

The Effect of Mandatory CSR Disclosure on Information Asymmetry: Evidence from a Quasi-natural Experiment in China

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ABSTRACT

Using a quasi-natural experiment that mandates a subset of listed firms to issue corporate social responsibility (CSR) reports, this paper examines the effect of mandatory CSR disclosure on market information asymmetry in China, where we estimate information asymmetry using high-frequency trade and quote data. We find that contrary to the criticism that mandatory CSR disclosure lacks credibility and relevance in emerging markets, mandatory CSR reporting firms experience a decrease in information asymmetry subsequent to the mandate. In additional analysis we further find that this relation is more pronounced for firms with greater political/social risk and firms with less analyst coverage.

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The Effect of Mandatory CSR Disclosure on Information Asymmetry: Evidence from a Quasi-natural Experiment in China

Corporate social responsibility (CSR) has become a key business practice in recent years, with its disclosure now one of the most important reporting issues in global business environments (KPMG and UNEP, 2010). A large body of literature examines the firm value and other capital market effects of CSR (Margolis et al., 2007; Hong and Kacperczyk, 2009; Dhaliwal et al., 2011) by focusing on *voluntary* CSR disclosure or other CSR-related activities in *developed markets*. However, this research does not provide evidence on the effect of *mandatory* CSR disclosure in *emerging markets*, where concerns related to child labor, food safety, working condition, and environmental abuses have led to an unprecedented increase in CSR initiatives by regulators in recent years.¹ Proponents of mandatory CSR reporting argue that such disclosure is critical to achieve stakeholder engagement and corporate accountability. Critics, in contrast, argue that such disclosure lacks credibility and relevance, and is just another regulatory burden on firms (Lin, 2010). Some management studies further argue that mandatory CSR reporting often results in empty rhetoric and biased information that may actually work against corporate accountability (Owen et al., 2001; Hess, 2007; Hess and Dunfee, 2007). Our study attempts to shed light on this debate by examining the impact of mandatory CSR disclosure on market information asymmetry in China.

¹ See Bonacchi et al. (2012), Du (2012), and Ballinger (2008) for examples of abuses related to child labor, food safety, and environmental conditions, respectively. Even in the developed world, whether CSR reporting should be mandatory or voluntary is a hotly debated issue. For example, on February 3, 2011, the Global Reporting Initiative, the European Trade Union Confederation, and the European Coalition for Corporate Justice all submitted responses to the EU Commission's public consultation on disclosure of non-financial information, urging the European Commission to introduce new regulation requiring companies in both industrialized and developing countries to report on their environmental, social, human rights, and governance impacts. In the U.S., similar discussions have also been raised (see 'CSR reporting may become mandatory,' *CBS News*, January 8, 2009).

China offers a unique setting to test the effect of CSR disclosure on market information asymmetry for several reasons. First, the Shanghai and Shenzhen stock exchanges required a subset of listed Chinese firms to issue CSR reports as of the end of 2008, which provides a quasi-natural experimental research setting that allows us to compare changes in the treatment group with changes in the control group subsequent to mandatory CSR disclosure. Second, the CSR mandate in China requires publication of a stand-alone CSR report on economic, environmental, social, and governance performance and has implications on shareholders and various stakeholders. As the world's second largest economy, China is economically significant and provides rich market depth for our empirical tests to explore cross-sectional variation in the effect of this disclosure reform. Third, CSR-related activities are viewed by the Chinese government as a significant force that can contribute to "building a harmonious society" because of the severity of the social and environmental issues they address (Fisman and Wang, 2012).² Thus, in China CSR performance is important for gaining support from the government, and its disclosure is important for investors to assess the risk facing the firm in the future. However, such disclosure is also subject to skepticism due to concerns over disclosure quality. By providing evidence from the Chinese capital markets, we contribute to this debate and improve our understanding of the importance of non-financial disclosure in emerging markets.

We focus on market information asymmetry effects of mandatory CSR disclosure because this is a fundamental question of disclosure. Market information asymmetry arises when some investors possess private information about the firm's value while other uninformed investors only

² Examples of social and environmental issues include toxic products, labor abuse, chemical leaks, and environmental disasters (Fisman and Wang, 2012). For example, the 2008 Great Sichuan Earthquake, which left more than 86,000 dead or missing and millions homeless, triggered a tidal wave of corporate donations and unprecedented demand for public disclosure on these activities (see 'The Sichuan earthquake-salt in their wounds,' *Economist*, May 14, 2009). Also in 2008, the melamine-laced milk scandal that sickened thousands of Chinese babies focused public attention on firms' social responsibilities (see 'Tainting of milk is open secret in China,' *Wall Street Journal*, November 3, 2008).

have access to public information. Disclosure essentially turns private information into public information and may therefore reduce information asymmetry. Information asymmetry is also an important topic on its own because a large body of literature suggests that the presence of information asymmetry creates an adverse selection problem, deters efficient resource allocation, reduces market liquidity, and increases a firm's required rate of returns (Akerlof, 1970; Diamond and Verrecchia, 1991; Healy and Palepu, 2001; Easley and O'Hara, 2004). Thus, an investigation of the effect of mandatory CSR disclosure on information asymmetry is central to assess potential effects of such disclosure on other economic consequences such as corporate governance, liquidity, and the cost of capital.

The effects of mandatory CSR disclosure on market information asymmetry are not obvious, as there are arguments suggesting negligible capital market effects as well as arguments supporting significant effects. For example, mandatory CSR disclosure may have no impact on information asymmetry if the reports are purely window dressing, that is, if the reports contain no new information. However, mandatory CSR disclosure may reduce information asymmetry if the reports are informative about firms' social and political risk, and therefore help investors assess a firm's future prospects.³ If CSR disclosure under mandatory reporting substitutes for the private information held by informed investors, such disclosure should reduce uninformed investors' information disadvantage and in turn decrease information asymmetry in the market. It is thus an empirical question whether mandatory CSR disclosure reduces information asymmetry in an emerging market such as China.

³ While mandatory CSR reports are not subject to detailed measurement rules and typically are not independently audited, they are often subject to intense monitoring by a firm's stakeholders (such as the government, employees, and consumers) and are relatively easy to verify from other public sources (such as inspection results from government agencies and the media). Thus, stakeholder monitoring may substitute for third-party verification and constrain managers' opportunistic reporting behaviors.

