through stock and option awards can promote corporate innovation.

In addition to focusing on the impact of corporate management incentives on innovation, scholars have begun to explore the important role of employees outside of management on corporate performance and innovation; in particular, the impact of employee compensation incentives on corporate innovation. Chang et al. (2015) indicate that, through employee stock ownership, allowing employees to participate in the distribution of residual income of the enterprise stimulates the enthusiasm of employees for innovation activities and improves the innovation performance of firms. However, Bradley et al. (2017) show that labor protection via stronger labor unions inhibits the innovation output of enterprises.

Although a compensation system based on residual income distribution can effectively stimulate the enthusiasm of employees to participate in innovation (Chang et al., 2015), such a compensation contract remains, in essence, incomplete (Hart, 1988), and cannot avoid the "hold-up" problem of employees' investing in specialised knowledge and learning (Grout, 1984; Malcomson, 1997). Gibbons (1998), Prendergast (1999) and Akerlof and Kranton (2005) argue that compensation contracts based on pecuniary incentives entail at least the following two problems. First, compensation contracts are often based on observable performance indicators, which do not perfectly capture the effort of employees, especially regarding innovation, which is full of complexity and entails a long payback period. Besides, a compensation system based on monetary and material incentives may also lead to "gaming the system" behaviors (Akerlof & Kranton, 2005), such as employees concentrating only on relatively easy and highly rewarding tasks. Manso (2011) believes that salary contracts based on traditional theory are not suitable for incentives for employee innovation. Second, employee governance based on compensation contracts only pays attention to the pecuniary incentives of employees, while ignoring employees' demands for non-pecuniary incentives (Akerlof & Kranton, 2005). Previous studies have found that employees value not only material rewards but also "spiritual" satisfaction from work (Sauermann & Cohen, 2010), such as being allocated their preferred tasks, or a convivial work atmosphere and co-worker relationships. In response to the problems that may exist in compensation incentives, Coff (1997) and Wang et al. (2009) find that companies should provide employees with a good working environment, career planning and development, and establish good relationships with employees through non-pecuniary incentives, as this could effectively motivate employees to invest in and learn specific knowledge and skills.

Table 2
Summary statistics.

VARIABLES	N	mean	sd	p1	p25	p50	p75	p99
Variables in baseline analyses and robustness tests								
PAT	10,408	51.338	275.852	1	4	12	29	656
IPAT	10,408	25.174	182.530	0	1	4	12	294
PATG	5775	33.168	136.612	0	3	8	21	474
IPATG	5775	9.014	52.958	0	0	2	5	112
LNPAT	10,408	2.648	1.293	0.693	1.609	2.565	3.401	6.488
LNIPAT	10,408	1.825	1.286	0.000	0.693	1.609	2.565	5.687
LNPATG	5775	2.328	1.319	0.000	1.386	2.197	3.091	6.163
LNIPATG	5775	1.211	1.138	0.000	0.000	1.099	1.792	4.727
LNCITE	9061	2.949	1.400	0.693	1.946	2.833	3.807	7.003
LNCITEG	8148	2.671	1.342	0.693	1.609	2.565	3.466	6.704
REMP	10,408	3.092	3.553	0.010	0.860	1.690	3.685	15.000
SIZE	10,408	22.004	1.214	20.018	21.130	21.801	22.641	26.022
LEV	10,408	0.397	0.199	0.047	0.235	0.386	0.546	0.856
ROA	10,408	0.044	0.048	−0.114	0.016	0.040	0.069	0.188
OCF	10,408	0.042	0.065	−0.138	0.005	0.041	0.082	0.219
TOBINQ	10,408	2.173	1.238	0.940	1.358	1.784	2.533	7.778
LNPAYE	10,408	11.366	0.473	10.312	11.056	11.334	11.645	12.769
SOE	10,408	0.331	0.470	0	0	0	1	1
OWN	10,408	0.352	0.143	0.095	0.241	0.335	0.447	0.742
SEP	10,408	0.048	0.076	0	0	0	0.086	0.279
DUAL	10,408	0.304	0.460	0	0	0	1	1
BOARD	10,408	2.143	0.194	1.609	1.946	2.197	2.197	2.708
Variables in further analyses								
MTOV	10,408	0.551	0.497	0	0	1	1	1
PBTOV	10,408	0.279	0.448	0	0	0	1	1
NPTOV	10,408	0.414	0.493	0	0	0	1	1
TURNOV	10,408	0.168	0.374	0	0	0	0	1
LNRD	10,408	15.550	6.090	0.000	16.582	17.557	18.422	21.554
RDE	10,408	3.335	3.378	0.000	0.998	2.480	4.573	17.475
PATE	10,408	1.329	2.809	0.010	0.200	0.566	1.469	10.859
IPATE	10,408	0.587	1.382	0	0.058	0.212	0.595	5.221

Note: This table presents the descriptive statistics. Please refer to Table 1 for the detailed definitions of variables.

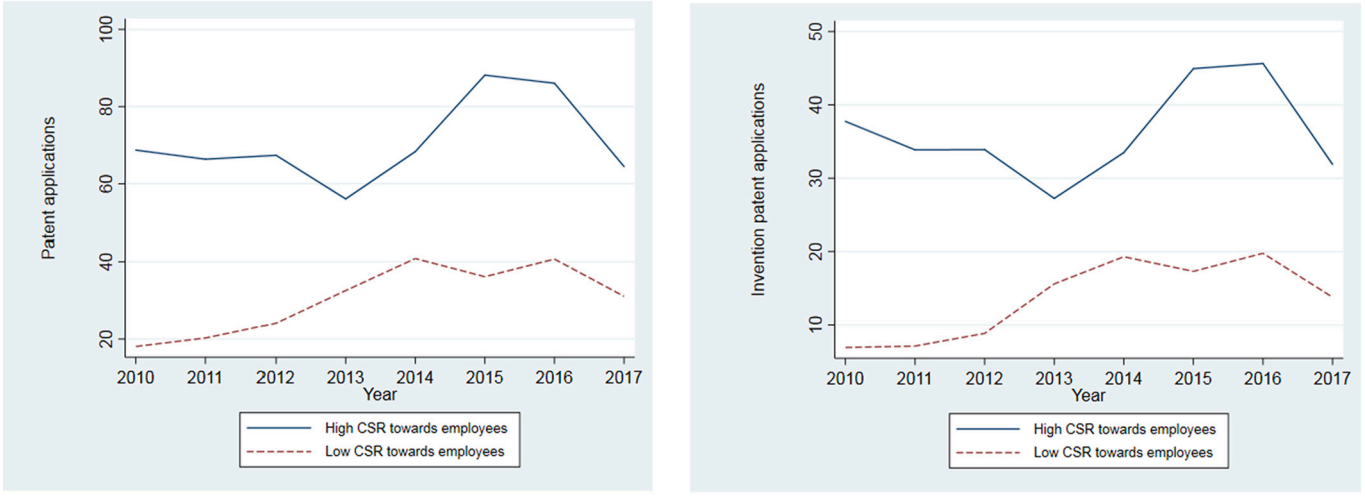

Fig. 1. Corporate responsibility towards employees and innovation in the sample period.

