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Corporate social responsibility and insider trading profitability: Evidence from an emerging market

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ABSTRACT

In this study, we examine whether and how corporate social responsibility (CSR) affects insider trading profitability by using a sample of Chinese listed firms from 2011 to 2018. We find that CSR is positively associated with insider trading profitability, especially insider sale profitability, which indicates that insiders tend to reap private benefits from CSR. Our findings are robust to the consideration of alternative proxies, sample bias, and endogeneity concerns. Moreover, we find that the positive relation between CSR and insider trading profitability is more significant before the regulator strengthens its supervision of insider trading, and that this positive relation is weakened by the nature of state-owned enterprises (SOEs), institutional ownership, and analyst coverage.

1. Introduction

Corporate social responsibility (CSR) has become an increasingly important strategic decision in current management practices (Albuquerque et al., 2019). However, the incentives to engage in CSR and its effects on firm value remain controversial. Some scholars argue that CSR can promote a firm's positive image, which can help it gain a competitive advantage (Albuquerque et al., 2019). Furthermore, CSR enables firms to build good relations with employees, suppliers, customers, and the government; and these relations contribute to improving shareholder value (El Ghoul et al., 2011; Flammer, 2015; Flammer and Kacperczyk, 2016). Other scholars hold the view that CSR is prompted by managers' self-serving incentives and raises agency problems (Fabrizi et al., 2014; Masulis and Reza, 2015), which are detrimental to firm value (Kruger, 2015).

Despite the controversy regarding managerial incentives to engage in CSR, little is known about how insiders benefit from CSR activities. In light of the information asymmetry between corporate insiders and outsiders, insiders tend to exploit their information advantage and opportunistically trade their stocks to make abnormal profits at the cost of shareholders, even under strict regulations (Chen et al., 2013; Skaife et al., 2013a). Therefore, insider trading provides an ideal setting to investigate whether insiders can obtain private benefits from CSR. Previous studies have examined the relation between CSR and insider trading in the U.S. market. For example, Gao et al. (2014) find that executives of CSR-conscious firms obtain significantly fewer profits than those of non-CSR-conscious firms via trading their stocks. However, Cui et al. (2015) reveal that insiders of socially responsible firms engage more

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actively in legal trades than in illegal ones. Therefore, from the perspective of insider trading, CSR is conducted to promote firm value rather than to provide insider private benefits in the U.S. market.

In this study, we aim to test how CSR affects insider trading profitability in China. As the Chinese setting differs from that of the U.S., empirical findings for the U.S. market may be not generalizable to the Chinese market. Previous studies show that compared with insider purchases, insider sales are more likely to result from a liquidity shock or diversification demand; therefore, insiders mainly make abnormal profits via insider purchases rather than insider sales in the U.S. market (Jeng et al., 2003; Ofek and Yermack, 2000). Cohen et al. (2012) further point out that only routine trading can bring abnormal returns for insiders. Unlike in the U.S., insiders in China can obtain abnormal profits from both sales and purchases, and nearly all insider trades in China are conducted in a non-routine manner.[1] Furthermore, in contrast to the diffuse corporate ownership in the U.S., the more concentrated ownership of controlling shareholders in China causes the expropriation of minority shareholders (Bertrand et al., 2002; Jiang et al., 2010). China's stock market underwent the Split Share Reform (SSR) in 2007, wherein the shares held by controlling shareholders were transformed from non-tradable to tradable stocks,[2] leaving much room for insiders to profit from trading and especially from selling their stocks (Li and Ji, 2021; Zhu and Wang, 2015). Moreover, as China's capital market is opening to the global market, and witnessing the emergence of environment, social, and governance (ESG) investing,[3] investors need to grasp the incentives for CSR in Chinese listed firms. Therefore, in particular, we investigate these incentives from the perspective of insider trading profitability.

Based on two different motives for CSR – namely, firm or stakeholder value maximization and the pursuit of insider private gains – this paper proposes two contrary hypotheses regarding how CSR affects insider trading profitability. On the one hand, if CSR stems from a motivation to maximize firm value, insiders may emphasize the importance of ethics and make less use of insider trading for personal gains (the "commitment to social good" hypothesis). On the other hand, if CSR is performed due to insiders' motivation to pursue their self-interests, insiders are likely to increase their profits by trading their stocks (the "self-serving" hypothesis).

This paper uses a sample of A-share listed firms on China's stock market from 2011 to 2018 to test these contrasting hypotheses. It finds that the better the CSR performance of listed firms, the more profitable the insider trading, especially for insider sales, and that an increase of one standard deviation in CSR performance leads to an increase of approximately 89.44% (28.2%) in the profitability of insider sales (purchases). These empirical findings support the hypothesis that insiders gain private benefits from CSR activities and are robust to the consideration of alternative proxies and potential sample bias.

However, the relation between CSR and insider trading profitability is likely due to reverse causality or caused by common firm characteristics. Considering the endogeneity problem, we first control for an exhaustive set of firm characteristic variables, as well as firm fixed effects, to alleviate the concern of omitted variables. Second, we use firms' donations to earthquake-stricken regions as a plausibly exogenous variation in CSR and use the difference-in-difference (DID) approach to establish causality between CSR and insider trading profitability. Furthermore, to control for the systematic differences between treatment firms (which donated) and control firms (which did not donate), we use the propensity score matching (PSM) method to match treatment firms with a subsample of control firms. The DID tests show that there is a significant increase in insider trading profitability, especially insider sale profitability, for treatment firms in the year and subsequent years of the earthquake, which further validates the causality between CSR and insider trading profitability.

Through further analysis, this paper finds that the relation between CSR and the profitability of insider trading mainly exists in the years before the China Securities Regulatory Commission (CSRC) strengthened its supervision of insider trading. Previous studies have shown that institutional investors and analyst coverage play important roles in monitoring insiders and reducing information asymmetry between corporate insiders and outsiders, thus reducing insider trading profitability (Frankel and Li, 2004; Hillegeist and Weng, 2021; Huddart et al., 2007). Therefore, we further investigate the moderating role of institutional ownership and analyst coverage in the relation between CSR and insider trading profitability and find that institutional ownership and analyst coverage significantly weaken the positive relation, which supports insiders' opportunistic incentives for CSR activities.

Our study makes several contributions to the literature. First, it contributes to the research on the incentives for CSR. Previous studies derive controversial conclusions regarding the motivation to engage in CSR. Some scholars contend that CSR is motivated by improving shareholder and stakeholder value, which can bring strategic resources to firms (Flammer, 2015), whereas others posit that CSR is conducted to satisfy insiders' self-interests (Hemingway and Maclagan, 2004; Kruger, 2015; Masulis and Reza, 2015). Although ESG investing is burgeoning in emerging markets, scholars have paid limited attention to the incentives underlying CSR, and there remains a relative lack of evidence on whether and how insiders reap private benefits from CSR in emerging markets. As Ali and Hirshleifer (2017) and Chung et al. (2019) point out that insider trading provides a crucial context to examine insiders' opportunistic incentives, this study investigates the relation between CSR and insider trading profitability in China and provides important evidence on insiders' incentives to engage in CSR. Furthermore, although Gao et al. (2014) find that executives of CSR-conscious firms obtain significantly lower profits than those of non-CSR-conscious firms in the U.S., our Chinese sample provides totally different results; we

[1] In our sample, routine insider transactions (517 sales and 107 purchases, respectively) account for less than 1% of total insider transactions (51,346 sales and 37,263 purchases, respectively). According to Cohen et al. (2012), an insider is defined as a routine trader if the trader makes at least one trade in the same calendar month for at least three consecutive years; after an insider is designated a routine trader, all trades made in the same calendar month are classified as routine trades. Furthermore, on average, the insider sale profit is more than 1 million yuan, while the insider purchase profit is only 0.24 million yuan.

[2] Before 2007, most stocks held by controlling shareholders were non-tradable in the secondary market in China.