We test the effect of mandatory CSR disclosure on information asymmetry using a sample of A-share listed firms in China over the 2006 through 2010 period. We include all A-share listed firms, except for firms that voluntarily release CSR reports during our sample period.⁴ We use high-frequency trade and quote data to construct two proxies for information asymmetry based on microstructure models of the bid-ask spread. Following the theoretical models of Kyle (1985) and Easley and O'Hara (1987) and the empirical analysis of Glosten and Harris (1988), Sadka (2006), and Chan et al. (2008), our first measure of information asymmetry captures the price impact of a trade (PI) and our second measure captures the adverse selection component of the bid-ask spread (AS).⁵ A higher value indicates greater information asymmetry. The intuition behind these measures is that when information asymmetry exists, informed traders submit order to profit from future price changes. In response, market makers would widen the spread to recover their loss to the informed traders from the uninformed investors.

We use two research designs in our empirical tests: (1) a baseline difference-in-differences approach, which we term 'DID method' and (2) a propensity-score-matched difference-in-differences approach, which we term 'DID-PSM method.' The DID method compares the *changes* in a firm's information asymmetry measures for firms that are mandated to release CSR reports (i.e., treatment firms) with the *changes* for firms that are not subject to the mandate (i.e., benchmark firms). This comparison helps control for other concurrent macro-economic shocks that may affect information asymmetry but are unrelated to the mandate. The DID-PSM method restricts our difference-in-differences analysis to a propensity-score-matched sample. This method

⁴ Voluntary release of CSR reports is uncommon in China. Specifically, we find that only 6% of domestically listed Chinese firms voluntarily release CSR reports during our sample period, 2006-2010. This is likely due to the fact that the disclosure of CSR activities typically requires that various reporting mechanisms be put in place, which is a non-trivial task. In addition to direct costs of preparing CSR reports, managers may also be reluctant to voluntarily release CSR reports due to concerns of proprietary costs. That is, CSR reports may attract pressure from various interested groups and allow competitors to infer operating efficiency and strategic plans of a firm.

⁵ The other components of the bid-ask spread include inventory holding costs, clearing fees, and monopoly profits.

addresses the concern that our treatment firms are not randomly selected (i.e., they tend to be larger and with better performance) by making non-CSR reporting firms more comparable with the mandatory CSR reporting firms.

Our analysis shows that compared to control firms not subject to the mandate, treatment firms experience a decrease in information asymmetry subsequent to the CSR mandate. Thus, contrary to the common criticism that mandatory CSR disclosure is simply window dressing or greenwash, our results suggest that mandatory CSR disclosure is informative and therefore leads to a decrease in information asymmetry among investors.

We next explore possible mechanisms through which mandatory CSR disclosure reduces information asymmetry in China. We first posit that CSR disclosure reduces information asymmetry by helping investors assess a firm's political or social risk.⁶ Since the government retains tight control over the corporate sector with an eye toward maintaining social stability, firms with greater political or social risk are more likely to incur large penalties and jeopardize their operation when they are involved in social and environmental scandals (Calomiris et al., 2010; Chen et al., 2011). This argument suggests that mandatory CSR disclosure should be more valuable to the market and therefore lead to a larger reduction in information asymmetry for firms with greater political or social risk. For example, compared to politically connected firms, non-politically connected firms have greater political or social risk and are more vulnerable to negative CSR-related shocks. Uninformed investors should therefore find mandatory CSR disclosure of non-politically connected firms to be more useful because such disclosure informs them about what the firm has done to avoid negative CSR-related shocks. Consistent with our prediction, we find that the effect of mandatory CSR disclosure on information asymmetry is more pronounced

⁶ Political risk generally involves execution of political power that threatens a company's value. Social risk often refers to challenges by stakeholders due to negative perceptions of business practices (Bekefi and Epstein, 2006). Since the distinction between political and social risk is often blurred in China, we do not separate them in this paper.

among treatment firms with greater political or social risk (i.e., firms that have lower government ownership, that are not politically connected, and that make fewer donations).

A second possible mechanism through which mandatory CSR disclosure reduces information asymmetry is increased analyst coverage. Again as predicted, we find that our treatment firms experience an increase in analyst following subsequent to the CSR mandate. Further, we find that the decrease in information asymmetry is greater for treatment firms with lower analyst following, consistent with our expectation that increased disclosure is most helpful for firms in poor information environments.⁷ Finally, we find that our conclusions continue to hold when we control for time trend, run a placebo test, and delete observations in 2008.

Our findings make several contributions to the literature. First, by providing insights into the economic consequences of an important aspect of CSR-related activities (namely, mandatory CSR disclosure), our study compliments prior work in financial economics that examines the effects of CSR-related activities on stock returns, institutional investors' portfolio choices, analyst coverage, and firm practices (Teoh et al., 1999; Hong and Kacperczyk, 2009; Ioannou and Serafeim, 2012). Compared to prior work, our quasi-natural experimental setting allows us to better identify the effect of mandatory CSR-related activities. Further, despite the push for government-mandated CSR disclosure worldwide, there is limited evidence on the capital market effects of mandatory CSR disclosure. To the best of our knowledge, we are the first to provide such evidence. Our findings improve our understanding of the implications of mandatory CSR reporting by documenting its effect on a firm's information asymmetry.

⁷ To shed light on the disclosure quality debate, we also perform several analyses on CSR disclosure ratings. We find that CSR disclosure ratings are higher for firms that are larger and have higher government ownership, suggesting that CSR activities and their disclosure are costly and subject to political factors. We also find that mandatory CSR disclosure reduces information asymmetry in both high and low CSR disclosure rating firms, but the effect is insignificantly different across these two subsamples. Collectively, our findings suggest that the informativeness of CSR reports primarily depend on a firm's information environment and risk attributes. CSR reports are informative even among firms with a relatively low level of disclosure.

Second, our study highlights the importance of political and social factors on the effect of mandatory CSR disclosure. Our findings suggest that non-financial disclosure associated with the CSR mandate in China reduces information asymmetry by helping investors assess political or social risk. These results complement prior research that finds that political affiliations affect CSR-related activities (Hong and Kostovetsky, 2012; DiGuili and Kostovetsky, 2012).

Finally, our study contributes to the research on the economic consequences of disclosure regulation. Prior studies find that mandatory adoption of International Financial Reporting Standards (IFRS) leads to positive economic consequences only in countries with strong law enforcement (DeFond et al. 2011). Several studies focusing on China, a country typically perceived to be a weak law enforcement country, further suggest that mandatory IFRS adoption introduces more opportunities of earnings management and reduces earnings quality for Chinese firms (DeFond et al., 2012; He et al., 2012). In contrast, our findings suggest that mandatory adoption of CSR reporting, which largely consists of non-financial disclosure on social, environmental, and governance performance, significantly reduces information asymmetry in China.