2.2. Hypotheses

Flammer and Luo (2017) argue that a firm's active commitment to CSR towards employees is an important way to motivate employees. The impact of CSR on corporate innovation may be reflected in the following aspects. First, CSR towards employees is an important way for firms (employers) to establish a psychological contract with employees (Guzzo, Noonan, & Elron, 1994). By fulfilling their responsibilities to employees, such as ensuring safe production, providing career planning and training, and caring for employees, enterprises can improve employee job satisfaction, enhance employee organizational identity and reduce employee turnover (Kim, Lee, Lee, & Kim, 2010), which is beneficial for the stability of production and innovation teams. The stability of production and innovation teams is conducive to the accumulation of knowledge and experience, improving the efficiency of collaborative production and innovation, and is also conducive to reducing the risk of knowledge spillovers arising from firm innovation.

Second, CSR towards employees is likely to reduce executives' career concerns and thereby, increases their willingness to innovate. Fang et al. (2014) and Tian and Wang (2014) show that executives tend not to invest many resources in innovation as they bear the pressure from the

Table 3
Baseline results.

	(1)	(2)
VARIABLES	LNPAT	LNIPAT
REMP	0.020***	0.021***
	(3.53)	(3.56)
SIZE	0.465***	0.459***
	(13.38)	(12.85)
LEV	−0.089	−0.136
	(−0.67)	(−0.99)
ROA	2.329***	2.022***
	(5.26)	(4.50)
OCF	0.631**	0.358
	(2.41)	(1.30)
INV	0.794**	1.121***
	(2.16)	(2.94)
TOBINQ	0.035**	0.051***
	(2.30)	(3.17)
LNPAYE	0.037	0.229***
	(0.71)	(4.26)
SOE	−0.013	0.051
	(−0.21)	(0.80)
OWN	0.095	−0.152
	(0.58)	(−0.91)
SEP	0.131	0.121
	(0.45)	(0.40)
DUAL	0.116***	0.126***
	(2.83)	(3.01)
BOARD	0.122	0.211
	(0.96)	(1.60)
Constant	−8.741***	−11.776***
	(−9.21)	(−12.04)
Ind and Year	Yes	Yes
Observations	10,408	10,408
Adjusted R^2	0.292	0.262

Note: This table reports the impact of CSR towards employees on innovation performance. Please refer to Table 1 for the detailed definitions of variables. The t-statistics in parentheses are calculated according to the standard errors clustered at firm levels; ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

Table 4
Alternative proxies for innovation.

	(1)	(2)	(3)	(4)
VARIABLES	LNPATG	LNIPATG	LNCITE	LNCITEG
REMP	0.017***	0.012*	0.014**	0.020***
	(2.59)	(1.92)	(2.56)	(3.40)
SIZE	0.445***	0.379***	0.664***	0.580***
	(10.84)	(9.65)	(22.10)	(17.90)
LEV	−0.059	−0.182	−0.198	−0.321**
	(−0.36)	(−1.23)	(−1.40)	(−2.26)
ROA	2.198***	1.273**	2.614***	1.887***
	(3.83)	(2.46)	(5.70)	(3.86)
OCF	0.406	0.706**	−0.501*	−0.100
	(1.31)	(2.57)	(−1.70)	(−0.34)
INV	0.831**	0.918**	1.307***	1.483***
	(2.02)	(2.41)	(3.40)	(3.67)
TOBINQ	0.037	0.042*	0.078***	0.081***
	(1.52)	(1.89)	(4.13)	(4.28)
LNPAYE	−0.036	0.174***	0.284***	0.276***
	(−0.64)	(3.22)	(5.28)	(4.87)
SOE	−0.043	0.019	0.051	0.062
	(−0.66)	(0.31)	(0.85)	(0.98)
OWN	0.153	0.032	−0.092	−0.016
	(0.82)	(0.18)	(−0.58)	(−0.10)
SEP	0.085	−0.068	−0.131	−0.133
	(0.26)	(−0.23)	(−0.45)	(−0.45)
DUAL	0.117**	0.128***	0.087**	0.065
	(2.37)	(2.76)	(2.07)	(1.55)
BOARD	0.053	0.307**	−0.029	0.054
	(0.36)	(2.22)	(−0.24)	(0.42)
Constant	−7.591***	−10.070***	−15.333***	−13.703***
	(−7.25)	(−9.87)	(−18.25)	(−15.07)
Ind and Year	Yes	Yes	Yes	Yes
Observations	5775	5775	9061	8148
Adjusted R^2	0.304	0.224	0.369	0.327

Note: This table reports the impact of CSR towards employees on innovation performance with alternative proxies for innovation. Please refer to Table 1 for the detailed definitions of variables. The t-statistics in parentheses are calculated according to the standard errors clustered at firm levels; ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

short-term decline and uncertainty when faced with career concerns and risk[1]; and Aghion et al. (2013) find that the alleviation of such career concerns encourages executives to support and promote innovation. As CSR towards employees enables managers to build and maintain good relations with employees, which are thought to reduce their career concerns (Unsal & Rayfield, 2019), we think it is conducive to firm innovation.

Above all, from both the perspective of employees' incentives and executives' career concerns, CSR towards employees is likely to promote firm innovation. Moreover, as high-quality innovation is more difficult to succeed, it needs more persistent employees' efforts and support from managers. Therefore, CSR towards employees is also likely to promote high-quality innovation and thereby, increases both the quantity and the quality of innovation.[2] Based on this, we postulate a positive relationship between CSR and corporate innovation in our first hypothesis.

H1. Ceteris paribus, the more social responsibility a firm undertakes towards its employees, the better the firm's innovation performance (both the quantity and the quality of innovation).

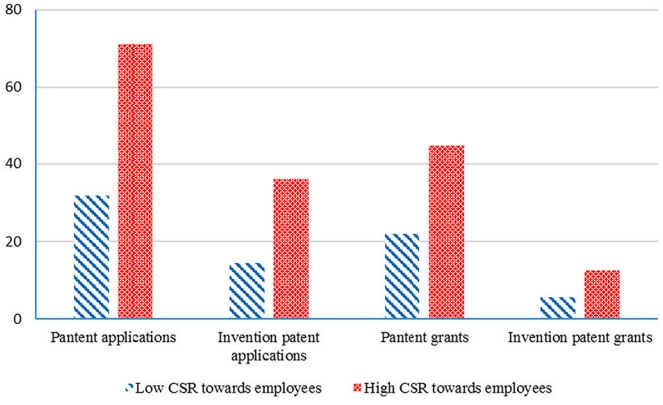

Fig. 2. CSR towards employees and innovation performance.

In contrast, as an import aspect of stakeholder relationship management, CSR towards employees is likely to increase managerial power by providing managers with unconditional discretion and creating an exaggerated perception of managers' value (Cennamo et al., 2008). Furthermore, as greater managerial power brings them more benefits, to protect their private benefits, managers tend to take on less risk and prefer enjoying the quiet life by spending fewer efforts in difficult and costly decisions, such as innovation (Bertrand & Mullainathan, 2003; John, Litov, & Yeung, 2008). Therefore, CSR towards employees is likely

[1] For example, He and Tian (2013) and Tian and Wang (2014) show that the focus and the (over-)emphasis on short-term performance of stock market participants, such as analyst, short-horizon investors and potential acquirers, increase executives' career concerns and lead to their myopia, which discourages firm innovation; and the alleviation of executives' career concerns plays an important role in fostering firm innovation (Aghion et al., 2013).

[2] Some studies focusing on the effect of institutions on innovation are likely to find the inconsistent or totally contrary effects of some institution on the quantity and the quality of innovation because firms tend to sacrifice the quality of patents to achieve a greater number of patents, which is a tactical response to the institution (e.g., Liu, Du, Zhang, Tian, & Kou, 2021).