[3] For example, China's stock market was included in the Morgan Stanley Capital International (MSCI) Emerging Markets Index in 2018, and since then, ESG investing has burgeoned.

find that CSR performance is positively associated with insider trading profitability, especially insider sale profitability. These contradictory findings reveal different insiders' incentives for engaging in CSR in emerging markets and can be explained by the different institutional environments. Institutional theory shows that institutions, including formal institutions (e.g., regulations, rules, and laws) and informal institutions (e.g., ethics, social capital, and norms), shape firms' decisions and behaviors and their consequent outcomes (Scott, 1987). At least two different institutional backgrounds lead to contradictory findings for China. On the one hand, Chinese firms face a relatively complex institutional environment, wherein a large number are likely to face government intervention (Yang et al., 2019) and heavily rely on informal institutions, such as reputations and relations, to obtain access to financing (Allen et al., 2005). This complicated environment contributes to complicated incentives behind CSR, which may obscure insiders' self-serving motives.[4] In addition, CSR has only begun to receive attention in recent years, and a wide range of listed firms have just begun to disclose CSR reports since 2010. Therefore, given the relatively complicated institutional environment and insufficient attention from investors in China, insiders are more likely to exploit CSR to reap private benefits. On the other hand, China's stock market underwent the SSR in 2007, and shares held by insiders experienced a transition from non-tradable to tradable status, which left much room for insiders to profit from trading their stocks, especially selling (Li and Ji, 2021; Zhu and Wang, 2015).[5] Hence, CSR mainly increases insider sale profitability rather than insider purchase profitability in China.

Second, this study enriches the research on insider trading in emerging markets. Extant studies have focused on the effects of the information environment and corporate governance on insider trading (Biggerstaffa et al., 2020; Frankel and Li, 2004; Huddart and Ke, 2007; Ke et al., 2003; Skaife et al., 2013a). In addition, previous studies find that only insider purchases bring abnormal profits, whereas insider sales are more likely to result from diversification and liquidity demands and bring no abnormal profits in the U.S. (Jeng et al., 2003; Ofek and Yermack, 2000). However, in this study, we find that insiders can reap abnormal profits via both insider sales and insider purchases, and that there is a positive association between CSR and insider sale profitability. Furthermore, despite the difference in insider sale profitability between the Chinese and U.S. markets, we find that institutional ownership and analyst coverage weaken the relation between CSR and insider sale profitability, which validates the role of external governance mechanisms in alleviating insider trading problems.

Finally, this study has significant implications for the regulation of CSR and insider trading in emerging markets. Firms that disclose CSR information should increase their disclosure of information to help investors identify possible self-serving motives of insiders. Furthermore, corporate governance should also be improved by developing institutional ownership and increasing analyst coverage to ensure the effective monitoring of insiders' incentives for CSR. Moreover, regulators in emerging markets should further strengthen regulations on information disclosure and restrictions on insider trading to reduce insiders' access to abnormal gains through stock transactions.

2. Literature review and hypotheses

2.1. Literature review

Initially, the controversy regarding whether a company should undertake CSR activities arose from the conflict between shareholder and stakeholder orientation. Based on a shareholder orientation, Friedman (1970) contends that the only legitimate social responsibility of a company is to maximize profits as much as permitted by law and ethics, and that resources should not be wasted on unproductive behavior. Jensen (2001) argues that there is a conflict between CSR and the goal of maximizing shareholder value. However, Carroll (1979) asserts that firms should be stakeholder-oriented and responsible for other stakeholders in addition to shareholders.

In recent years, an increasing number of scholars have expressed that, according to social exchange theory and resource dependence theory, these two value orientations (shareholder and stakeholder) of firms are not contradictory (e.g., Deng and Kang, 2013). CSR can help firms obtain important strategic resources to support their long-term development, such as a positive corporate image and high-quality consumers and employees (Flammer and Kacperczyk, 2016; Greening and Turban, 2000). Furthermore, via CSR activities, firms can establish and maintain good relations with the government and thereby obtain government support (Flammer, 2018) and broader access to loans at lower costs (Goss and Roberts, 2011).

Given the resources brought by CSR, Flammer (2015) finds significant positive relations between CSR and both corporate performance and shareholder value. Deng and Kang (2013) reveal that CSR can improve both market reactions to and post-merger performance of mergers and acquisitions (M&As). In addition to its positive effect on firm performance and value, previous studies show that CSR also promotes the quality of firm information disclosure (Kim et al., 2012) and restrains managerial opportunism (Ferrell et al., 2016).

Although the current research on CSR tends to unify the two value orientations of firms, scholars are paying increasing attention to

[4] This does not mean that CSR is a bad thing, and we do not deny the merits of CSR. CSR can still help firms maintain good relationships with stakeholders and gain external resources (e.g., government support); however, it also likely increases agency costs inside firms. We tend to think, in equilibrium, CSR activities involve a tradeoff between the benefits and the costs.

[5] Before 2007, shares held by insiders were segmented into tradable and non-tradable stocks, and most insiders held non-tradable stocks, which could not be sold in the market. A detailed description concerning the SSR and its impact on insider trading can be found in Li and Ji (2021). Our descriptive statistics indicate that insider sales bring more abnormal profits than insider purchases, which is consistent with our main finding that CSR mainly increases insider sale profitability.

the principal-agent problem posed by CSR activities (Hemingway and Maclagan, 2004; Masulis and Reza, 2015). For example, Masulis and Reza (2015) argue that insiders tend to satisfy their self-interests rather than the interests of shareholders via CSR activities, and Kruger (2015) states that insiders may use company resources to build a positive image of themselves at the cost of shareholders. Petrovits (2006) finds that firms tend to use donations as an excuse to engage in strategic earnings management.

As insider trading is considered a key means by which corporate insiders may obtain private benefits (Ali and Hirshleifer, 2017; Chung et al., 2019), it provides an ideal setting to investigate the incentives for CSR activities by examining the relation between CSR and insider trading profitability. Frankel and Li (2004) find that the more serious the information asymmetry, the more profitable the insider trading. Ali and Hirshleifer (2017) find that insider trading profits reflect the opportunistic motives of management, and that firms with more profitable insider trading are more likely to restate their financial statements, face higher litigation risks, and be punished by the U.S. Securities and Exchange Commission (SEC). Chung et al. (2019) reveal that in a less transparent company, management is more likely to profit from insider trading. Cohen et al. (2012) point out that only non-routine trading brings abnormal returns for insiders.

Specifically in China, Li and Ji (2021) also find that high information asymmetry contributes to more insider trading profitability. Moreover, Li and Ji (2021) find that, in contrast to the U.S., most insider trading in China is conducted in a non-routine manner, and that institutional ownership reduces insider trading profitability by improving corporate governance.

2.2. Hypotheses

Insiders have incentives to exploit their information advantage over outsiders to make abnormal profits; thus, a firm's information environment has an important influence on insider trading profitability. In particular, insiders in more transparent firms tend to reap lower profits from trading their stocks (Huddart and Ke, 2007; Chung et al., 2019).

Consistent with a "commitment to social good" view, Kim et al. (2012) find that firms with higher levels of CSR performance are less likely to conduct earnings management and thus have more transparent information disclosure. Furthermore, Gao et al. (2014) find that executives of CSR-conscious firms are more likely to obey rules of ethics and less likely to seek private benefits than those of other firms. Ferrell et al. (2016) find that the better the CSR performance of a company, the less likely that executives use managerial power to reap private benefits. Therefore, we propose a hypothesis of commitment to social good (H1), positing that CSR performance is negatively associated with insider trading profitability.

H1. CSR is negatively associated with insider trading profitability.

In contrast to the above commitment to social good hypothesis, we propose an alternative hypothesis based on insiders' self-serving incentives. Masulis and Reza (2015) argue that insiders tend to satisfy their self-interests rather than the interests of shareholders via CSR. In addition, insiders may use company resources to build a positive self-image at the cost of shareholders through good CSR performance (Kruger, 2015). Moreover, Petrovits (2006) finds that firms tend to use donations to engage in strategic earnings management. Therefore, we posit that in China, if CSR is motivated by insiders' self-interests, CSR may cause firms to be less transparent and thereby increase the profitability of insider trading. We thus propose our second hypothesis (H2), as stated below.

H2. CSR is positively associated with insider trading profitability.

3. Data, variables, and model specification

3.1. Data and sample

Following Zhu et al. (2022), Zhao and Xiao (2019), Zhang et al. (2021), and Li et al. (2022), we obtain CSR data from the Hexun Scoring of Listed Firms' CSR. Hexun is a Chinese professional financial website that provides a compilation of CSR scores of listed firms beginning from 2010. Because we employ lagged CSR as our explanatory variable in the empirical test, we select A-share listed firms on the Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE) from 2011 to 2018 as the initial sample.