The remainder of the paper is organized as follows: Section 1 discusses the institutional background, related literature, and our empirical predictions. Section 2 presents our sample and data. Section 3 describes empirical results and Section 4 reports additional analysis and sensitivity tests. Section 5 concludes.

1. Institutional Background, Related Literature, and Empirical Predictions

1.1. Background on China's CSR initiatives

While worsening working and environmental conditions in China were largely tolerated during the rapid economic growth in the 1990s, they have taken a heavy toll in recent years and have

become an alarming issue. For example, according to a special report by China's State Environmental Protection Administration (SEPA) and the World Bank in 2007, the combined health and non-health costs of outdoor air and water pollution in China amount to roughly US\$ 100 billion a year (5.8% of China's GDP).⁸ In addition, due to weak legal institutions in China, unresolved labor and environmental disputes often lead to protests and threaten social instability. As a result of growing concerns about social and environmental problems in China (Locke and Romis, 2007; Lin, 2010), anti-sweatshop and anti-pollution movements in the global supply chain, and the view that CSR can contribute to "building a harmonious society" (the long-term goal of the Chinese Communist Party), the Chinese government and stock exchange regulators have launched an unprecedented number of CSR initiatives in recent years.

For example, the amended PRC Company Law, effective since January 2006, explicitly refers to CSR.⁹ In addition, in December 2008 the Shanghai Stock Exchange (hereafter SHSE) and the Shenzhen Stock Exchange (hereafter SZSE) issued "*Notice Concerning Listed Companies' Preparation for 2008 Annual Reports*" that **mandated** -- for the first time -- a subset of listed firms to issue CSR reports along with annual reports starting with the reports for fiscal year 2008, which were released in 2009 (Noronha et al., 2012). The SHSE imposed the requirement on three types of its listed companies: firms included in the SHSE "Corporate Governance Index," financial firms, and firms with overseas listed shares; the SZSE imposed the requirement on firms included in the SZSE 100 index. According to the relevant regulations (SZSE, Social Responsibility Instructions to Listed Companies), the CSR report shall include, but not be limited to, the following: (1)

⁸ See 'Cost of pollution in China' by the World Bank. According to the article, the calculation of premature deaths was removed from the final report for fear of provoking "social unrest" (see '750,000 a year killed by Chinese pollution,' *Financial Times*, July 2, 2007).

⁹ Article 5 states that "*In conducting business operations, a company shall comply with the laws and administrative regulations, social morality, and business morality. It shall act in good faith, accept the supervision of the government and general public, and bear social responsibilities*".

implementation of social responsibility activities related to employee protection, impact on the environment, product quality, and community relationships; (2) assessment of implementation of the Social Responsibility Instructions and reasons for the gap, if any; and (3) measures for improvement and timetable. These requirements provide a unique research setting that allows us to compare changes in information asymmetry for the treatment group (i.e., firms subject to the CSR mandate) with changes in information asymmetry for the benchmark group (i.e., firms not subject to the mandate) subsequent to 2008.

We note that our treatment firms are not randomly selected – they are constituents of key stock exchange indexes and are typically large in size. Thus, the policy reform may not be viewed as a purely natural experiment for a standard difference-in-differences research design. We mitigate this concern by implementing a DID-PSM method that attempts to make our treatment and benchmark groups more comparable. We caveat, however, propensity score matching is based on observable variables. If our treatment firms and control firms differ on unobservable dimensions, our DID-PSM method will not be able to address such a concern. Thus, we provide further corroborating evidence to our main argument using cross-sectional analysis.

We also note that the 2008 SHSE notice also requires listed companies to disclose the directors' self-evaluation reports of the internal control. However, this requirement mainly specifies the format guideline for internal control reports because firms were already required to provide information on internal control by SHSE and SZSE in 2006 and formally by the China Securities Regulation Commission in 2007. During our sample period, China also mandated the adoption of International Financial Reporting Standards (IFRS) as of January 1, 2007. Our placebo test discussed in Section 5 does not find evidence suggesting that our treatment firms experience a

decrease in information asymmetry subsequent to 2007. Thus, our results are unlikely to be driven by other concurrent regulatory changes or time trend.

1.2. Related literature and empirical predictions

CSR reporting typically involves disclosure on a company's economic, environmental, social, and governance performance. CSR disclosures can help investors assess potential environmental and social liabilities of the firm. In addition, since socially responsible firms appeal to socially aware consumers and investors (Hong and Kacperczyk, 2009), CSR disclosure also serves as an important way to communicate with stakeholders and investors. Consistent with the notion that CSR disclosure is informative, prior studies find that CSR disclosure is associated with a reduction in a firm's cost of capital and an increase in analyst following (Dhaliwal et al., 2011). However, due to data constraint, this literature generally focuses on *voluntary* disclosure, where firms self select to provide information, in *developed* economies, where legal institutions are generally strong. Thus, the informativeness of mandatory CSR disclosure in emerging markets has not been fully explored.

Mandatory CSR disclosure may not be informative and thus have a negligible effect on market information asymmetry in China for at least two reasons. First, despite its impressive economic growth, China is commonly viewed as having weak legal institutions and poor protection of property rights, and its capital market is characterized by prevalent earnings manipulation and high stock return synchronicity (Morck et al., 2000; Chen and Yuan, 2004). Prior research therefore finds that the value of financial disclosure and the benefits of mandatory reporting regulation tend to be limited in China. For example, Barber et al. (2013) find that while earnings announcement premia generally exist across the globe, such a phenomenon is absent in China. In addition, He et

al. (2012) suggest that mandatory adoption of high quality accounting standards such as International Financial Reporting Standards (IFRS) do not increase earnings' usefulness in China. Second, CSR reports in China typically are not audited and the quality of CSR disclosure tends to be low. According to a recent report by CSR consulting firm SynTao, only 5% of the 535 CSR reports surveyed in 2009 were independently audited and over 50% of the reports counted no more than ten pages (SynTao, 2009). Critics argue that a CSR report without a third-party inspection is no more than a company brochure, and they urge companies to invite third-parties to supervise their CSR reports ('Study: China's CSR reports need improvement,' *Global Times*, November 25, 2010). Not surprisingly, there is much skepticism about the usefulness of mandatory CSR disclosure in China, with the common concern being that these reports are simply window dressing (SRI, 2010).