Table 5
Alternative proxy for corporate responsibility towards employees.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	LNPAT	LNIPAT	LNPATG	LNIPATG	LNCITE	LNCITEG
HREMP	0.075**	0.105***	0.066	0.084**	0.050	0.092**
	(2.17)	(2.98)	(1.55)	(2.18)	(1.37)	(2.41)
SIZE	0.478***	0.470***	0.460***	0.386***	0.674***	0.593***
	(13.87)	(13.32)	(11.35)	(9.98)	(22.83)	(18.75)
LEV	−0.094	−0.137	−0.069	−0.182	−0.202	−0.323**
	(−0.70)	(−1.00)	(−0.42)	(−1.23)	(−1.42)	(−2.27)
ROA	2.360***	2.029***	2.228***	1.265**	2.637***	1.901***
	(5.33)	(4.51)	(3.89)	(2.46)	(5.75)	(3.86)
OCF	0.636**	0.357	0.405	0.698**	−0.496*	−0.092
	(2.42)	(1.30)	(1.30)	(2.54)	(−1.69)	(−0.31)
INV	0.796**	1.130***	0.825**	0.927**	1.307***	1.486***
	(2.16)	(2.96)	(2.00)	(2.44)	(3.40)	(3.67)
TOBINQ	0.039**	0.055***	0.042*	0.045**	0.081***	0.085***
	(2.53)	(3.39)	(1.73)	(2.04)	(4.28)	(4.48)
LNPAYE	0.040	0.223***	−0.033	0.166***	0.287***	0.273***
	(0.75)	(4.07)	(−0.58)	(3.01)	(5.21)	(4.71)
SOE	−0.003	0.061	−0.034	0.025	0.060	0.073
	(−0.05)	(0.96)	(−0.51)	(0.40)	(0.98)	(1.15)
OWN	0.088	−0.157	0.144	0.029	−0.100	−0.029
	(0.54)	(−0.94)	(0.77)	(0.16)	(−0.63)	(−0.17)
SEP	0.142	0.125	0.096	−0.068	−0.120	−0.121
	(0.48)	(0.42)	(0.30)	(−0.23)	(−0.41)	(−0.41)
DUAL	0.118***	0.128***	0.120**	0.130***	0.089**	0.070
	(2.87)	(3.06)	(2.41)	(2.80)	(2.12)	(1.64)
BOARD	0.129	0.219*	0.061	0.313**	−0.024	0.061
	(1.01)	(1.66)	(0.41)	(2.27)	(−0.20)	(0.47)
Constant	−9.040***	−11.955***	−7.939***	−10.132***	−15.571***	−13.950***
	(−9.54)	(−12.19)	(−7.61)	(−9.99)	(−18.52)	(−15.44)
Ind and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,408	10,408	5775	5775	9061	8148
Adjusted R^2	0.290	0.260	0.303	0.223	0.369	0.326

Note: This table reports the impact of CSR towards employees on innovation performance with alternative proxies for CSR towards employees. Please refer to Table 1 for the detailed definitions of variables. The t-statistics in parentheses are calculated according to the standard errors clustered at firm levels; ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

to impede firm innovation due to the increased managerial power and their preferences for enjoying the quiet life. As high-quality innovation is riskier and needs more resource inputs and managers' support, managers are more likely to reduce high-quality innovation. As a result, CSR towards employees reduces both the quantity and the quality of innovation. Based on this, we propose our second hypothesis.

H2. Ceteris paribus, the more social responsibility a firm undertakes towards its employees, the worse the firm's innovation performance (both the quantity and the quality of innovation).

3. Data, variables and model specification

3.1. Data and sample

Since data on CSR towards employees starts in 2010, this paper selects A-share listed companies from 2010 to 2017 as the initial sample (excluding the financial industry and ST companies). The CSR towards employees data used in this paper come from http://Hexun.com's score on CSR of listed companies, innovation patent data of listed companies, financial statement data, stock returns data and corporate governance data come from the China Stock Market & Accounting Research (CSMAR) database, and institutional investor shareholding data come from the RESSET database. Moreover, we obtain the citation of patents from the Chinese Research Data Service (CNRDS) database. Excluding missing values implies a total of 10,408 firm-year observations. To reduce the influence of outliers, we winsorize all continuous variables at 1% and 99% levels.

3.2. Variables

This paper uses the number of patent and invention patent applications of listed companies as proxy variables for corporate innovation performance (adding 1 to take the natural logarithm (*LNPAT, LNIPAT*). Considering that a company may manipulate patent applications, as a robustness test, this paper further attempts to use the number of grants (*LNPATG, LNIPATG*) of all patents and invention patents applied for by the company in the application year and the following three years as alternative proxies for innovation performance. Compared to the numbers of all patents applications and grants, the numbers of invention patent applications and grants are more likely to capture the quantity of high-quality invention (Wang, 2021). Moreover, we also use the sum of citations of applied patents (in the form of logarithm, *LNCITE*) in the application and following three years, and the sum of citations of granted patents (in the form of logarithm, *LNCITE1*) in the granting and following three years as the proxies for the quality of innovation in robustness checks.

The explanatory variable of this paper is the CSR towards employees score (*REMP*) – a comprehensive score across multiple dimensions such as employee training, employee safety and caring for employees. Other control variables include the company's fundamental characteristics and corporate governance characteristics – specifically, asset size (*SIZE*), asset–liability ratio (*LEV*), total assets, variables such as rate of return (*ROA*), operating cash flow (*OCF*), investment level (*INV*), Tobin's Q (*TOBINQ*), nature of ownership (*SOE*), ownership structure (*OWN, SEP*) and board governance (*DUAL, BOARD*). The main variables are defined and calculated as shown in Table 1.

3.3. Model specification

The model of the main test in this paper is shown in Eq. (1). The explanatory variable (Patent) is the number of applications for all patents or invention patents of the listed company, plus 1 to take the natural

Table 6
2SLS regressions.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	REMP	LNPAT	LNIPAT	LNPATG	LNIPATG
LNTEMP	**0.128*** **				
	(6.06)				
REMP		**0.301*** **	**0.070**	**0.373*** **	**0.223*** **
		(4.01)	**(1.16)**	**(4.08)**	**(3.22)**
SIZE	0.946***	0.118	0.334***	−0.095	0.041
	(19.73)	(1.57)	(5.58)	(−0.77)	(0.43)
LEV	−0.808***	0.161	−0.047	0.475**	0.151
	(−3.80)	(1.44)	(−0.52)	(2.49)	(1.02)
ROA	4.106***	−0.459	0.426	−0.881	−0.896*
	(4.62)	(−0.92)	(1.06)	(−1.23)	(−1.70)
OCF	0.911*	0.444*	0.450**	0.306	0.716**
	(1.71)	(1.71)	(2.11)	(0.80)	(2.48)
TOBINQ	0.208***	−0.053**	0.012	−0.112***	−0.056*
	(6.83)	(−2.51)	(0.72)	(−2.74)	(−1.89)
LNPAYE	1.564***	−0.412***	0.125	−0.539***	−0.134
	(18.80)	(−3.48)	(1.32)	(−4.04)	(−1.33)
SOE	0.753***	−0.153**	0.057	−0.271***	−0.114*
	(8.53)	(−2.39)	(1.10)	(−2.94)	(−1.66)
OWN	−0.645***	0.389***	−0.033	0.615***	0.327**
	(−2.80)	(3.33)	(−0.35)	(3.39)	(2.30)
SEP	1.743***	−0.389	−0.005	−0.542*	−0.476*
	(3.94)	(−1.63)	(−0.03)	(−1.66)	(−1.93)
DUAL	0.096	0.079***	0.116***	0.075	0.100***
	(1.49)	(2.61)	(4.61)	(1.62)	(2.80)
BOARD	0.264	0.028	0.187***	−0.115	0.196*
	(1.48)	(0.33)	(2.69)	(−0.89)	(1.93)
INST	−0.706***	0.119	0.023	0.076	0.173*
	(−4.57)	(1.34)	(0.33)	(0.62)	(1.86)
ANA	0.016***	0.016***	0.017***	0.014***	0.012***
	(3.53)	(7.05)	(9.21)	(3.69)	(4.04)
Constant	−36.010***	2.144	−8.535***	7.828**	−0.210
	(−27.06)	(0.81)	(−4.05)	(2.09)	(−0.07)
Ind and Year	Yes	Yes	Yes	Yes	Yes
Observations	10,357	10,357	10,357	5733	5733
F	113.7***	35.17***	40.40***	242.2***	233.0***
Cragg-Donald Wald statistics		37.447	37.447	29.085	29.085