We then obtain the insider trading of A-share listed firms on the SSE and SZSE from the China Stock Market & Accounting Research (CSMAR) database. Following Chung et al. (2019), Huddart and Ke (2007), and Skaife et al. (2013a), we define insiders as corporate directors, managers, and their relatives, and we only include insider transactions in the secondary market, excluding changes in insiders' shareholding due to stock dividend payments, stock placements, and stock option grants. After computing the profitability of all transactions for each firm in a given year, we aggregate the profitability of insider sales and purchases at the firm-year level. We then draw financial and corporate governance variables from the CSMAR database and institutional shareholding data from the RESSET database and merge them with insider trading profitability and our CSR sample.

Considering that there is a certain lock-up period (usually 2 or 3 years) for insider shareholding in newly listed firms, we only keep observations listed on exchanges for at least three years. We exclude firms in the financial industry and special treatment (ST) firms, where the latter comprise firms in financial distress that have experienced losses for two consecutive years. After removing the observations with missing variables, our final sample for empirical analysis comprises 15,860 firm-years. To eliminate the influence of outliers on the results, we winsorize all continuous variables except insider trading profitability at the 1% and 99% levels,[6] following

[6] The winsorization of insider trading profitability does not change the empirical findings.

Table 1
Variable definitions.

Variable	Definition
TPR	Profit earned from total insider trading, calculated using Eq. (3.1).
BPR	Profit earned from insider purchases, calculated using Eq. (1.1).
SPR	Profit earned from insider sales, calculated using Eq. (2.1).
TPR(%)	Profitability of total insider trading, calculated using Eq. (3.2).
BPR(%)	Profitability of insider purchases, calculated using Eq. (1.2).
SPR(%)	Profitability of insider sales, calculated using Eq. (2.2).
CSR	CSR score calculated as the sum of the scores for employee responsibility, supplier (customer, consumer) responsibility, and environmental responsibility, divided by 100.
CSR1	Weighted-average CSR score for employee responsibility, supplier (customer, consumer) responsibility, and environmental responsibility, where the weights for the above three are 15%, 15%, and 20%, respectively, according to Hexun.
CSR2	CSR score calculated as the sum of the scores for employee responsibility, supplier (customer, consumer) responsibility, environmental responsibility, and public responsibility (tax contribution and charity donation), divided by 100.
LNMV	Natural logarithm of market value at the end of the prior year.
LEV	Financial leverage, calculated as the total debt over total assets.
ROA	Operating income scaled by total assets.
SOE	Indicator that equals one when firms are state-owned enterprises (SOEs) and zero otherwise.
LNANA	Natural logarithm of one plus the number of analysts following the firm.
INST	Institutional ownership, calculated by the shares held by institutional investors over total firm shares.
BOARD	Natural logarithm of the number of directors on the board.
DUAL	Indicator that equals one when the chair of the board is also the CEO, and zero otherwise.
SGR_WA	Weighted average sales growth over the past five years, where year *t*-1 has a weight of five, year *t*-2 has a weight of four, etc.
BTM	Book-to-market ratio at the end of the prior year, computed as the book value divided by the market value of equity.
EP	Earnings-to-price ratio at the end of the prior year, computed as the earnings divided by the stock price.

Chung et al. (2019).

3.2. Variables

Following Chung et al. (2019), Huddart and Ke (2007), and Skaife et al. (2013b), we construct our measure of insider trading profitability, which combines the trading volume and abnormal return of the trading. First, for firm *i*, we aggregate all transactions on day *j* as a single transaction and calculate the total value of insider sales (*SellValue*) and insider purchases (*BuyValue*). Then, we compute the one-year buy-and-hold abnormal return (BHAR) beginning one day after the transaction date,[7] multiply the transaction value by the abnormal return, and aggregate it at the firm-year level to derive the trading profit, including the sale profit (*SPR*) and buy profit (*BPR*). Please note that we multiply the sale value by −1 following Chung et al. (2019), which indicates losses avoided on sales and is interpreted in a manner similar to gains on purchases. Finally, we scale both sale and purchase profits by the lagged market value (*MV*) and then multiply by 100 to derive the profitability of sales (*SPR(%)*) and purchases (*BPR(%)*), respectively, both of which are a percentage of lagged MV. The total profit (profitability) is the sum of the sale and purchase profits (profitability).[8] For firms with no insider transactions in a year, the insider trading profitability is set to 0.

$$BPR_{it} = \sum_{j=1}^{k} BHAR_{itj} \times BuyValue \quad (1.1) \qquad BPR(\%)_{it} = \frac{BPR_{it}}{MV_{i,t-1}} \quad (1.2)$$

$$SPR_{it} = -\sum_{j=1}^{k} BHAR_{itj} \times SellValue \quad (2.1) \qquad SPR(\%)_{it} = \frac{SPR_{it}}{MV_{i,t-1}} \quad (2.2)$$

$$TPR_{it} = SPR_{it} + BPR_{it} \quad (3.1) \qquad TPR(\%)_{it} = SPR(\%)_{it} + BPR(\%)_{it} \quad (3.2)$$

$$BHAR = \prod_{d=1}^{365}(1 + R_d) - \prod_{d=1}^{365}(1 + R_{m,d}) \quad (4)$$

The Hexun Scoring System (HSS) includes five dimensions: responsibility toward shareholders, responsibility toward employees,

[7] The CSRC forbids the same insider to trade (i.e., sell or purchase) her or his stocks twice within six months. Previous studies have shown that insider trading is profitable when trading profits are measured over periods of one year or even longer (Ke et al., 2003; Lakonishok and Lee, 2001). Following Skaife et al. (2013) and Li and Ji (2021), we thus use one year as the window to compute insider trading profitability in the main test, and use six and 18 months as alternative windows to compute insider trading profitability in the robustness check.

[8] We can only compute total insider trading profitability at the firm-year level but not at the individual insider level. Individual insiders are forbidden to sell and buy their stock within a period (usually six months), and cannot profit from buying and selling stock at the same time. However, at the firm-year level, there is more than one insider (such as all executives and directors), and there are likely to be both sales and purchases. Therefore, we divide all insider trading into purchases and sales and add the profitability of these two kinds of transactions together to derive total profitability, following Chung et al. (2019), Huddart and Ke (2007), and Skaife et al. (2013).

responsibility toward suppliers (customers and consumers), environmental responsibility, and public responsibility. In general cases, HSS assigns different weights to the above five items, and the weights are 30%, 15%, 15%, 20%, and 20%, respectively (the detailed description of the items can be seen in Appendix A).

Although the Hexun rating of public responsibility considers a company's social donations, it is mainly based on the company's tax contributions, which are related more to its financial performance and tax policies than to its social responsibility.[9] Hence, when calculating the CSR performance of listed companies in the main test, we do not consider the scores concerning public responsibility. According to Flammer and Kacperczyk (2016), Jiao (2010), and McWilliams and Siegel (2001), the term "CSR" refers to a firm's responsibility to stakeholders such as employees, suppliers, and consumers, in addition to shareholders. However, Hexun assigns the greatest weight (30%) to responsibility toward shareholders in its scoring of CSR. Therefore, to accurately measure CSR as a firm's responsibility beyond the interests of its shareholders, we follow Jiao (2010) to calculate CSR scores, excluding the score on responsibility toward shareholders and public responsibility. Our calculation of CSR scores is mainly based on the scores of the following three dimensions: social responsibility toward employees, social responsibility toward suppliers (customers and consumers), and environmental responsibility.

In the robustness test, we further use the weighted sum of the aforementioned three dimensions to compute an alternative proxy of CSR (*CSR1*), where the weight of each dimension is assigned by Hexun (see Table 1 and Appendix A). In addition, the public responsibility score is also included to calculate the CSR of listed companies (*CSR2*) in the robustness check to alleviate any measurement error concerns.

Following Chung et al. (2019) and Skaife et al. (2013a), we control for firm size (*LNMV*), book-to-market ratio (*BTM*), earnings-to-price ratio (*EP*), and past sales growth (*SALEGR*) because insider trading is more profitable in small firms (Lakonishok and Lee, 2001; Seyhun, 1986) and insiders are likely to be contrarian investors (Piotroski and Roulstone, 2005; Rozeff and Zaman, 1998). Moreover, Huddart and Ke (2007) and Li and Ji (2021) show that information asymmetry and institutional investors have an impact on insider trading profitability; therefore, we control for analyst coverage (*LNANA*) as a proxy for information asymmetry and institutional ownership (*INST*).

In addition, following Chung et al. (2019) and Li and Ji (2021), we control for financial leverage (*LEV*), return on total assets (*ROA*), the size of the board of directors (*BOARD*), and the duality of CEO and chair (*DUAL*) to capture the effects of firm characteristics and governance structure on insider trading profitability. Detailed definitions and descriptions of the calculation of variables are provided in Table 1.