One the other hand, there are reasons to believe that mandatory CSR disclosure may be informative, and in turn reduce market information asymmetry, in China. First, increased disclosure may help uninformed investors reduce their information disadvantage relative to more informed investors (Diamond and Verrecchia, 1991; Baiman and Verrecchia, 1996). In our setting, when CSR reports are not publically available and some investors (such as institutional investors) are better informed about companies' CSR activities due to lower information acquisition costs, there is high information asymmetry in the market. Mandatory CSR disclosure makes it easier for less informed investors to acquire information on companies' CSR activities, thereby reducing their information disadvantage and decreasing information asymmetry among different types of investors.¹⁰

¹⁰ This empirical prediction is based on evidence from extant literature that increased disclosure resulting in significant economic consequences reduces information asymmetry. We note, however, that from a purely theoretical perspective, increased disclosure may exacerbate information asymmetry. Specifically, prior theoretical models suggest that to the extent that sophisticated investors have lower information processing costs and better ability to help

Second, as a practical matter, CSR performance is important to gain support from government and non-governmental organizations due to the severity of pollution and worker safety problems in China (Fisman and Wang, 2012). Consequently, CSR disclosure is critical in assessing a firm's future social and political risks, and thus should help reduce information asymmetry in the capital market. For example, coal mine accidents are common in China, resulting in thousands of deaths each year (see 'Management blamed in China mine blast that kills 104,' *CNN World*, November 23, 2009). Non-financial disclosures such as the mortality rate and spending on safety controls are therefore important in assessing the future prospects of mining firms. Similarly, due to the heavy toll of worsening environmental conditions, disclosures on wastewater discharge and environmental protection projects are important in evaluating the growth prospects of industrial firms in China. The 2010 toxic waste leakages of Zijin Mining Group, China's leading gold and copper producer, illustrate this point. The two leakages from its mine not only poisoned a river and devastated the surrounding area, but also resulted in a significant decline in share price and a substantial loss of firm value. In addition, the leakages prompted a government probe into the timing of the accident disclosures, and led to various enforcement actions including imprisonment of several senior executives (see 'Zijin mining pollution draws Beijing's Ire,' *BusinessWeek*, July 22, 2010). The company's expansion plan was also stalled due to deteriorating relations with the government. Not surprisingly, in its 2010 sustainability report (29 pages long, in Chinese), Zijin mining provides extensive disclosure on both the incidents and corrective measures taken.

Last but not least, while mandatory CSR reports typically are not independently audited or inspected, they are often subject to intense monitoring from stakeholders and can be verified from

interpret CSR disclosures, increased disclosure may actually increase the extent of information asymmetry between sophisticated and unsophisticated investors (Indjejkian, 1991; Kim and Verrecchia, 1994, 1997). Furthermore, a recent study by Kondor (2012) suggests that public disclosure might increase disagreement among agents in higher-order expectations when investors have different trading horizons and when they collect private information on different dimensions of the fundamentals.

various public sources (such as the inspection results from environmental protection bureaus and media coverage of fraudulent business practices). Thus, stakeholder monitoring of CSR disclosure may substitute for third-party verification and increase the credibility of the reports.

2. Sample Selection and Descriptive Statistics

2.1. Data sources, sample selection, and estimation

Our sample consists of 7,059 firm-year observations from 2006 to 2010. Our initial sample includes all 1,967 A-share (local shares) listed firms with required financial and trading data after excluding 106 firms with B-shares (foreign shares) because they are subject to different market trading mechanisms. We also exclude 119 firms that voluntarily issue CSR reports during our sample period because they confound the identification of the treatment effect of mandatory CSR disclosure. Our treatment group includes 270 listed A-share firms (1,312 firm years) on the SHSE and SZSE that issued individual CSR reports starting from fiscal year 2008 due to the mandate. Our control group includes 1,578 remaining A-share firms (5,747 firm years) on the SHSE and SZSE. Since mandatory CSR reports typically did not become publicly available until April 2009, we code 2006-2008 as pre-adoption years and 2009-2010 as post-adoption years.¹¹ In addition, we obtain stock trading data from GTA and financial information from its China Security Market and Accounting Research (CSMAR) database.

We use high-frequency trade and quote data to construct two proxies for information asymmetry based on market microstructure models. Our first proxy captures the price impact of a trade based on the theoretical model in Kyle (1985)'s seminar paper. Specifically, Kyle (1985) proposes a linear relation between order flows and price changes (i.e., price impact), with a higher price impact indicating greater information asymmetry. Following Glosten and Harris (1988) and

¹¹ Additional analysis finds that our result is not sensitive to excluding the transition year, 2008.

Chan et al. (2008), we estimate the price impact measure using the following structural model:

$$\Delta P_t = \gamma Q_t V_t + \varphi(Q_t - Q_{t-1}) + e_t \quad (1)$$

Where P is transaction price, V is trade size, and Q is trade sign (i.e., +1 for a buyer-initiated transaction and -1 for a seller-initiated transaction).¹² γ is the price impact coefficient that captures the degree of information asymmetry. Chan et al. (2008) document that for their sample of 76 Chinese firms with A- and B- shares the mean estimate of γ is 9.66×10^{-7} Yuan per share for the A-share market from January to December 2000. Given the small value of γ , we calculate our price impact measure by taking a natural logarithm of γ multiplied by 10^7 . Specifically, we define our price impact measure, $\log PI$, as follows:

$$\text{LogPI} = \text{Log}(\gamma * 10^7) \quad (2)$$

Our second proxy for information asymmetry captures the adverse selection component of the bid-ask spread, which is based on an extension of the price impact parameter as estimated in equation (1). Following prior studies (Easley and O'Hara, 1987; Glosten and Harris, 1988; Lin et al., 1995), we decompose the bid-ask spread to calculate its adverse selection component using the following structural model:

$$\Delta P_t = c_0(Q_t - Q_{t-1}) + c_1(Q_t V_t - Q_{t-1} V_{t-1}) + z_0 Q_t + z_1 Q_t V_t + e_t \quad (3)$$

In this model, $z_0 + z_1 Q_t V^*$ reflect the adverse selection component of the bid-ask spread, where V^* is the median order size. Sadka (2006) simplifies the calculation by using z_1 directly as a measure of information asymmetry. We therefore follow Sadka to ease the calculation before applying a

¹² Following prior studies (Lee and Ready, 1991; Chan et al., 2008), we use the following rule to classify trades as buyer- or seller-initiated: (1) if a transaction occurs above the prevailing quote midpoint, we classify it as a purchase and vice versa, and (2) if a transaction occurs exactly at the quote midpoint, we sign it using the previous transaction price according to the tick test (i.e., a purchase if the sign of the last nonzero price change is positive and vice versa).

logarithm transformation of z_1 multiplied by 10^8 . Thus, we define our adverse selection component of the bid-ask spread, $logAS$, as follows:

$$LogAS=log(z_1*10^8) \tag{4}$$

2.2. Descriptive statistics

Table 1 presents descriptive statistics of the variables used in our analysis for the full sample. Table 2 describes the propensity score matching procedure and evaluates the effectiveness of the match. The propensity-score-matching approach involves pairing treatment and control firms based on similar observable characteristics (Dehejia and Wahba, 2002). We implement this procedure by first estimating a logit regression to model the probability of being a treatment firm using the pre-shock period data. We then match each treatment firm to the control firms using the nearest neighbor matching technique (with replacement, and caliper set at $0.25*$ standard error of propensity score).