Note: This table reports the results of 2SLS regressions, where the IV is the natural logarithm of the number of temples (LNTEMP) in the province where the listed company is located. Please refer to Table 1 for the detailed definitions of other variables. The t-statistics in parentheses are calculated according to the standard errors clustered at firm levels; ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

logarithm (*LNPAT, LNIPAT*). As a robustness test, this paper further considers the number of grants (*LNPATG, LNIPATG*) for all patents and inventions filed by the company in the year of filing and in the following three years as a proxy for innovation performance. The explanatory variable (*REMP*) is the score of CSR towards employees. This paper estimates model (1) via OLS, and includes industry and year fixed effects in the regression. Specifically, we use the Industry Classification Guidelines for Listed Companies issued by the China Securities Regulatory Commission (CSRC) in 2012 to classify industries and we control the fixed effects for manufacturing firms at the second industry levels (coded as C13, C14…C43, the combination of a character and a two-digit number) and other firms at the first industry levels (coded as A, B, D…S).

$$\text{Patent}_{it} = \beta_0 + \beta_0 \text{REMP}_{it} + \sum \beta_j \text{Control}_{j,it} + \sum \text{Industry} + \sum \text{Year} + \varepsilon_{it} \quad (1)$$

This paper focuses on the coefficient of *REMP* – if H1 holds, we would expect this coefficient to be significantly positive, whereas if H2 holds, it should be significantly negative. We use robust standard errors clustered at firm levels for the coefficient estimates.

4. Empirical results

4.1. Summary statistics

Table 2 reports descriptive statistics for the main variables in this paper. During the sample period, the average number of patent applications (*PAT*) of listed companies was 51.338, the standard deviation was 275.852, the median was 12, and the 1% and 99% quantiles were 1 and 656, respectively. The mean of invention patent applications (*IPAT*) is 25.174, the standard deviation is 182.53, the median is 4, and the 1% and 99% quantiles are 0 and 294, respectively. This shows that, whether all patents or invention patents are considered, there is a relatively large difference between companies within the sample range. The average value of corporate social responsibility (*REMP*) for employees is 3.092, the median is 1.69 and the 1% and 99% quantiles are 0.01 and 15, respectively, indicating that, on average, the level of Chinese listed companies' CSR towards employees is not high, suggesting further improvement is required.[3] The descriptive statistics of the remaining control variables are consistent with the previous literature.

4.2. Baseline results

First, this paper takes the CSR towards employees (*REMP*) industry-

[3] Although there is a lack of comparable benchmarks for the average scores of *REMP* (3.092), we judge that the average *REMP* is low based on the full score of *REMP* (15 points) and its composition. As *REMP* includes three aspects, each of which is assigned 5 points, the average score of 3.092 points indicates that on average, firms even cannot do well in any one of the three aspects. Moreover, as the background of our study is the promotion of the harmonious relations between employer and employees, the low average scores of *REMP* needs our attention.

Table 7
Heckman two-step regressions.

	(1)	(2)	(3)
VARIABLES	HREMP	LNPAT	LNIPAT
REMP		0.020***	0.021***
		(5.85)	(5.98)
SIZE	0.563***	0.692***	0.672***
	(23.86)	(35.17)	(33.57)
LEV	−0.356***	−0.450***	−0.475***
	(−3.83)	(−5.63)	(−5.83)
ROA	3.662***	5.516***	5.030***
	(10.40)	(15.54)	(13.92)
OCF	1.346***	1.322***	1.016***
	(5.69)	(6.64)	(5.02)
SOE	0.292***	0.161***	0.216***
	(8.95)	(5.28)	(6.97)
INV		0.721***	1.047***
		(3.05)	(4.35)
TOBINQ		0.014	0.031***
		(1.23)	(2.72)
LNPAYE		0.229***	0.410***
		(7.52)	(13.25)
OWN		0.015	−0.231***
		(0.18)	(−2.79)
SEP		0.116	0.106
		(0.79)	(0.71)
DUAL		0.118***	0.129***
		(4.82)	(5.17)
BOARD		0.099*	0.195***
		(1.65)	(3.18)
IMR		1.421***	1.342***
		(16.68)	(15.47)
LNEMP	−0.330***		
	(−15.57)		
TEMP	0.052***		
	(5.94)		
Constant	−10.163***	−17.009***	−19.574***
	(−24.06)	(−26.55)	(−30.02)
Observations	10,357	10,357	10,357
Ind & Year	Yes	Yes	Yes
Pseudo R^2	0.0765		
Adjusted R^2		0.310	0.278

Note: This table reports the results of Heckman two-step regressions, where the exogenous variable in the first-step regression is the natural logarithm of the number of temples (LNTEMP) in the province where the listed company is located. Please refer to Table 1 for the detailed definitions of other variables. The z-statistics or t-statistics in parentheses are calculated according to the standard errors clustered at firm levels; ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

annual median as the standard, and defines an enterprise with CSR towards employees above the median as in the group with high CSR towards employees, and that with low otherwise. Fig. 1 shows that, in terms of years, companies with a higher level of corporate employee responsibility have a higher average level of corporate innovation. The empirical results for the main regression models are shown in Table 3, where the dependent variables in columns (1) and (2) are the natural logarithms of all patents and invention patent applications plus 1 (*LNPAT, LNIPAT*). In columns (1) and (2) of Table 3, the coefficients of CSR towards employees (*REMP*) are 0.02 and 0.021, respectively, and both are significantly positive at the 1% level, indicating that the more a company undertakes CSR towards employees, the better its innovation performance, supporting H1. Regarding economic significance, a one standard deviation increase in *REMP* results in a nearly 5.5% (5.8%) standard deviation increase in *LNPAT* (*LNIPAT*). In addition, the results for the control variables show that the larger the company (*SIZE*) and the better its profitability (*ROA*), its cash flow (*OCF*) and its growth (*TOBINQ*), the higher its innovation performance.

Table 8
Subsample tests — firms in high-tech vs non-high-tech industries.