3.3. Model specification

Our baseline regression model is shown in Eq. (5), where the dependent variables (*Profit)* are total insider trading profitability (*TRP (%)*), insider sale, and insider purchase profitability (*SRP(%)* and *BRP(%)*, respectively). We focus on the explanatory variable of CSR performance (*CSR*), and control for firm characteristics and governance variables that may affect insider trading profitability. Furthermore, we control for firm and year fixed effects to alleviate the influence of omitted variables. We expect the coefficient of *CSR* to be negative if H1 holds and positive if H2 holds.

$$Profit_{it} = \alpha_i + \alpha_t + \alpha_1 CSR_{i,t-1} + \sum_j \alpha_j Control_{j,it} + \varepsilon_{it} \tag{5}$$

There is an endogeneity concern in our baseline model. Although we use the lagged CSR performance as an explanatory variable, reverse causality is still possible. Moreover, the relation between CSR and insider trading profitability is likely to be caused by unobservable and time-varying firm characteristics, which may still cause an omitted variable problem.

To further alleviate any endogeneity concern, we exploit earthquake events that occurred during the sample period, specifically in 2013 and 2014, as exogenous shocks. These earthquakes caused a sudden increase in firms' opportunities to engage in donations, leading to a rise in CSR performance, but had no direct influence on insider trading.

Following Beck et al. (2010) and Bertrand and Mullainathan (2003), we use a two-way fixed effects model for our DID tests. After controlling firm and year fixed effects in the model, the dummy variable separating the treatment group (firms with donation) and control group (firms without donation) is omitted and absorbed by firm fixed effects instead, and we focus on the coefficient of *POST*. For firms that donated toward earthquake relief, *POST* takes the value of one in the year and subsequent years of the earthquake, and zero otherwise; for firms that did not donate, *POST* equals zero in the sample period. The control variables in the DID tests are consistent with the baseline test of the study. To capture the exogenous effect of donations in the earthquake years, we restrict the sample to the period from 2011 to 2015, which includes only the two years before and after the earthquakes.

$$Profit_{it} = \alpha_i + \alpha_t + \beta_1 POST_{it} + \sum_j \beta_j Control_{j,it} + \mu_{it} \tag{6}$$

Considering the potentially systematic differences between treatment and control firms, following Chen et al. (2018) and Fang et al.

[9] For about 95% of firm-years (23,791 firm-years) in the initial sample (25,141 firm-years), the score for public responsibility is mainly determined by tax payments. Therefore, to better capture the incentives for firms' CSR conduct, we do not include the score of this item to compute CSR performance (*CSR*). However, we do include it to compute CSR performance (*CSR2*) in the robustness tests to validate that our results are consistent no matter how CSR performance is computed.

Table 2
Summary statistics.

Variables	N	Mean	SD	Min	Medium	Max
TPR (Million RMB)	15,860	1.305	47.730	-2004.684	0.000	1102.835
SPR (Million RMB)	15,860	1.059	56.465	-4245.691	0.000	1102.835
BPR (Million RMB)	15,860	0.246	21.798	−211.592	0.000	2241.007
TPR(%)	15,860	−0.020	1.373	−84.462	0.000	23.615
SPR(%)	15,860	−0.033	1.435	−84.462	0.000	23.615
BPR(%)	15,860	0.013	0.401	−3.423	0.000	26.829
CSR	15,860	0.081	0.141	−0.002	0.019	0.600
CSR1	15,860	0.133	0.240	−0.003	0.028	1.050
CSR2	15,860	0.131	0.155	−0.150	0.068	0.670
LNMV	15,860	22.462	0.946	20.647	22.369	25.306
LEV	15,860	0.448	0.207	0.055	0.447	0.887
ROA	15,860	0.048	0.062	−0.240	0.047	0.222
SOE	15,860	0.437	0.496	0.000	0.000	1.000
LNANA	15,860	1.453	1.035	0.000	1.386	3.401
INST	15,860	0.261	0.235	0.000	0.183	0.855
BOARD	15,860	2.143	0.201	1.609	2.197	2.708
DUAL	15,860	0.265	0.441	0.000	0.000	1.000
SGR_WA	15,860	0.306	0.824	−0.206	0.145	6.882

Notes: This table reports the summary statistics of variables obtained for the period 2011–2018. Please refer to Table 1 for the variable definitions. To mitigate the effect of outliers, all continuous variables are winsorized at the 1% and 99% levels except insider trading profitability.

(2014), we adopt the PSM method to alleviate sample selection bias. The variables used in PSM include market values (*LNMV*), capital structure (*LEV*), *ROA*, nature of property rights (*SOE)*, and analyst coverage (*LNANA*).

4. Main findings

4.1. Descriptive statistics

The descriptive statistics of the variables are shown in Table 2. The average value of insider sale profit (*SPR*) during the sample period is greater than 1 million yuan, which means that, on average, insider sales bring abnormal profits for insiders following their transactions. The average value of insider purchase profit (*BPR*) is 240,000 yuan. Thus, in terms of average value, insider sales are more profitable than insider purchases. In addition, the average profit on total insider trading is about 1.3 million yuan. Our figures are similar to those of Li and Ji (2021), who report average profits of insider purchases and insider sales of 1.203 and 0.041 million yuan, respectively. The average CSR score is 8.1 points, and the minimum and maximum are −0.2 and 60, respectively.[10] Consistent with Zhou et al. (2021), the overall CSR of listed companies is relatively low, and there is a large variation in CSR in our sample. The descriptive statistics of the remaining control variables are generally similar to those of Li and Ji (2021).

4.2. CSR and insider trading profitability

Table 3 reports the main empirical findings concerning the relation between CSR and insider trading profitability. The dependent variable in Column (1) is total insider trading profitability (*TPR(%)*). The coefficient of *CSR* is 0.229, which is significant at the 1% level, indicating that CSR performance is positively associated with total insider trading profitability. We further focus on the effect of CSR on insider sale profitability (*SPR(%)*) and purchase profitability (*BPR(%)*), showing the results in Columns (2) and (3) of Table 3. The coefficients of *CSR* on *SPR(%)* and *BPR(%)* are significantly positive at the 1% and 10% levels, respectively. In terms of economic significance, an increase of one standard deviation in CSR performance leads to an increase of approximately 89.44% (28.2%) in the profitability of insider sales (purchases) relative to its mean value. Regardless of the statistical or economic significance, the effect of CSR on insider sale profitability is larger than that on insider purchase profitability.[11] These results support H2 by indicating that insider trading is more profitable for firms with better CSR performance.

4.3. Robustness check

4.3.1. Alternative proxies

Similar to SEC regulations, the CSRC requires insiders to disgorge any gains from a purchase (sale) following a previous sale (purchase) within six months. Ke et al. (2003) and Lakonishok and Lee (2001) show that insider trading is profitable when trading

[10] Negative CSR scores arise from negative CSR events such as environmental pollution, low product quality, and poor production safety.
[11] We should be cautious in interpreting the results regarding insider purchase profitability (*BPR(%)*) because the coefficients of CSR in the following robustness check and further analysis are not consistent or robust (in some cases they become insignificant or even negative). We provide possible explanations for this in Section 4.3.1.