Panel A of Table 2 presents the logit regression model using data prior to the mandate. We find that the likelihood of being a mandatory CSR reporting firm is greater among firms with greater market value, higher return on assets, greater government ownership, and more analyst following. Panel B presents results evaluating the effectiveness of the matches. This panel shows a substantial reduction in the differences of firm characteristics subsequent to the match, suggesting that the matches are effective. Specifically, the panel shows that the differences in firm characteristics used in the pre-period determinant model, including our information asymmetry measure, all become insignificant at conventional levels.

Table 3 presents the correlations among variables used in our analysis for the full sample (lower diagonal) and the PSM sample (upper diagonal). Consistent with prior studies (Chan et al.,

2008), the table shows that our two measures of information asymmetry are highly correlated, with a correlation coefficient of 0.946 for the full sample and 0.930 for the PSM sample. In addition, consistent with the view that larger firms have less information asymmetry in the stock markets, we find that the correlation between $\log PI$ and $\log(\text{Market value})$ is -0.254 for the full sample and is -0.237 for the PSM sample.

3. Empirical Results

Our analysis regresses measures of information asymmetry on a dummy variable indicating whether the period is post mandatory CSR reporting (*Post*) and its interaction with a dummy variable indicating whether the firm is mandated to provide CSR reports (*Treatment firms*). This interaction term captures the change in information asymmetry for treatment firms after 2008 relative to the change for control firms. To control for differences in firm characteristics and year effects, we include firm and year fixed effects in all of our regression. In addition, our full regression model includes several firm characteristics that are likely correlated with measures of information asymmetry: firm size, share turnover, stock returns, accounting profitability, and government ownership.¹³ Our regression model is as follows:

$$\text{Measure of information asymmetry} = \beta_0 + \beta_1(\text{Post} * \text{Treatment firms}) + \beta_j(\text{Controls}_j) \quad (5)$$

Appendix A reports variable definitions. A negative coefficient on β_1 is consistent with a decrease in information asymmetry and a positive coefficient on β_1 is consistent with an increase in information asymmetry. We use robust standard errors clustered by firm throughout our analysis.

¹³ We do not include a dummy variable indicating whether the year is post mandatory CSR reporting (*Post*) or whether the firm is a treatment firm (*Treatment firms*) because our regression model includes firm and year fixed effects. In addition, we note that the effects of firm characteristics are estimated imprecisely because the firm fixed effects absorb most of the variation across firms.

Table 4 presents results of the regression analysis. Models 1-4 show results using *logPI* as the dependent variable, with Models 1-2 reporting the results based on the DID method and Models 3-4 reporting the results based on the DID-PSM method. Models 5-8 follow the same pattern and show results using *logAS* as the dependent variable.

Table 4 shows that the coefficient on *Post*Treatment firms* is significantly negative at $p \leq 10\%$ (two-tailed) throughout various specifications. Since the coefficients of independent variables on regressions with a log-transformed dependent variable indicate percentage changes, we can easily see that based on the coefficients on *Post*Treatment firms* in Models 2 and 6, the average *PI* and *AS* decrease by 18.8% and 25.6% for treatment firms relative to the control firms when using the DID estimation method. Thus, the decrease in information asymmetry for our treatment firms is economically significant. The coefficient on *Post*Treatment firms* becomes smaller when using the DID-PSM estimation method. For example, it decreases from -0.188 in Model 2 to -0.112 in Model 4. This finding suggests that the DID-PSM estimation method results in the most conservative estimate, likely because this benchmark sample is most comparable to our treatment sample.

In summary, the results of our analysis suggest that mandatory CSR reporting firms experience a decrease in information asymmetry subsequent to the CSR mandate. Thus, contrary to the common criticism that mandatory CSR disclosure is simply window dressing, our result suggests that mandatory CSR disclosure in China is informative and helps improve a firm's information environments. This finding is consistent with the notion that social and environmental disclosure, while lacking mature reporting framework, remains an important information source to investors in an environment that is characterized by frequent social/environmental disasters and large political/social penalties associated with these disasters.

4. Additional Analysis and Robustness Checks

4.1. The effect of mandatory CSR disclosure conditional on firms' political/social risk

We propose that an important mechanism through which CSR disclosure reduces information asymmetry in China is that investors find such disclosure useful in assessing a source of risk that is critical for companies in emerging economies – political/social risk. Since the government retains a tight control over the corporate sector and focuses on maintaining social stability, firms with greater political or social risk (e.g., those without strong political ties) not only are less likely to enjoy favorable regulatory treatments and government support, but also are more likely to incur larger penalties when violating labor and environmental standards (Calomiris et al., 2010; Chen et al. 2011; Hung et al., 2012).¹⁴ Uninformed investors should therefore find CSR disclosure of firms with greater political or social risk to be more useful because such disclosure informs them about what the firm has done to avoid negative CSR-related shocks. Consequently, we expect that mandatory CSR disclosure of firms with greater political or social risk results in a greater decrease in information asymmetry.

To test this prediction, we perform analysis conditional on a firm's political/social risk. We use three variables to capture political/social risk: government ownership, political connections, and donations. The notion underlying these measures is that greater government ownership, stronger political connections, and larger donations can help firms mitigate unfavorable government intervention and tension between the firm and its stakeholders (e.g., Ma and Parish, 2006; Wang and Qian, 2011). Following Calomiris et al. (2010), we define a firm as politically connected if one of its top executives ever worked as a (deputy) chief office in the city-level (and above)

¹⁴ For example, Chen et al. (2011) find that compared to private companies, state-owned enterprises are punished less severely when violating government regulation. Similar cases are discussed in Calomiris et al. (2010, p.400).

government, i.e., *Chuji* and above. We classify a firm as having greater political/social risk if its government ownership is below the sample firm-level median, it is not politically connected, or its level of donations is below the sample firm-level median. We then estimate our full model in Table 4 in each of these political/social risk partitions and test whether the coefficient on *Post*Treatment firms* differs across the partitions. For parsimony, we only report results based on *logPI* in this and the remaining analyses. Results based on *logAS* are qualitatively the same, which is not surprising because these two measures are highly correlated as indicated in Table 3.