	(1)	(2)	(3)	(4)
	High-tech	Non-high-tech	High-tech	Non-high-tech
VARIABLES	LNPAT	LNPAT	LNIPAT	LNIPAT
REMP	0.038***	0.011*	0.040***	0.012*
	(4.00)	(1.67)	(3.99)	(1.76)
SIZE	0.469***	0.469***	0.490***	0.452***
	(7.96)	(11.10)	(7.87)	(10.50)
LEV	0.348	−0.396**	0.194	−0.358**
	(1.64)	(−2.34)	(0.88)	(−2.10)
ROA	2.917***	1.823***	2.255***	1.757***
	(4.20)	(3.24)	(3.15)	(3.11)
OCF	0.148	0.965***	0.470	0.384
	(0.34)	(3.05)	(1.00)	(1.17)
INV	1.592**	0.358	1.849***	0.815**
	(2.44)	(0.88)	(2.68)	(1.98)
TOBINQ	0.030	0.044**	0.037	0.071***
	(1.38)	(2.04)	(1.58)	(3.29)
LNPAYE	0.094	0.007	0.371***	0.153**
	(1.08)	(0.10)	(3.95)	(2.37)
SOE	0.018	−0.042	0.006	0.060
	(0.16)	(−0.61)	(0.05)	(0.84)
OWN	−0.184	0.267	−0.404	0.023
	(−0.73)	(1.30)	(−1.57)	(0.11)
SEP	0.325	0.031	0.649	−0.134
	(0.60)	(0.09)	(1.14)	(−0.39)
DUAL	0.075	0.138***	0.065	0.160***
	(1.22)	(2.60)	(1.02)	(2.98)
BOARD	−0.042	0.210	−0.040	0.349**
	(−0.19)	(1.38)	(−0.17)	(2.27)
Constant	−9.176***	−9.248***	−13.457***	−11.490***
	(−5.35)	(−8.21)	(−7.31)	(−10.22)
Ind and Year	Yes	Yes	Yes	Yes
Observations	3800	6608	3800	6608
Adjusted R^2	0.289	0.301	0.243	0.269
Significance of the dif. in REMP	<0.01***		<0.01***	

Note: This table reports the impact of CSR towards employees in two subsamples: companies in high-tech versus non-high-tech industries. Please refer to Table 1 for the detailed definitions of variables. The t-statistics in parentheses are calculated according to the standard errors clustered at firm levels; ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

5. Robustness checks

5.1. Alternative measurement

Considering that there may be room for "manipulation" in company patent applications, we further use the natural logarithm (*LNPATG, LNIPATG*) of all patents and invention patents granted in the current year and the next three years (*LNPATG, LNIPATG*) as alternative indicators of innovation performance. The regression results are shown in Columns (1) and (2) of Table 4. The coefficients of CSR towards employees (*REMP*) of 0.017 and 0.012, respectively, are significant at the 1% and 10% levels, respectively, indicating that the main empirical findings of this paper are robust. Moreover, as is shown in Columns (3) and (4), CSR towards employees promotes the citations of patents, which are the proxy for the quality of innovation.

In addition, according to Fig. 1, this paper divides the sample into a group with high CSR towards employees and a group with low CSR towards employees based on the median value within the industry-year. The average number of patent applications and grants for these two groups are shown in Fig. 2. As can be seen, both the number of (invention) patent applications and the mean number of granted patents for the group with higher CSR towards employees are higher than those for the group with lower CSR towards employees.

The above grouping is further set as a dummy variable (*HREMP*) as

Table 9
Subsample tests — firms with high vs low R&D expenditures.

	(1)	(2)	(3)	(4)
	High R&D	Low R&D	High R&D	Low R&D
VARIABLES	LNPAT	LNPAT	LNIPAT	LNIPAT
REMP	0.030***	0.010	0.030***	0.013*
	(4.40)	(1.41)	(4.10)	(1.71)
SIZE	0.489***	0.475***	0.472***	0.489***
	(11.33)	(11.28)	(10.61)	(11.38)
LEV	−0.106	0.194	−0.081	0.231
	(−0.60)	(1.18)	(−0.45)	(1.43)
ROA	1.379***	3.668***	1.377**	3.113***
	(2.64)	(5.96)	(2.57)	(5.12)
OCF	0.122	1.043***	0.031	0.657*
	(0.35)	(3.09)	(0.09)	(1.90)
INV	1.371***	−0.050	1.383***	0.354
	(3.01)	(−0.11)	(2.92)	(0.74)
TOBINQ	0.009	0.051**	0.026	0.062***
	(0.48)	(2.41)	(1.36)	(2.81)
LNPAYE	0.073	−0.028	0.275***	0.122*
	(1.10)	(−0.42)	(3.99)	(1.79)
SOE	−0.041	0.032	0.025	0.111
	(−0.53)	(0.45)	(0.31)	(1.50)
OWN	0.370*	−0.134	0.027	−0.293
	(1.92)	(−0.66)	(0.14)	(−1.45)
SEP	−0.071	0.169	0.241	−0.064
	(−0.20)	(0.45)	(0.68)	(−0.17)
DUAL	0.108**	0.110**	0.087*	0.147***
	(2.14)	(2.06)	(1.69)	(2.73)
BOARD	0.383**	−0.171	0.489***	−0.102
	(2.54)	(−1.13)	(3.26)	(−0.64)
Constant	−10.957***	−8.261***	−13.577***	−11.063***
	(−9.41)	(−7.06)	(−11.14)	(−9.26)
Ind and Year	Yes	Yes	Yes	Yes
Observations	4946	5462	4946	5462
Adjusted R^2	0.322	0.298	0.289	0.280
Significance of the dif. in REMP	<0.05**		<0.1*	

Note: This table reports the impact of CSR towards employees in two subsamples: companies with high vs low R&D expenditures. Please refer to Table 1 for the detailed definitions of variables. The t-statistics in parentheses are calculated according to the standard errors clustered at firm levels; ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

Table 10
Subsample tests — firms with high vs low employee collaboration.

	(1)	(2)	(3)	(4)
	High collaboration	Low collaboration	High collaboration	Low collaboration
VARIABLES	LNPAT	LNPAT	LNIPAT	LNIPAT
REMP	0.027***	0.012	0.028***	0.012
	(3.95)	(1.52)	(3.97)	(1.43)
SIZE	0.434***	0.502***	0.391***	0.527***
	(12.03)	(10.45)	(10.72)	(10.80)
LEV	0.007	−0.255	−0.006	−0.278
	(0.04)	(−1.34)	(−0.04)	(−1.44)
ROA	2.345***	2.253***	2.202***	1.862***
	(4.71)	(3.41)	(4.37)	(2.74)
OCF	0.279	0.812**	0.032	0.611
	(0.93)	(2.07)	(0.10)	(1.52)
INV	0.816*	0.457	1.392***	0.552
	(1.82)	(0.90)	(3.03)	(1.05)
TOBINQ	0.067***	0.122***	0.060***	0.143***
	(3.94)	(3.11)	(3.37)	(3.44)
LNPAYE	0.043	0.142	0.172***	0.382***
	(0.74)	(1.58)	(2.85)	(4.22)
SOE	0.016	−0.070	0.088	−0.016
	(0.23)	(−0.82)	(1.21)	(−0.17)
OWN	−0.044	0.170	−0.410**	0.061
	(−0.25)	(0.79)	(−2.22)	(0.28)
SEP	0.788**	−0.537	0.857**	−0.585
	(2.13)	(−1.41)	(2.26)	(−1.48)
DUAL	0.103**	0.132**	0.127**	0.124**
	(2.09)	(2.37)	(2.46)	(2.22)
BOARD	−0.023	0.251	0.103	0.326*
	(−0.16)	(1.48)	(0.67)	(1.89)
Constant	−8.621***	−11.574***	−9.813***	−15.606***
	(−8.82)	(−8.07)	(−10.07)	(−10.47)
Ind and Year	Yes	Yes	Yes	Yes
Observations	5219	5189	5219	5189
Adjusted R^2	0.255	0.328	0.225	0.308
Significance of the dif. in REMP	0.1		0.1	