Table 3
CSR performance and insider trading profitability.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	TPR(%)	TPR(%)	SPR(%)	SPR(%)	BPR(%)	BPR(%)
CSR	0.379***	0.223***	0.381***	0.196***	−0.002	0.027*
	(4.53)	(3.12)	(4.46)	(2.67)	(−0.12)	(1.73)
LNMV		0.358***		0.437***		−0.079***
		(4.64)		(5.59)		(−3.63)
LEV		0.519***		0.551***		−0.032
		(4.64)		(4.91)		(−1.01)
ROA		−0.529***		−0.441*		−0.088
		(−2.61)		(−1.93)		(−0.54)
SOE		−0.018		0.072*		−0.090
		(−0.21)		(1.78)		(−1.22)
LNANA		0.003		−0.007		0.010
		(0.14)		(−0.29)		(1.00)
INST		0.018		−0.059		0.077***
		(0.33)		(−1.03)		(3.18)
BOARD		0.035		0.046		−0.011
		(0.26)		(0.37)		(−0.21)
DUAL		−0.066		−0.054		−0.012*
		(−1.45)		(−1.17)		(−1.92)
SGR_WA		0.004		0.005		−0.001
		(0.28)		(0.36)		(−0.35)
BTM		−0.038		−0.042		0.005
		(−0.50)		(−0.54)		(0.26)
EP		−0.150		−0.272		0.122
		(−0.41)		(−0.72)		(0.75)
Constant	−0.048***	−8.227***	−0.060***	−10.050***	0.012***	1.823***
	(−3.37)	(−4.52)	(−4.21)	(−5.54)	(4.96)	(3.22)
Firm and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,860	15,860	15,860	15,860	15,860	15,860
N of firms	2718	2718	2718	2718	2718	2718
Adjusted R^2	0.006	0.016	0.007	0.020	0.004	0.009
F	9.389	5.380	10.39	5.964	6.949	6.073

Notes: This table reports the results of the following model:$Profit_{it} = \alpha_i + \alpha_t + \alpha_1 CSR_{i,\,t-1} + \sum_j \alpha_j Control_{j,\,it} + \varepsilon_{it}$. First, we run the model without control variables except firm (*Firm*) and year (*Year*) fixed effects, and results are displayed in Columns (1), (3), and (5). Second, we run the model with control variables, and results are reported in Columns (2), (4), and (6). The dependent variables in columns (1)–(6) are total insider trading profitability (*TPR (%)*), insider sale profitability (*SPR(%)*), and insider purchase profitability (*BPR(%)*), respectively. *CSR* refers to CSR performance. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors at the firm level. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

profits are measured over different periods, such as six months, one year, or even longer. Chung et al. (2019), Skaife et al. (2013b), and Li and Ji (2021) use insider trading profitability over different periods to validate the robustness of their empirical findings. Following these studies, as a robustness check, we first replace the measurements of insider trading profitability over a shorter or a longer window than one year. *TPR1(%)*, *SPR1(%)*, and *BPR1(%)* are calculated via Eqs. (1)–(4), using a six-month buy-and-hold abnormal return (BHAR) beginning one day after the transaction date; *TPR2(%)*, *SPR2(%)*, and *BPR2(%)* are calculated via Eqs. (1)–(4) but using an 18-month buy-and-hold abnormal return (BHAR). We re-estimate Eq. (6) with these alternative proxies of insider trading profitability and report the results in Table 4.[12] Regardless of whether the dependent variable is total insider trading profitability (*TPR1(%), TPR2(%)*) or insider sale profitability (*SPR1(%), SPR2(%)*), the coefficients of CSR remain significantly positive.

However, when the dependent variable is insider purchase profitability (*(BPR1(%), BPR2(%)*), the CSR coefficients are no longer significant, which indicates that the results regarding insider purchase profitability are not robust and consistent. The inconsistency may be due to the complicated incentives for insider purchases and differing interpretations of insider purchase profitability. Some scholars argue that only insider purchases rather than insider sales can bring abnormal profits because insider sales are more seriously regulated and more likely to be driven by liquidity or diversification needs (Jeng et al., 2003; Ofek and Yermack, 2000). Therefore, according to this view, insider purchase profitability mainly reflects insiders' opportunistic incentives. However, another school of thought holds that, compared with insider sales, insider purchases can stabilize stock prices (which can be regarded as a positive signal to investors) and align the incentives of insiders and investors due to increased shareholdings of insiders (Bricker and Markarian, 2015; Li and Ji, 2021). However, such increased shareholding via insider purchases also increases insiders' risk, especially exposure to firm-specific risk, requiring compensation. In this vein, insider purchase profits can be regarded, to some extent, as a kind of compensation

[12] Furthermore, we follow Cohen et al. (2012) and Hillegeist and Weng (2021) to construct profitability from non-routine trades and also derive consistent findings. Due to space limitations, we only report the replicated results of Table 3 using the profitability from non-routine trades as dependent variables in Appendix B. The definition and proportion of non-routine trades (among all trades) can be seen in Footnote 1.

Table 4
Alternative proxies of insider trading profitability.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	TPR1(%)	SPR1(%)	BPR1(%)	TPR2(%)	SPR2(%)	BPR2(%)
CSR	0.120**	0.107**	0.013	0.329***	0.300***	0.029
	(2.43)	(2.14)	(1.40)	(3.50)	(3.11)	(1.26)
Constant	−5.204**	−6.646***	1.442**	−10.869***	−12.823***	1.954***
	(−2.21)	(−2.94)	(2.13)	(−5.99)	(−7.11)	(3.91)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Firm and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,860	15,860	15,860	15,860	15,860	15,860
N of firms	2718	2718	2718	2718	2718	2718
Adjusted R2	0.005	0.007	0.008	0.025	0.031	0.007
F	4.240***	4.624***	5.005***	7.076***	7.832***	3.822***

Notes: This table reports the results with alternative measurements of insider trading profitability. We replace the measurement of total insider trading profitability as *TPR1(%)* and *TPR1(%)*, replace the measurement of insider sale profitability as *SPR1(%)* and *SPR2(%)*, and replace the measurement of insider purchase profitability as *BPR1(%)* and *BPR2(%)*, respectively. *TPR1(%)*, *SPR1(%),* and *BPR1(%)* are calculated by Eq. (1)–(4) but using six-month rather than one-year buy-and-hold abnormal return (BHAR) beginning one day after the transaction date. *TPR2(%)*, *SPR2(%),* and *BPR2(%)* are also calculated by Eq. (1)–(4) but using eighteen-month buy-and-hold abnormal return (BHAR) beginning one day after the transaction date. We run the following model:$Profit_{it} = \alpha_i + \alpha_t + \alpha_1 CSR_{i,\,t-1} + \sum_j \alpha_j Control_{j,\,it} + \varepsilon_{it}$. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors by firms. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

Table 5
Alternative proxy of CSR performance.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	TPR(%)	SPR(%)	BPR(%)	TPR(%)	SPR(%)	BPR(%)
CSR1	0.127***	0.112***	0.015*			
	(3.06)	(2.62)	(1.69)			
CSR2				0.168**	0.144**	0.024
				(2.52)	(2.10)	(1.47)
Constant	−8.232***	−10.054***	1.822***	−8.258***	−10.080***	1.822***
	(−4.52)	(−5.54)	(3.22)	(−4.54)	(−5.57)	(3.24)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Firm and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,860	15,860	15,860	15,860	15,860	15,860
N of firms	2718	2718	2718	2718	2718	2718
Adjusted R^2	0.016	0.020	0.009	0.016	0.020	0.009
F	5.376***	5.964***	6.072***	5.346***	5.933***	6.072***

Notes: This table reports the results with alternative measurements of CSR performance. We replace the measurement of CSR with CSR1 and CSR2. The dependent variables in Columns (1)–(6) are total insider trading profitability (*TPR(%)*), insider sale profitability (*SPR(%)*), and insider purchase profitability (*BPR(%)*), respectively. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors by firms. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

for increased risk (Li and Ji, 2021).

From the descriptive statistics in Table 2, insider sales are more profitable than insider purchases (which is contradictory to the first point of view outlined above), and in fact, the Chinese government encourages insiders to increase their purchases when the stock market experiences huge declines.[13] According to Li and Ji (2021), insider purchases reflect more compensation for risk rather than insiders' opportunistic incentives, or at least a mixture of the two. Therefore, we cannot derive any deterministic conclusion about the relation between CSR and insider purchase profitability.

We also use alternative proxies of CSR (*CSR1* and *CSR2*) to replicate our baseline results. According to the weights assigned by Hexun to various dimensions of CSR, we calculate a weighted-average CSR (*CSR1*; see Table 1 for a detailed definition) for each firm. We also include tax and public welfare scores in the calculation of the sum of CSR to derive another alternative proxy (*CSR2*). After replacing the proxies for CSR performance, the empirical findings in this paper remain consistent. The results are shown in Table 5.

[13] For example, in May 2015, the stock prices of more than 1000 stocks, which accounted for nearly half of the stocks then listed on China's A-share market, fell by approximately 10% in a single day. As a response, in May 2015, the CSRC relaxed restrictions on insider purchases, and encouraged insiders to increase their shareholdings by buying stocks from the secondary stock market. Furthermore, in July 2015, the CSRC removed the prohibition on insider purchases for firms whose stock prices had fallen by more than 30% in the past 10 consecutive trading days.