Table 5 summarizes the results of this analysis. Panel A of the table reports the results using the DID estimation method and Panel B reports the results using the DID-PSM method. Consistent with our expectation, both panels show that the coefficient on *Post*Treatment firms* is more negative in the partition indicating greater political/social risk. Thus, the findings indicate that mandatory CSR reporting firms with greater political or social risk (i.e., firms that have lower government ownership, that are not politically connected, and that make fewer donations) experience a greater reduction in information asymmetry following the CSR mandate.

4.2. Mandatory CSR disclosure and analyst following

We propose that another mechanism through which mandatory CSR disclosure reduces a firm's market information asymmetry is increased analyst coverage. Analysts are important information intermediaries and prior literature suggests that firms with better disclosure quality attract greater analyst following because increased disclosure reduces analysts' information acquisition costs (Lang and Lundholm, 1996). If our inference is correct that mandatory CSR disclosure provides useful information to the market, we expect the releases of CSR reports to increase analyst following, which in turn help reduce information asymmetry in the market. In

addition, we expect the effect of increased disclosure associated with mandatory CSR reporting to be more pronounced among firms with fewer analyst following, a common proxy for poor environment environments.

We perform analysis examining the impact of mandatory CSR disclosure on analyst following by replacing our dependent variable in Table 4 with a variable measuring analyst coverage, defined as $\log(1 + \text{number of analysts})$.¹⁵ Panel A of Table 6 presents results of this analysis using both the DID estimation method and the DID-PSM estimation method. The panel shows that the interaction term *Post*Treatment firms* is significantly positive at $p < 1\%$ (two-tailed) in all models, suggesting that treatment firms experience a greater increase in the number of analyst following. Thus, the finding is consistent with our expectation that mandatory CSR reporting reduces information asymmetry through increased analyst coverage.

To test the effect of mandatory CSR reporting conditional analyst following, we label firms with the number of analysts above (below or equal to) the sample firm-level median as high analyst following (low analyst following). We then estimate our full model in Table 4 in each of the partitions and test whether the coefficient on *Post*Treatment firms* differs across the low and high analyst following firms. Panel B of Table 6 presents results of this analysis. Also consistent with our prediction, we find that the coefficient on *Post*Treatment firms* is more negative in the low analyst following partition than in the high analyst following partition. Thus, these findings suggest that treatment firms in poorer information environments experience a greater reduction in information asymmetry following the CSR mandate.

4.3. Robustness tests

¹⁵ While not reported in the table, the mean and median number of analysts following among our sample firms is 11 and 5.

One concern for our analysis is that our results may simply reflect a time trend. To address this concern, we perform three sensitivity tests. First, we further control for time trend by adding another interaction term: *Treatment firms*year*. Panel A of Table 7 reports the results of this analysis. In the interest of parsimony, we do not report the coefficients on firm-level controls in the sensitivity tests. This panel shows that our results remain qualitatively unchanged after controlling for time trend. Second, we perform a placebo test ending our sample period in 2008 (the year before mandatory CSR reports are released). We then rerun our analysis by recoding the post dummy variable from indicating the period 2009-2010 to indicating years 2007 and 2008. Panel B of Table 7 reports the results of this analysis. Unlike our result in Table 4, this panel shows that the coefficient on *Post*Treatment firms* becomes significantly positive in the DID estimation and becomes insignificant in the DID-PSM estimation. Thus, our placebo test does not find evidence suggesting that our treatment firms experience a decrease in information asymmetry prior to the mandatory CSR reporting period. Third, since 2008 is the peak of financial crisis and there is a lot of turbulence in global financial markets in that year, we perform an analysis after deleting all observations in 2008. Panel C of Table 7 reports the results of this analysis. It shows that our results are qualitatively the same as the results in Table 4.

5. Conclusion

This paper examines the effect of mandatory CSR disclosure on firms' information asymmetry in China. Following the market microstructure literature, we construct two measures of information asymmetry: the price impact of a trade and the adverse selection component of the bid-ask spread. In addition, we use a difference-in-differences research design by taking advantages of the unique regulatory setting that mandates a subset of listed Chinese firms to issue

CSR reports as of the end of 2008. To mitigate the concern that our treatment firms are not random, we also combine the difference-in-differences design with a propensity-score-matched procedure that attempts to make our treatment and benchmark groups more comparable.

We find that contrary to common criticism that mandatory CSR disclosure lacks credibility and is simply window dressing in emerging markets such as China, mandatory CSR reporting firms experience a decrease in information asymmetry subsequent to the mandate, especially among firms with greater political/social risk and firms with less analyst coverage. Overall, our results suggest that mandatory CSR disclosure reduces the information disadvantages of investors that are less informed about firms' CSR activities by helping these investors assess firms' political or social risk and by increasing analyst following.

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Appendix A
Variable definitions

Variables	Definitions
<i>Measures of information asymmetry</i>	
LogPI	A measure of information asymmetry that captures the price impact of a trade, as estimated in Glosten and Harris (1988). The measure is defined as $Log(\gamma * 10^7)$, with γ being estimated from $\Delta P_t = \gamma Q_t V_t + \varphi(Q_t - Q_{t-1}) + e_t$ where P is transaction price, V is trade size, and Q is trade sign (i.e., +1 for a buyer-initiated transaction and -1 for a seller-initiated transaction).
LogAS	A measure of information asymmetry that captures the adverse selection component of the spread decomposition, as estimated in Glosten and Harris (1988) and Lin et al. (1995). The measure is defined as $Log(z_1 * 10^8)$, with z_1 being estimated from $\Delta P_t = c_0(Q_t - Q_{t-1}) + c_1(Q_t V_t - Q_{t-1} V_{t-1}) + z_0 Q_t + z_1 Q_t V_t + e_t$
<i>Variables of interest</i>	
Post	A dummy variable equal to one for periods after 2008 (i.e., years 2009 and 2010)
Treatment firms	A dummy variable equal to one if the listed firm is mandated to issue CSR reports starting from December 2008
<i>Firm-level controls</i>	
Market value	Total market value of a firm's equity
Turnover	Annual share turnover
Return	Annual stock return
ROA	Return on assets
Government ownership	Percentage of shares owned by the government
<i>Other variables</i>	
Analysts	The number of financial analysts following a firm
Political connection	A dummy variable equal to one if a firm's top executives ever worked in the city-level (and above) government
Donation	Amount of donations divided by total assets

Table 1**Summary statistics, full sample**

This table provides descriptive statistics for the variables used in our full sample DID estimation (N=7,059 firm-years). See Appendix A for variable definitions.