Note: This table reports the impact of CSR towards employees in two subsamples: companies with high vs low per-employee market premium. Please refer to Table 1 for the detailed definitions of variables. The t-statistics in parentheses are calculated according to the standard errors clustered at firm levels; ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

an alternative indicator of explanatory variables. When a company is in the group with a higher CSR towards employees score, the *HREMP* value is 1; otherwise, it is 0. The regression results are shown in Table 5. When the dependent variables are all patent applications and the number of invention patent applications (Columns (1) (2)), the coefficients of *HREMP* are 0.075 and 0.105, respectively, and are significant at the 5% and 1% levels. Except when the dependent variables are the number of patents (Column (3)) and the number of citation of applied patents (Column (5)), in most cases, the coefficients of *HREMP* are still significant at the 5% and 1% levels. The above results further support the main empirical finding of this paper – that there is a significant positive relationship between CSR towards employees and innovation.

5.2. Endogeneity problem

Considering that there may be endogeneity problems caused by missing variables and reverse causality, this paper further employs an instrumental variable (IV) method with two-stage regressions. Du, Jian, Zeng, and Du (2014) find that the culture of the company's location has a significant impact on its CSR, which is manifested in the significant positive relationship between the number of Buddhist temples (Buddhist culture) in the location surrounding the company and its CSR. Therefore, this paper uses the natural logarithm of the number of temples (*LNTEMP*) in the province where the listed company is located as an instrumental variable. While the number of temples in a company's location has a certain impact on the company's CSR towards employees, it does not have a direct impact on the company's innovation, and hence, the number of temples in a company's location can be used as an appropriate IV to mitigate potential endogeneity issues. As shown in column (1) of Table 6, the results of the first stage regression show that there is a significant positive relationship between CSR towards employees and the number of temples where the company is located. The results of the second stage regression are shown in columns (2)–(5) of Table 6. Among these, when the dependent variables are the number of patent applications (Column (2)), the number of patents granted (Column (4)) and the number of invention patents granted (Column (5)), the coefficients of CSR towards employees are all significantly positive at the 1% level, indicating that the positive relationship between CSR towards employees and company innovation still holds after considering potential endogeneity issues. Moreover, the magnitudes of the IV coefficients are greater than the OLS estimates. A potential explanation for this is that IV estimates capture the local average treatment effect (LATE) arising from the heterogeneous effects of our IV variable (Buddhist culture) on different firms. Specifically, the sensitivity of firms to local culture varies, and all else equal, firms more sensitive to local culture are likely to obtain more benefits by better adapting to local culture than insensitive firms. Therefore, CSR towards employees (as a firm's response to local culture) is likely to generate a greater effect on innovation for sensitive firms, which likely results in a possible upward

Table 11
The turnover of management members with different backgrounds.

	(1)	(2)	(3)
VARIABLES	MTOV	PBTOV	NPBTOV
REMP	−0.012*	−0.018**	−0.006
	(−1.71)	(−2.26)	(−0.82)
SIZE	0.134***	0.060*	0.139***
	(4.50)	(1.81)	(4.63)
LEV	0.071	−0.125	0.259*
	(0.47)	(−0.70)	(1.67)
ROA	−2.005***	−0.896	−1.766***
	(−3.41)	(−1.27)	(−3.01)
OCF	−1.282***	−1.315***	−0.640*
	(−3.37)	(−2.81)	(−1.71)
INV	0.121	0.293	−0.219
	(0.26)	(0.56)	(−0.46)
TOBINQ	−0.049**	−0.065**	−0.027
	(−2.34)	(−2.46)	(−1.25)
LNPAYE	0.075	0.136**	0.052
	(1.28)	(2.04)	(0.86)
SOE	0.062	−0.074	0.034
	(1.05)	(−1.09)	(0.56)
OWN	−0.126	−0.063	−0.099
	(−0.76)	(−0.34)	(−0.59)
SEP	−0.488*	−0.426	−0.274
	(−1.65)	(−1.21)	(−0.92)
DUAL	0.219***	0.110**	0.215***
	(4.26)	(1.96)	(4.24)
BOARD	−0.489***	−0.323**	−0.391***
	(−4.20)	(−2.31)	(−3.32)
Constant	−2.528***	−2.998***	−2.899***
	(−3.13)	(−3.16)	(−3.65)
Ind and Year	Yes	Yes	Yes
Observations	10,408	9222	10,408
Pseudo R-squared	0.0454	0.0741	0.0241

Note: This table reports the impact of CSR towards employees on turnover of management members with different backgrounds. Please refer to Table 1 for the detailed definitions of variables. The t-statistics in parentheses are calculated according to the standard errors clustered at firm levels; ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

bias compared to the OLS estimates.[4]

5.3. Self-selection bias

Considering that there may be a problem of self-selection for companies undertaking responsibility towards employees – that is, that the companies in the sample are those with better performance in terms of social responsibility (including CSR towards employees) – this paper uses Heckman two-step regression to control this selection bias. As is shown in Table 7, the dependent variable of the first step regression is whether a company has undertaken a high level of CSR towards employees (*HREMP*); control variables include firm size (*SIZE*), capital structure (*LEV*), profitability (*ROA*), operating cash flow (*OCF*), property nature of ownership (*SOE*), logarithm of the number of employees (*LNEMP*) and the number of temples where the company is located (*TEMP*). When the Inverse Mill's Ratio (*IMR*) obtained in the first-step regression is controlled, the second-step regression derives the consistent findings with our baseline results in – that is, there is still a significant positive relationship between CSR towards employees and corporate innovation.

5.4. Subsample analyses

For high-tech industries or firms with high R&D spending, the significance of innovation to firm value may be more important, and the empirical results of this paper may also be driven by a sample of firms with high-tech or high R&D expenditures. Therefore, as a robustness test, this paper divides the sample into companies in high-tech versus non-high-tech industries, and then repeats the main test. Here, "high-tech industry" is defined in line with Loughran and Ritter (2002), and includes the tele-communication, information transmission, software and pharmaceutical manufacturing industries. The regression results are shown in Table 8. Regardless of whether high-tech or non-high-tech industries are considered, the coefficients of innovation performance (*LNPAT, LNIPAT*) and CSR towards employees (*REMP*) are significantly positive. That said, the coefficients of CSR towards employees for the high-tech industry sample are significantly larger than for the non-high-tech industry sample, and indeed, the difference between the two is significant at the 1% level.

We also divide the sample into high R&D expenditure and low R&D expenditure groups according to the industry-annual median of the proportion of R&D in sales revenue, and examines the relationship between innovation and CSR towards employees in the grouped samples. The regression results are shown in Table 9. For both the high R&D expenditure and low R&D expenditure groups, the coefficients of innovation and CSR towards employees are significantly positive. However, the coefficient of CSR towards employees for the high R&D expenditure sample is significantly greater than for the low R&D expenditure sample, with the difference between the two significant at the 5% or 10% level. Therefore, even when considering the differences in characteristics of different companies (innovation) and R&D investment, the empirical results of this paper still hold; that is, CSR towards employees significantly improves the innovation performance of enterprises, and this effect is more pronounced in high-tech industries and companies with high R&D expenditures. (See Table 10.)