Table 6
Alternative sample.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	TPR(%)	SPR(%)	BPR(%)	TPR1(%)	SPR1(%)	BPR1(%)
CSR	0.509***	0.773***	0.057	0.339***	0.442**	−0.009
	(2.74)	(2.95)	(0.77)	(2.61)	(2.37)	(−0.20)
Constant	−18.031***	−30.461***	6.853***	−11.136**	−20.194***	5.485*
	(−4.30)	(−5.06)	(2.87)	(−2.09)	(−2.69)	(1.95)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Firm and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7334	5421	4718	7334	5421	4718
N of firms	2168	1855	1930	2168	1855	1930
Adjusted R^2	0.035	0.056	0.032	0.011	0.020	0.033
F	5.318***	5.907***	4.365***	4.205***	4.689***	3.171***

Notes: This table reports the results with an alternative sample, where each firm-year observation has at least one insider transaction within a year. The dependent variables in Columns (1)–(6) are total insider trading profitability (*TPR(%)* or *TPR1(%)*), insider sale profitability (*SPR(%)* or *SPR1(%)*), and insider purchase profitability (*BPR(%)* or *BPR1(%)*), respectively. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors by firms. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

Table 7
Logit regression before and after PSM.

	(1)	(2)
	Before PSM	After PSM
Variables	Logit(Donate)	Logit(Donate)
ROA	−0.677	−1.727
	(−0.31)	(−0.74)
SOE	0.028	−0.137
	(0.16)	(−0.78)
LNMV	0.725***	0.559***
	(8.42)	(6.07)
LEV	1.302**	0.864
	(2.53)	(1.59)
LNANA	0.378***	0.116
	(3.62)	(1.06)
INST	0.773**	0.383
	(2.02)	(0.95)
BTM	0.380	0.079
	(1.17)	(0.24)
EP	4.132*	3.923*
	(1.94)	(1.81)
Constant	−36.772	−15.616***
	(−0.02)	(−7.58)
Observations	4025	1736
Industry and Year	Yes	Yes
Pseudo R-squared	0.239	0.0764

Notes: This table reports the results of logit regression before and after PSM. The dependent variable is an indicator that equals one if firms donate to earthquake-stricken regions and zero otherwise. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors by firms. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

4.3.2. Alternative sample

Following conventional wisdom, we set the profitability of insider trading to zero for a firm-year without transactions (Chung et al., 2019; Huddart and Ke, 2007; Skaife et al., 2013a). In our sample, the profitability of more than half of the observations is zero. Therefore, our empirical findings may be affected by observations without insider transactions. To alleviate this concern, we exclude these observations and retain only firm-years with insider transactions as an alternative sample. In Table 6, the dependent variables in Columns (1)–(3) are trading profitability over a one-year window, and the dependent variables in Columns (4)–(6) are trading profitability over a six-month window.[14] As shown in Table 6, the positive relation between CSR and insider trading profitability remains significant in the alternative sample.

[14] When insider trading profitability is computed based on returns in an 18-month window, the results remain consistent (unreported in the table).

Table 8
DID tests.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	TPR(%)	SPR(%)	BPR(%)	TPR(%)	SPR(%)	BPR(%)
POST	0.089**	0.101***	−0.012*	0.088**	0.090**	−0.002
	(2.22)	(2.65)	(−1.88)	(1.98)	(2.10)	(−0.36)
Constant	−4.834***	−6.077***	1.243***	−0.688	−0.873	0.185
	(−3.27)	(−3.85)	(2.87)	(−0.51)	(−0.64)	(1.38)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Firm and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,227	10,227	10,227	3498	3498	3498
N of firms	2408	2408	2408	619	619	619
Adjusted R^2	0.007	0.006	0.001	0.002	0.001	0.001
F	3.351	3.718	3.109	1.320	1.603	1.112

Notes: This table reports the results of DID tests, where Columns (1)–(3) are the analysis in the unmatched sample and Columns (4)–(6) are the analysis in the matched sample. The dependent variables in columns (1)–(6) are total insider trading profitability (*TPR(%)*), insider sale profitability (*SPR(%)*), and insider purchase profitability (*BPR(%)*), respectively. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors by firms. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

4.3.3. Addressing the endogeneity problem

Previous studies have exploited the exogenous shock represented by an earthquake to investigate the determinants and consequences of firm CSR conduct, such as Gao et al. (2012) and Zhang et al. (2009). To address the potential endogeneity problem, we use domestic earthquakes in 2013 and 2014 as exogenous shocks to identify the causality between CSR and insider trading profitability. We restrict the sample period to 2011–2015, which includes only the two years before and after these earthquakes. According to whether firms donate toward earthquake relief, we partition firms into treatment firms (with donation) and control firms (without donation). We exploit the two-way fixed effects model to capture the effect of staggered events as the exogenous earthquakes occurred in 2013 and 2014, and firms are likely to have donated to earthquake-stricken regions in either or both of these years. Considering the potentially systematic differences between treatment and control firms, we adopt the PSM method to alleviate sample selection bias (see Table 7). The results of the DID tests are shown in Table 8. Specifically, the profitability of insider trading in treatment firms increased significantly in the year and subsequent years of the earthquake (see Column (1) in the unmatched sample and Column (4) in the matched sample). The coefficient of *POST* is significantly positive, especially when the dependent variable is insider sale profitability (see Column (2) in the unmatched sample and Column (5) in the matched sample), while there is no significant difference in the change of insider purchase profitability between the treatment and control firms (see Column (6)). The above results show that after considering potential endogeneity problems, we still find that CSR has a significant and positive impact on insider trading profitability, which is consistent with our baseline results.

Although we have tried to eliminate the systematic differences between donating firms and non-donating firms via the PSM method, our results are also likely caused by the influence of earthquakes on firms. For instance, the firms that made higher donations are likely those located in the earthquake regions, and hence, their operations are likely to be seriously affected, leading to decreased insider trading profitability. To further eliminate the potential impact of earthquakes on firms, we further replicate our DID results in a subsample where firms located in earthquake regions are removed.[15] Results remain consistent with our findings in Table 8 (see Appendix C).

5. Further analysis

5.1. The influence of stronger regulations

Insider sales have attracted the close attention of regulatory authorities in China since 2015. In January 2016, the CSRC issued a document, Regulations on the Reduction of Shares of Major Shareholders, Directors, Supervisors, and Senior Executives of Listed Companies (hereafter the Regulations), with further modifications made in January 2017 and May 2018. The Regulations increase obligations regarding information disclosure for insider sales and impose strict restrictions on the proportion of a firm's shares permitted to be sold by insiders. According to the Regulations, insiders should fulfill their obligation to disclose accurately and promptly, and the number of insiders' stocks traded through centralized bidding transactions on the stock exchange within any three months should not exceed 1% of the total number of shares.

This study further partitions the sample period into two periods, namely, the periods before and after 2016, to test whether the relation between CSR performance and the profitability of insider trading is affected by the strengthened regulations. The results are

[15] We owe many thanks to a referee for this valuable comment. The earthquakes in 2013 and 2014 mainly affected five provinces – Sichuan, Gansu, Jilin, Yunnan, and Xinjiang – and were significant enough to rank in the Top 10 Natural Disaster Events in China, which were disclosed by the Chinese government.

Table 9
CSR and insider trading profitability before and after the strengthened regulation.

	(1)	(2)	(3)	(4)	(5)	(6)
	Before regulation	After regulation	Before regulation	After regulation	Before regulation	After regulation
Variables	TPR(%)	TPR(%)	SPR(%)	SPR(%)	BPR(%)	BPR(%)
CSR	0.486***	0.016	0.423***	0.008	0.063*	0.009
	(3.34)	(0.28)	(2.86)	(0.13)	(1.80)	(0.70)
LNMV	0.259***	0.022	0.342***	0.051	−0.083***	−0.030**
	(2.78)	(0.43)	(3.42)	(0.96)	(−3.12)	(−2.13)
LEV	0.388*	0.121	0.311	0.192	0.077	−0.071**
	(1.77)	(0.94)	(1.32)	(1.44)	(0.88)	(−2.13)
ROA	−0.707**	0.418*	−0.571	0.455*	−0.136	−0.037
	(−2.12)	(1.74)	(−1.43)	(1.74)	(−0.60)	(−0.57)
SOE	0.059	0.062	0.099	0.036	−0.040*	0.026
	(0.79)	(1.40)	(1.30)	(1.14)	(−1.84)	(0.98)
LNANA	0.017	0.027	0.009	0.027	0.008	−0.000
	(0.52)	(1.17)	(0.25)	(1.19)	(0.57)	(−0.02)
INST	0.302*	0.272***	0.220	0.272***	0.081	0.000
	(1.81)	(4.29)	(1.27)	(4.04)	(1.24)	(0.02)
BOARD	0.014	0.040	−0.003	0.047	0.017	−0.007
	(0.08)	(0.62)	(−0.02)	(0.82)	(0.24)	(−0.25)
DUAL	−0.171***	−0.032	−0.167**	−0.008	−0.004	−0.024*
	(−2.71)	(−1.10)	(−2.56)	(−0.26)	(−0.36)	(−1.91)
SGR_WA	0.015	0.031	0.020	0.029	−0.006	0.002
	(0.80)	(1.22)	(1.27)	(1.18)	(−0.56)	(0.73)
BTM	−0.291	−0.059	−0.218	−0.075	−0.073	0.015
	(−1.64)	(−0.76)	(−1.18)	(−0.96)	(−1.58)	(0.97)
EP	0.214	0.235	−0.170	0.242	0.383	−0.008
	(0.45)	(0.65)	(−0.28)	(0.64)	(1.13)	(−0.10)
Constant	−5.999***	−0.808	−7.811***	−1.511	1.812***	0.703**
	(−2.95)	(−0.71)	(−3.60)	(−1.27)	(3.07)	(2.17)
Firm and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8960	6900	8960	6900	8960	6900
N of firms	2397	2634	2397	2634	2397	2634
Adjusted R^2	0.009	0.029	0.008	0.028	0.002	0.009
F	3.716***	6.812***	3.936***	7.140***	3.364***	2.618***