Variable	Mean	Std. dev.	Median	Min	Max
LogPI	0.764	1.234	0.655	-2.263	3.921
LogAS	1.812	1.419	1.769	-4.871	5.153
Post	0.461	0.498	0.000	0.000	1.000
Treatment firms	0.186	0.389	0.000	0.000	1.000
Log(Market value)	14.503	1.173	14.425	10.208	19.410
Turnover	7.096	3.909	6.372	0.768	21.270
Return	0.695	1.146	0.498	-0.869	4.355
ROA	0.033	0.077	0.036	-0.406	0.217
Government ownership	0.188	0.228	0.032	0.000	0.971
Log(1+Analysts)	1.699	1.274	1.792	0.000	4.754

Table 2
Propensity-score-matching procedure

This table describes the propensity-score-matching approach. We implement this procedure by first estimating a logit regression to model the probability of being a treatment firm using the pre-shock period data. We then match each treatment firm to the control firms using the nearest neighbor matching technique (with replacement, and caliper set at 0.25*standard error of propensity score). Panel A reports the estimation result for the logit regression. Panel B reports results evaluating the effectiveness of the match.

Panel A: The estimation result of the logit regression model

<i>Variable</i>	Dep. var. = Mandatory CSR reporting firms
Log(Market value)	1.191*** (0.158)
Return	-0.097 (0.060)
ROA	2.583** (1.313)
Government ownership	1.096** (0.432)
LogPI	-0.023 (0.109)
Log(1+Analysts)	1.454*** (0.289)
Log(1+Donation)	0.010 (0.013)
Constant	-37.976 (0.000)
N	3,243
Pseudo R-squared	0.389

Table 2, continued**Panel B: Test of the effectiveness of the propensity score matches**

Variable		Treatment firms	Control firms	P-values for test of the difference^a
Log(Market value)	Pre-match	15.526	14.269	0.000
	Post-match	15.229	15.206	0.725
Return	Pre-match	0.946	0.778	0.016
	Post-match	0.946	0.933	0.865
ROA	Pre-match	0.060	0.040	0.000
	Post-match	0.060	0.063	0.334
Government ownership	Pre-match	0.333	0.278	0.000
	Post-match	0.333	0.330	0.815
LogPI	Pre-match	0.341	0.860	0.000
	Post-match	0.482	0.514	0.613
Log(1+Analysts)	Pre-match	1.253	0.970	0.000
	Post-match	1.253	1.238	0.444
Log(1+Donation)	Pre-match	9.141	8.703	0.156
	Post-match	9.141	8.780	0.288

Table 3
Correlation Analysis

This table provides a Pearson correlation matrix among all the variables for the full sample (lower diagonal, 7,059 firm-years) and the PSM sample (upper diagonal, N=3,795). See Appendix A for variable definitions. A correlation coefficient in bold indicates that the correlation is significant at least at the 10 percent level.

	LogPI (1)	LogAS (2)	Post (3)	Treatment firms (4)	Log(Market value) (5)	Turnover (6)	Return (7)	ROA (8)	Gov. own. (9)	Log(1+ Analysts) (10)
(1)	1	0.930	-0.163	-0.119	-0.237	-0.037	0.021	0.304	-0.010	0.098
(2)	0.946	1	-0.004	-0.106	-0.148	-0.059	0.026	0.291	-0.063	0.157
(3)	0.055	0.176	1	-0.002	0.399	-0.133	-0.168	-0.003	-0.399	0.343
(4)	-0.164	-0.140	-0.056	1	0.413	-0.183	0.016	0.154	0.103	0.356
(5)	-0.254	-0.163	0.356	0.417	1	-0.374	0.121	0.256	-0.144	0.646
(6)	0.031	0.011	-0.075	-0.177	-0.320	1	-0.139	-0.221	0.101	-0.275
(7)	-0.140	-0.129	-0.044	0.051	0.220	-0.119	1	0.098	0.131	-0.152
(8)	0.270	0.280	0.075	0.143	0.263	-0.159	0.063	1	0.028	0.358
(9)	-0.114	-0.138	-0.315	0.135	-0.029	0.053	0.068	0.011	1	-0.067
(10)	0.223	0.275	0.348	0.331	0.576	-0.172	-0.115	0.381	-0.010	1

Table 4**The impact of mandatory CSR disclosure on information asymmetry**

This table presents the results of the impact of mandatory CSR disclosure on information asymmetry. See Appendix A for variable definitions. Robust standard errors clustered by firm are reported in parentheses. *,**,*** indicate significance at 10%, 5%, and 1% levels (two-tailed), respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.=	LogPI				LogAS			
Estimation method	DID		DID-PSM		DID		DID-PSM	
Post*Treatment firms	-0.186*** (0.051)	-0.188*** (0.049)	-0.115** (0.053)	-0.112** (0.050)	-0.257*** (0.065)	-0.256*** (0.063)	-0.186*** (0.068)	-0.183*** (0.065)
Log(Market value)		0.082** (0.034)		0.058 (0.042)		0.197*** (0.044)		0.242*** (0.057)
Turnover		-0.037*** (0.003)		-0.043*** (0.004)		-0.029*** (0.005)		-0.034*** (0.007)
Return		-0.070*** (0.013)		-0.016 (0.016)		-0.114*** (0.019)		-0.045* (0.023)
ROA		0.523*** (0.134)		1.109*** (0.244)		0.604*** (0.204)		0.765** (0.328)
Government ownership		0.194** (0.080)		0.254*** (0.098)		0.224** (0.107)		0.314** (0.136)
Fixed effects	Firm&Year	Firm&Year	Firm&Year	Firm&Year	Firm&Year	Firm&Year	Firm&Year	Firm&Year
N	7,059	7,059	3,795	3,723	7,059	7,059	3,795	3,723
Adjusted R-squared	0.848	0.859	0.810	0.822	0.765	0.774	0.723	0.731

Table 5**The effect of mandatory CSR disclosure on information asymmetry, conditional on political/social risk**

This table presents the results of the impact of mandatory CSR disclosure on information asymmetry, conditional on various proxies for a firm's political/social risk. The dependent variable is *logPI*. See Appendix A for variable definitions. Robust standard errors clustered by firm are reported in parentheses. *, **, *** indicate significance at 10%, 5%, and 1% levels (two-tailed), respectively.