Previous studies show that teamwork and employee collaboration play an important role in fostering innovation (Chang et al., 2015), we posit CSR towards employees promotes collaborative production and innovation and therefore, we predict that the effect of CSR towards employees on innovation is more pronounced in firms with high level of collaboration. As employee collaboration is difficult to measure and capture, we follow Chang et al. (2015) and use the per-employee market value premium to measure the valuation of employee collaboration.[5] For firms with high level of employee collaboration, they are likely to be associated with high per-employee value premium. We partition the sample into two subsamples (high level vs low level of premiums), and replicate our baseline regressions in these two subsamples. We find that the effect of CSR towards employees on innovation mainly remains significantly positive in firms with high level valuation of collaboration, and the differences between the coefficients in two subsamples are also marginally significant (significant at around 10% levels), which is consistent with our prediction.

6. Further analyses

As further analysis, this paper focuses on the impact of CSR on employee turnover, innovation efficiency and executive performance pressure, which affect firm innovation performance.

6.1. CSR towards employees and employee turnover

Through CSR towards employees, enterprises can establish a good relationship with employees, thereby effectively reducing turnover rate, which is conducive to the stability of the innovation team. As turnover data for ordinary employees in a company are not available, this paper mainly analyses the impact of CSR on the turnover rate of management. First, this paper uses a logit regression to analyse the impact of CSR

[4] The F-statistics and Cragg-Donald Wald F statistics in Table 6 exclude the possibility of weak IVs.

[5] According to Chang et al. (2015), the per-employee market value premium is computed as (market value-book value)/the number of employees.

Table 12
The analyses of innovation efficiency.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	LNRD	RDE	PATE	IPATE	LNPAT	LNIPAT
REMP	**−0.024**	**0.003**	**0.014**	**0.012****	**0.007**	**0.013****
	(−1.49)	**(0.33)**	**(1.61)**	**(2.31)**	**(1.47)**	**(2.56)**
RDE					0.010*	0.034***
					(1.90)	(6.06)
REMP*RDE					**0.004*****	**0.002****
					(3.97)	**(2.35)**
SIZE	0.533***	0.038	−0.266***	−0.088***	0.466***	0.458***
	(8.19)	(1.00)	(−8.74)	(−5.21)	(27.34)	(26.24)
LEV	−3.093***	−1.622***	−0.515**	−0.273**	−0.059	−0.072
	(−9.12)	(−8.16)	(−2.11)	(−2.15)	(−0.77)	(−0.93)
ROA	5.174***	4.842***	2.478**	1.062***	2.222***	1.821***
	(4.14)	(6.17)	(2.47)	(2.59)	(7.49)	(6.05)
OCF	−1.550*	−4.479***	−1.539***	−1.227***	0.724***	0.540***
	(−1.71)	(−8.29)	(−2.73)	(−4.05)	(3.63)	(2.68)
INV	5.048***	0.751	−0.110	0.604*	0.783***	1.094***
	(4.47)	(1.32)	(−0.20)	(1.78)	(3.30)	(4.55)
TOBINQ	−0.164***	0.079**	0.028	0.028*	0.034***	0.048***
	(−3.75)	(2.47)	(0.94)	(1.85)	(3.08)	(4.26)
LNPAYE	0.086	3.146***	1.331***	0.746***	−0.034	0.098***
	(0.65)	(32.27)	(13.75)	(14.62)	(−1.07)	(3.00)
SOE	−1.117***	−0.618***	−0.164**	−0.032	−0.002	0.075**
	(−8.23)	(−7.88)	(−2.02)	(−0.82)	(−0.05)	(2.42)
OWN	0.723*	−0.991***	−0.202	−0.172*	0.118	−0.111
	(1.95)	(−4.98)	(−0.83)	(−1.79)	(1.39)	(−1.29)
SEP	−0.095	1.138***	1.077**	0.562**	0.092	0.064
	(−0.15)	(3.13)	(2.38)	(2.24)	(0.61)	(0.42)
DUAL	−0.016	0.159***	0.234***	0.103***	0.112***	0.119***
	(−0.17)	(2.63)	(4.06)	(3.68)	(4.62)	(4.85)
BOARD	0.427	−0.073	−0.282*	−0.093	0.128**	0.217***
	(1.63)	(−0.44)	(−1.72)	(−0.98)	(1.97)	(3.28)
Constant	−5.308***	−33.374***	−7.136***	−5.684***	−7.975***	−10.371***
	(−2.74)	(−26.60)	(−6.26)	(−9.45)	(−16.29)	(−20.72)
Ind and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,408	10,408	10,408	10,408	10,408	10,408
Adjusted R^2	0.440	0.363	0.098	0.102	0.295	0.270

Note: This table reports the impact of CSR towards employees on innovation efficiency and marginal output of R&D inputs. Please refer to Table 1 for the detailed definitions of variables. The t-statistics in parentheses are calculated according to the standard errors adjusted for heteroscedasticity (the statistical significance of the results remains the same when the standard errors are clustered at firm levels); ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

towards employees on the turnover rate of management; that is, a regression for which the dependent variable is 'leaving the company' (if 'leaving', *MTOV* = 1; otherwise, it is 0) and the explanatory variable is CSR towards employees (REMP). The empirical results are shown in column (1) of Table 11, which shows the coefficient of CSR towards employees is −0.012, which is significant at the 10% level. Second, considering that members of the management team with a production or R&D background can play an important leadership role in pairing, which is crucial to the stability of the production and innovation teams, this paper further analyses turnover rate according to whether the member of the management team has a production or R&D background, or some other background. The empirical results are shown in columns (2) and (3) of Table 11. CSR towards employees (*REMP*) mainly reduces the turnover rate of management team members with production or R&D backgrounds (*PBTOV*), while the turnover rate for members with other backgrounds (*NPBTOV*) is not significantly affected.

6.2. CSR towards employees and innovation efficiency

From the perspective of innovation efficiency, this paper further analyses the potential impact of a company's CSR towards employees on innovation performance. The regression results are shown in Table 12. First, the dependent variables in columns (1) and (2) of Table 12 are the natural logarithm (*LNRD*) of the R&D expenditure (plus 1) and the per capita R&D expenditure (*RDE*, unit: ten thousand yuan/the number of employees). From columns (1) and (2) of Table 12, it can be seen that the coefficients of *REMP* are not significant, indicating that CSR towards employees does not promote an increase of corporate R&D investment.

Second, following Flammer (2015), this paper measures innovation efficiency by total patent applications per 100 employees (*PATE*) and invention patent applications per 100 employees (*IPATE*). The empirical results in columns (3) and (4) of Table 12 show that the relationship between CSR towards employees (*REMP*) and the number of (invention) patent applications per 100 employees is significantly positive, indicating that CSR towards employees significantly improves firms' innovation efficiency.