Notes: This table reports the results before and after the strengthened regulation. The dependent variables in Columns (1)–(6) are total insider trading profitability (*TPR(%)*), insider sale profitability (*SPR(%)*), and insider purchase profitability (*BPR(%)*), respectively. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors by firms. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

shown in Table 9. Regardless of whether the dependent variable is total insider trading or insider sale profitability, the coefficients of *CSR* are mainly significant in the period before the stronger regulations but not significant afterward, showing that the CSRC's policy restrains the motivation of insiders to trade their stocks for abnormal profits.[16]

5.2. State-owned enterprises and non-state-owned enterprises

Because insiders in state-owned enterprises (SOEs) tend to strive for political promotion (Bradshaw et al., 2018), their motivation to obtain pecuniary benefits is relatively weak. Therefore, we posit that the nature of SOEs weakens the relation between CSR and insider trading profitability. The results are shown in Table 10. When the dependent variables are *TPR(%)* and *SPR(%)*, the coefficients of the interaction between *CSR* and *SOE* are significantly negative at the 5% level, which supports our conjecture.[17]

5.3. Institutional ownership and analyst coverage

Previous studies find that institutional investors can significantly inhibit insiders' opportunistic motivation (Crane et al., 2016; Li and Ji, 2021). Therefore, we posit that institutional ownership is likely to weaken the relation between CSR and the profitability of insider trading. The empirical results are shown in Table 11. When the dependent variables are total insider trading profitability (*TPR*

[16] Because we control for year fixed effects, which capture the influences of common macro-economic factors for all firms, our findings are less likely to be driven by omitted macro-economic variables. In addition, we control firm fixed effects and most firms in our sample do not switch industries; therefore, our findings are also less likely to be driven by the omitted industry trend. Moreover, the results of all regressions remain robust and consistent if we control for both industry fixed effects and macro-economic factors (such as GDP per capita, GDP growth, and CPI).

[17] Because we find that the effects of CSR on insider trading profitability only exist in the before-regulation period, we mainly perform our cross-sectional analyses for this period. The results across the whole period remain qualitatively consistent.

Table 10
CSR, SOE and insider trading profitability.

	(1)	(2)	(3)
Variables	TPR(%)	SPR(%)	BPR(%)
CSR	0.853***	0.780***	0.073
	(2.82)	(2.58)	(1.40)
CSR × SOE	−0.552**	−0.537**	−0.015
	(−2.01)	(−1.97)	(−0.34)
SOE	0.103	0.141*	−0.039*
	(1.31)	(1.78)	(−1.75)
LNMV	0.260***	0.343***	−0.083***
	(2.79)	(3.43)	(−3.12)
LEV	0.402*	0.325	0.077
	(1.84)	(1.38)	(0.88)
ROA	−0.693**	−0.557	−0.136
	(−2.08)	(−1.39)	(−0.60)
LNANA	0.019	0.011	0.008
	(0.57)	(0.29)	(0.57)
INST	0.302*	0.221	0.081
	(1.82)	(1.28)	(1.24)
BOARD	0.015	−0.002	0.017
	(0.08)	(−0.01)	(0.24)
DUAL	−0.168***	−0.164**	−0.004
	(−2.65)	(−2.51)	(−0.36)
SGR_WA	0.013	0.019	−0.006
	(0.71)	(1.17)	(−0.56)
BTM	−0.283	−0.210	−0.073
	(−1.59)	(−1.14)	(−1.58)
EP	0.213	−0.170	0.383
	(0.45)	(−0.28)	(1.13)
Constant	−6.067***	−7.877***	1.810***
	(−2.98)	(−3.63)	(3.07)
Firm and Year	Yes	Yes	Yes
Observations	8960	8960	8960
N of firms	2397	2397	2397
Adjusted R^2	0.009	0.008	0.001
F	3.598***	3.812***	3.194***

Notes: This table reports the results with a moderator (SOE). The dependent variables in Columns (1)–(3) are total insider trading profitability (*TPR(%)*), insider sale profitability (*SPR(%)*), and insider purchase profitability (*BPR(%)*), respectively. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors by firms. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

(%)) and sale profitability (*SPR(%)*), both coefficients of the interaction between *CSR* and institutional ownership (*INST*) are significantly negative at the 1% level, which supports our conjecture.

In addition to institutional investors, analysts are an important external governance mechanism for listed companies. Analysts can significantly improve firms' information environments, thereby inhibiting the insider's motivation to opportunistically trade their stocks (Frankel and Li, 2004). Therefore, we also posit that analyst coverage is likely to weaken the relation between CSR and insider trading profitability. The empirical results of our test are shown in Table 12. When the dependent variables are total insider trading profitability (*TPR(%)*) and insider sale profitability (*SPR(%)*), both coefficients of the interaction between *CSR* and analyst coverage (*LNANA*) are significantly negative at the 10% level, which supports the view that analyst coverage weakens insiders' opportunistic incentives and thus weakens the relation between CSR and insider trading profitability.

6. Conclusions

Chinese authorities have recently emphasized the importance of the capital market in fighting poverty and promoting an environmentally conscious society. Firms' active participation in CSR activities is of vital importance to the harmonious and stable development of society. However, from the perspective of insider trading, this study finds that high CSR performance is associated with high insider trading profitability, especially insider sale profitability. In addition, the CSRC's regulations on insider sales effectively limit the profitability of insider trading, and SOEs, institutional ownership, and analyst coverage significantly weaken the relationship

Table 11
CSR, institutional ownership and insider trading profitability.

	(1)	(2)	(3)
Variables	TPR(%)	SPR(%)	BPR(%)
CSR	0.707***	0.621***	0.086*
	(3.65)	(3.14)	(1.74)
CSR × INST	−1.132***	−1.016***	−0.116
	(−2.98)	(−2.64)	(−1.08)
INST	0.421**	0.327	0.093
	(2.20)	(1.64)	(1.24)
LNMV	0.258***	0.341***	−0.083***
	(2.77)	(3.40)	(−3.12)
LEV	0.390*	0.313	0.077
	(1.78)	(1.33)	(0.88)
ROA	−0.721**	−0.583	−0.138
	(−2.16)	(−1.46)	(−0.60)
SOE	0.057	0.097	−0.040*
	(0.77)	(1.28)	(−1.84)
LNANA	0.015	0.007	0.008
	(0.46)	(0.20)	(0.55)
BOARD	0.019	0.002	0.017
	(0.11)	(0.01)	(0.25)
DUAL	−0.171***	−0.166**	−0.004
	(−2.70)	(−2.55)	(−0.36)
SGR_WA	0.015	0.020	−0.005
	(0.81)	(1.27)	(−0.55)
BTM	−0.299*	−0.225	−0.074
	(−1.68)	(−1.21)	(−1.59)
EP	0.222	−0.162	0.384
	(0.46)	(−0.27)	(1.14)
Constant	−6.006***	−7.817***	1.811***
	(−2.95)	(−3.60)	(3.07)
Firm and Year	Yes	Yes	Yes
Observations	8960	8960	8960
N of firms	2397	2397	2397
Adjusted R^2	0.009	0.008	0.001
F	3.501***	3.707***	3.251***

Notes: This table reports the results with a moderator, institutional ownership (*INST*). The dependent variables in Columns (1)–(3) are total insider trading profitability (*TPR(%)*), insider sale profitability (*SPR(%)*), and insider purchase profitability (*BPR (%)*), respectively. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors by firms. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

between CSR and insider trading profitability. The empirical findings in this paper enrich the research on the economic consequences of CSR and the determinants of insider trading profitability.