Panel A: DID method, full sample

	Government ownership		Political connection		Donation	
	High government ownership	Low government ownership	Politically connected	Non-Politically connected	Large donation	Small donation
Post* Treatment firms (β_1)	-0.134* (0.075)	-0.267** (0.114)	0.218 (0.175)	-0.195*** (0.052)	-0.048 (0.070)	-0.307*** (0.094)
<i>Test of difference in β_1</i>	0.133**		0.413***		0.259***	
Log(Market value)	0.215*** (0.052)	0.010 (0.055)	0.076 (0.121)	0.099*** (0.038)	-0.027 (0.049)	0.179*** (0.055)
Turnover	-0.031*** (0.005)	-0.039*** (0.005)	-0.054*** (0.012)	-0.037*** (0.004)	-0.043*** (0.005)	-0.031*** (0.005)
Return	-0.077*** (0.019)	-0.080*** (0.024)	-0.052 (0.052)	-0.082*** (0.015)	-0.014 (0.022)	-0.129*** (0.022)
ROA	0.365* (0.205)	0.501** (0.223)	1.064 (0.781)	0.463*** (0.139)	1.604*** (0.446)	0.076 (0.154)
Government ownership	1.005*** (0.174)	2.898 (5.438)	0.670** (0.282)	0.269*** (0.085)	0.024 (0.134)	0.250* (0.128)
Fixed effects	Firm&Year	Firm&Year	Firm&Year	Firm&Year	Firm&Year	Firm&Year
N	3,566	3,493	269	5,404	3,547	3,512
Adjusted R-squared	0.865	0.876	0.846	0.805	0.861	0.870

Table 5, continued

Panel B: DID-PSM method, PSM matched sample

	Government ownership		Political connection		Donation	
	High government ownership	Low government ownership	Politically connected	Non-Politically connected	Large donation	Small donation
Post* Treatment firms (β_1)	-0.031 (0.082)	-0.212** (0.100)	0.236 (0.178)	-0.137*** (0.053)	-0.032 (0.072)	-0.163* (0.091)
<i>Test of difference in β_1</i>	<i>0.181**</i>		<i>0.373***</i>		<i>0.131*</i>	
Log(Market value)	0.178*** (0.066)	-0.016 (0.066)	0.034 (0.134)	0.061 (0.044)	-0.056 (0.065)	0.229*** (0.070)
Turnover	-0.036*** (0.006)	-0.049*** (0.008)	-0.064*** (0.013)	-0.042*** (0.004)	-0.050*** (0.007)	-0.039*** (0.008)
Return	-0.040* (0.024)	-0.019 (0.029)	-0.010 (0.047)	-0.017 (0.017)	0.025 (0.030)	-0.074*** (0.022)
ROA	0.840** (0.365)	1.163*** (0.389)	2.473** (1.185)	1.059*** (0.247)	2.370*** (0.689)	0.467 (0.283)
Government ownership	1.122*** (0.254)	-1.042 (0.685)	0.515* (0.286)	0.254** (0.104)	0.041 (0.167)	0.421*** (0.150)
Fixed effects	Firm&Year	Firm&Year	Firm&Year	Firm&Year	Firm&Year	Firm&Year
N	1,860	1,863	241	3,482	1,869	1,854
Adjusted R-squared	0.855	0.836	0.883	0.816	0.822	0.839

Table 6**Mandatory CSR disclosure and analyst following**

Panel A of this table presents the results of the impact of mandatory CSR disclosure on analyst following. Panel B presents the results of the impact of mandatory CSR disclosure on information asymmetry, conditional on the number of analyst following. See Appendix A for variable definitions. Robust standard errors clustered by firm are reported in parentheses. *,**,*** indicate significance at 10%, 5%, and 1% levels (two-tailed), respectively.

Panel A: The impact of mandatory CSR disclosure on analysts' coverage

Estimation method	Dependent variable = Log(1+Analysts)	
	DID	DID-PSM
Post*Treatment firms	0.189*** (0.040)	0.098** (0.044)
Log(Market value)	0.458*** (0.030)	0.463*** (0.037)
Turnover	0.017*** (0.003)	0.019*** (0.004)
Return	-0.099*** (0.011)	-0.129*** (0.014)
ROA	0.624*** (0.136)	1.129*** (0.261)
Government ownership	0.261*** (0.087)	0.315*** (0.096)
Fixed effects	Firm&Year	Firm&Year
N	7,059	3,723
Adjusted R-squared	0.867	0.871

Table 6, continued

Panel B: The effect of mandatory CSR disclosure on information asymmetry, conditional on analyst following

Method=	Dependent variable = logPI			
	DID		DID-PSM	
	High analyst following	Low analyst following	High analyst following	Low analyst following
Post* Treatment firms (β_1)	-0.082 (0.054)	-0.329** (0.133)	0.034 (0.066)	-0.200** (0.099)
<i>Test of difference in β_1</i>		-0.247***		-0.234*
Log(Market value)	0.011 (0.042)	0.144** (0.056)	-0.046 (0.051)	0.135** (0.067)
Turnover	-0.036*** (0.004)	-0.035*** (0.005)	-0.052*** (0.006)	-0.032*** (0.006)
Return	-0.029* (0.016)	-0.118*** (0.023)	0.014 (0.021)	-0.048* (0.027)
ROA	2.059*** (0.405)	0.169 (0.129)	2.719*** (0.536)	0.496** (0.221)
Government ownership	-0.052 (0.104)	0.413*** (0.114)	0.123 (0.137)	0.347*** (0.134)
Fixed effects	Firm&Year	Firm&Year	Firm&Year	Firm&Year
N	3,464	3,595	1,930	1,793
Adjusted R-squared	0.850	0.873	0.837	0.805

Table 7**Robustness tests**

This table presents results of sensitivity tests. The dependent variable is *logPI*. Panel A reports the results of further controlling for the interaction term Treatment firms*Year. Panel B reports the results of a placebo test. Panel C reports the results after deleting observations in 2008. See Appendix A for variable definitions. Robust standard errors clustered by firm are reported in parentheses. *,**,*** indicate significance at 10%, 5%, and 1% levels (two-tailed), respectively.

Panel A: Analysis further controlling for Treatment*year

Method	DID	DID-PSM
Post* Treatment firms	-0.286*** (0.054)	-0.158** (0.064)
Firm-level controls	Included	Included
Fixed effects	Firm&Year	Firm&Year
N	7,059	3,723
Adjusted R-squared	0.859	0.825

Panel B: A Placebo test using sample period 2006-2008

Method	DID	DID-PSM
Post 2007* Treatment firms	0.218* (0.113)	0.175 (0.127)
Firm-level controls	Included	Included
Fixed effects	Firm&Year	Firm&Year
N	3,808	2,189
Adjusted R-squared	0.737	0.739

Panel C: Analysis deleting 2008

Method	DID	DID-PSM
Post* Treatment firms	-0.185*** (0.061)	-0.148** (0.065)
Firm-level controls	Included	Included
Fixed effects	Firm&Year	Firm&Year
N	5768	3085
Adjusted R-squared	0.855	0.792