Finally, this paper further analyses the impact of a company's CSR towards employees on the marginal output of R&D investment. The dependent variables in columns (5) and (6) of Table 12 are the natural logarithm of the number of patent applications (plus one) and the natural logarithm of the number of invention patent applications (plus one), and the explanatory variables are CSR towards employees (*REMP*), per capita R&D investment (*RDE*) and the interaction of CSR towards employees and per capita R&D investment. The coefficient of the interaction is significantly positive, indicating that a company's commitment to CSR towards employees significantly improves the marginal output of the company's R&D investment, further supporting the role of a company's CSR towards employees in promoting innovation performance. The above empirical results show that CSR towards employees does not promote corporate R&D investment, but can significantly improve corporate innovation efficiency and the marginal output of R&D investment.

Table 13
Corporate responsibility towards employees and pressure on management.

	(1)	(2)	(3)	(4)	(5)	(6)
	Total sample	High R&D	Low R&D	Total sample	High R&D	Low R&D
VARIABLES	TURNOV	TURNOV	TURNOV	TURNOV	TURNOV	TURNOV
REMP	−0.011	−0.000	−0.020*	−0.012	0.008	−0.028**
	(−1.28)	(−0.04)	(−1.73)	(−1.36)	(0.56)	(−2.28)
ROA_a	−3.945***	−3.752***	−4.186***			
	(−4.78)	(−3.80)	(−2.97)			
REMP*ROA_a	**0.267***	**0.369****	**0.115**			
	(1.91)	**(2.00)**	**(0.54)**			
ROA_d				−1.339*	−1.955*	−0.834
				(−1.95)	(−1.76)	(−0.81)
REMP*ROA_d				**0.204**	**0.504***	**−0.067**
				(1.03)	**(1.70)**	**(−0.22)**
SIZE	0.000	−0.087	0.040	−0.023	−0.114**	0.013
	(0.01)	(−1.55)	(0.87)	(−0.66)	(−2.03)	(0.28)
LEV	0.476**	0.672**	0.212	0.872***	1.076***	0.638**
	(2.48)	(2.22)	(0.80)	(4.72)	(3.66)	(2.54)
OCF	−0.179	−0.291	−0.087	−0.790*	−0.948	−0.703
	(−0.37)	(−0.39)	(−0.14)	(−1.68)	(−1.28)	(−1.14)
INV	0.035	0.146	0.347	−0.345	−0.389	0.064
	(0.06)	(0.15)	(0.41)	(−0.52)	(−0.38)	(0.07)
TOBINQ	0.046	0.001	0.090**	0.045	0.014	0.074*
	(1.61)	(0.02)	(2.18)	(1.57)	(0.35)	(1.71)
LNPAYE	−0.072	0.031	−0.097	−0.075	0.028	−0.114
	(−0.98)	(0.27)	(−0.99)	(−0.98)	(0.24)	(−1.10)
SOE	0.340***	0.431***	0.262***	0.350***	0.422***	0.283***
	(4.77)	(3.86)	(2.77)	(4.77)	(3.66)	(2.90)
OWN	−0.167	−0.007	−0.244	−0.275	−0.134	−0.330
	(−0.80)	(−0.02)	(−0.87)	(−1.28)	(−0.41)	(−1.13)
SEP	0.022	−0.737	0.423	0.085	−0.797	0.531
	(0.06)	(−1.25)	(0.88)	(0.23)	(−1.32)	(1.07)
DUAL	−0.028	−0.161*	0.106	−0.015	−0.155	0.124
	(−0.43)	(−1.65)	(1.22)	(−0.22)	(−1.56)	(1.38)
BOARD	−0.230	−0.343	−0.169	−0.262*	−0.392*	−0.192
	(−1.54)	(−1.56)	(−0.80)	(−1.69)	(−1.73)	(−0.89)
Constant	−0.791	0.404	−1.605	0.022	0.991	−0.400
	(−0.75)	(0.24)	(−1.17)	(0.02)	(0.56)	(−0.28)
Ind and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,408	4946	5462	9676	4684	4992
Pseudo R^2	0.0239	0.0341	0.0279	0.0209	0.0319	0.0246

Note: This table reports the impact of CSR towards employees on the sensitivity of CEO turnover to performance. Please refer to Table 1 for the detailed definitions of variables. The t-statistics in parentheses are calculated according to the standard errors adjusted for heteroscedasticity (the statistical significance of the results becomes only marginally significant when the standard errors are clustered at firm levels); ***, **, * indicate that the variable estimation coefficient is significant at the 1%, 5%, and 10% levels, respectively.

6.3. CSR towards employees and pressure on management

Since innovation activities may lead to a short-term performance decline, company executives may reduce the company's innovation activities when they face greater performance pressure (Fang et al., 2014). This paper argues that actively taking CSR towards employees can help company executives resist external pressure, reduce the sensitivity of CEO turnover to performance, and thus may increase the willingness of company executives to participate in innovation activities. Therefore, this paper further analyses a company's CSR towards employees in light of its impact on executive performance pressure. The performance indicators chosen for this paper are industry (median)-adjusted ROA (*ROAa*) or industry (median)-adjusted change in ROA (*ROAd*). In line with Aghion et al. (2013), this paper divides the sample into companies with high R&D expenditure and those with low R&D expenditure, and explores the impact of a company's CSR towards employees on CEO turnover and performance sensitivity, respectively. The logit regression results are shown in Table 13. There is a significant negative relationship between CEO turnover (*TURNOV*) and performance, indicating that when a company faces poor performance or a performance decline, the possibility of CEO turnover is higher. Among companies with high R&D expenditures, the cross-product of CSR towards employees and performance is significantly positive. The above results show that in companies with high R&D expenditures, CSR towards employees significantly reduces the sensitivity of CEO turnover to performance, helps company executives resist the pressure arising from performance decline, and may increase company executives' willingness to innovate.

7. Conclusions

In the context of building harmonious capital-labor relations in China, this paper focuses on non-remuneration incentives for employees and discusses the impact of CSR towards employees on corporate innovation. We find that there is a significant positive relationship between CSR towards employees and firm innovation. In addition, the listed firms' commitment to CSR towards employees significantly reduces the turnover rate of management members with production and R&D backgrounds, which is conducive to the stability of the innovation team. Moreover, firms' commitment to CSR towards employees

significantly improves innovation efficiency, and in firms with high R&D expenditures, commitment to CSR towards employees significantly reduces the sensitivity of executive turnover to performance, thereby helping management resist the pressure of short-term performance declines. To sum up, this paper explores the determinants of corporate innovation from the perspective of employee non-remuneration incentives – CSR towards employees – and enriches the research on the effect of employee incentives and management career concerns on firm innovation.

Declaration of Competing Interest

None.

Appendix A. Appendix

Item	Description
Employee performance	The sum of the scores on employee performance is 5 points, including the scores on income per employee (4 points) and employee training (1 point). Specifically, the score on income per employee for a firm is based on its relative ranking of income per employee across all listed firms. The score on employee training for a firm depends on whether it has employees' skill training programs or not; and if the firm has employees' skill training programs, it gets 1 point and 0, otherwise.
Employee safety	The sum of the scores on employee safety is 5 points and it includes scores on two items: safety checks (2 points) and safety training on employees (3 points). If the firm has regular safety checks or occasional safety checks, it gets 2 points or 1 point, respectively, and 0, otherwise. If the firm has regular safety training and occasional safety training, it gets 3 points or 1 point, respectively, and 0, otherwise.
Caring for employees	The sum of the scores on caring for employees is 5 points, which is a total evaluation on caring awareness, caring for staff, such as holiday leave and bonuses and visiting sick employees.

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