Our study has policy implications for the regulation of emerging markets. First, firms that disclose CSR information should more fully disclose information concerning insiders' interests to help investors identify the possible self-serving motives of insiders to engage in CSR. Second, corporate governance should be improved, such as by developing institutional investors and increasing analyst coverage, to effectively monitor insiders' opportunistic motivations to engage in CSR activities. Finally, regulators should strengthen information disclosure requirements and restrictions on insider trading to reduce insiders' access to abnormal gains through stock transactions.

Credit author statement

Tao Li: Conceptualization, Methodology, Software, Data curation, Investigation, Writing-Revised version preparation.
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Haomin Li: Conceptualization, Methodology, Investigation.

Declaration of Competing Interest

None.

Table 12
CSR, analyst coverage and insider trading profitability.

	(1)	(2)	(3)
Variables	TPR(%)	SPR(%)	BPR(%)
CSR	0.813***	0.790***	0.023
	(2.82)	(2.74)	(0.58)
CSR × LNANA	−0.170*	−0.191*	0.021
	(−1.67)	(−1.88)	(1.23)
LNANA	0.031	0.025	0.007
	(0.87)	(0.64)	(0.43)
LNMV	0.261***	0.345***	−0.084***
	(2.81)	(3.45)	(−3.13)
LEV	0.384*	0.306	0.078
	(1.75)	(1.30)	(0.88)
ROA	−0.694**	−0.556	−0.138
	(−2.08)	(−1.39)	(−0.60)
SOE	0.063	0.103	−0.040*
	(0.84)	(1.36)	(−1.85)
INST	0.307*	0.227	0.080
	(1.84)	(1.31)	(1.23)
BOARD	0.012	−0.005	0.017
	(0.07)	(−0.03)	(0.24)
DUAL	−0.172***	−0.168**	−0.004
	(−2.72)	(−2.57)	(−0.36)
SGR_WA	0.014	0.020	−0.005
	(0.77)	(1.23)	(−0.55)
BTM	−0.305*	−0.234	−0.072
	(−1.71)	(−1.26)	(−1.57)
EP	0.237	−0.143	0.380
	(0.49)	(−0.24)	(1.13)
Constant	−6.063***	−7.882***	1.820***
	(−2.99)	(−3.64)	(3.08)
Firm and Year	Yes	Yes	Yes
Observations	8960	8960	8960
N of firms	2397	2397	2397
Adjusted R^2	0.009	0.008	0.001
F	3.566***	3.755***	3.180***

Notes: This table reports the results with a moderator, analyst coverage (*LNANA*). The dependent variables in Columns (1)–(3) are total insider trading profitability (*TPR(%)*), insider sale profitability (*SPR(%)*), and insider purchase profitability (*BPR(%)*), respectively. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors by firms. T-values are displayed in brackets. ***, **, and * represent significance at 0.01, 0.05, and 0.1 levels, respectively.

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Appendix A. The Hexun Scoring System (HSS) for listed firms' CSR.

Item	Description
Responsibility toward shareholders	This mainly focuses on financial performance and return to shareholders, such as return on assets or equity and dividend payouts (HSS weight: 30%).
Responsibility toward employees	The sum of the scores on employee income, career training, production safety, and caring for employees (e.g. holiday leave and bonuses) (HSS weight: 15%).
Responsibility toward suppliers, customers, and consumers	The sum of the scores on product quality, after-sale services, consumer satisfaction, and fair competition for suppliers (HSS weight: 15%).
Environmental responsibility	The sum of the scores on environmental management system certification, input in environmental protection, pollutant emission, and energy saving (HSS weight: 20%).
Public responsibility	The sum of the scores on income tax payment (as a percentage of total earnings) and public welfare donations (HSS weight: 20%).

Appendix B. Main results with the profitability of non-routine insider trading.

(*continued on next page*)

(*continued*)

Variables	(1) TPR_NR(%)	(2) TPR_NR(%)	(3) SPR_NR(%)	(4) SPR_NR(%)	(5) BPR_NR(%)	(6) BPR_NR(%)
CSR	0.378***	0.222***	0.380***	0.196***	−0.002	0.027*
	(4.52)	(3.12)	(4.45)	(2.67)	(−0.12)	(1.73)
LNMV		0.357***		0.436***		−0.079***
		(4.63)		(5.57)		(−3.63)
LEV		0.519***		0.550***		−0.032
		(4.65)		(4.91)		(−1.00)
ROA		−0.524***		−0.436*		−0.088
		(−2.59)		(−1.91)		(−0.54)
SOE		−0.018		0.072*		−0.090
		(−0.20)		(1.78)		(−1.21)
LNANA		0.003		−0.007		0.010
		(0.13)		(−0.29)		(1.00)
INST		0.019		−0.058		0.077***
		(0.34)		(−1.03)		(3.18)
BOARD		0.034		0.045		−0.011
		(0.25)		(0.36)		(−0.22)
DUAL		−0.066		−0.054		−0.012*
		(−1.46)		(−1.18)		(−1.93)
SGR_WA		0.004		0.005		−0.001
		(0.27)		(0.36)		(−0.36)
BTM		−0.037		−0.042		0.005
		(−0.49)		(−0.54)		(0.27)
EP		−0.144		−0.266		0.123
		(−0.40)		(−0.71)		(0.75)
Constant	−0.048***	−8.199***	−0.060***	−10.021***	0.012***	1.822***
	(−3.37)	(−4.50)	(−4.22)	(−5.53)	(4.95)	(3.22)
Firm and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,860	15,860	15,860	15,860	15,860	15,860
N of firms	2718	2718	2718	2718	2718	2718
Adjusted R^2	0.006	0.016	0.007	0.020	0.004	0.009
F	9.413	5.369	10.40	5.954	6.933	6.044

Notes: This table reports the results of the following model:$Profit_{it} = \alpha_i + \alpha_t + \alpha_1 CSR_{i,\,t-1} + \sum_j \alpha_j Control_{j,\,it} + \varepsilon_{it}$. First, we run the model without control variables except firm (*Firm*) and year (*Year*) fixed effects, and results are displayed in Columns (1), (3), and (5). Second, we run the whole model; results are reported in Columns (2), (4), and (6). The dependent variables in Columns (1)–(6) are **non-routine** insider trading profitability (*TPR_NR(%)*), **non-routine** insider sale profitability (*SPR_NR(%)*), and **non-routine** insider purchase profitability (*BPR_NR(%)*), respectively. *CSR* refers to CSR performance. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors at the firm level. t-values are displayed in brackets. ***, **, and * represent significance at the 0.01, 0.05, and 0.1 levels, respectively.

Appendix C. DID tests in the subsample when firms located in earthquake regions are removed.

Variables	(1) TPR(%)	(2) SPR(%)	(3) BPR(%)	(4) TPR(%)	(5) SPR(%)	(6) BPR(%)
POST	0.085*	0.098**	−0.013*	0.105**	0.108**	−0.003
	(1.89)	(2.30)	(−1.80)	(2.05)	(2.20)	(−0.49)
Constant	−5.865***	−7.312***	1.447***	−0.896	−1.077	0.181
	(−3.59)	(−4.18)	(3.00)	(−0.60)	(−0.71)	(1.19)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Firm and Year	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9269	9269	9269	3184	3184	3184
N of firms	2199	2199	2199	563	563	563
F	3.261	3.658	2.725	1.285	1.642	0.993

Notes: This table reports the results of DID tests in the subsample where firms located in earthquake regions are removed. Columns (1)–(3) include the analysis for the unmatched sample and Columns (4)–(6) include the analysis for the matched sample. The dependent variables in Columns (1)–(6) are total insider trading profitability (*TPR(%)*), insider sale profitability (*SPR(%)*), and insider purchase profitability (*BPR(%)*), respectively. *Control* refers to a vector of control variables. Please refer to Table 1 for variable definitions. Following Petersen (2009), we cluster standard errors at the firm level. t-values are displayed in brackets. ***, **, and * represent significance at the 0.01, 0.05, and 0.1 levels, respectively.

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