Does Corporate Social Responsibility Reduce Information Asymmetry?

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Abstract. In this article, we examine the empirical association between corporate social responsibility (CSR) and information asymmetry by investigating their causal, simultaneous, and endogenous effects. Employing a large and extensive U.S. sample during 1991-2010, we find an inverse association between CSR engagement and the level of information asymmetry after controlling for various firm characteristics. Based on the simultaneous equation approach, we further find that CSR activities reduce information asymmetry more than information asymmetry decreases CSR activities. Furthermore, after controlling for endogeneity based on dynamic panel generalized method of moment (GMM), we still find an inverse relation between CSR engagement and information asymmetry. We interpret these results to support the stakeholder-theory based information-asymmetry-reduction explanation that considers CSR engagement as a vehicle to reduce asymmetric information between managers and non-investing stakeholders, but not the agency-theory based over-investment hypothesis that views CSR as a waste of valuable resources at the cost of shareholders and considers firm's CSR engagement making information environment more opaque.

Keywords: Corporate social responsibility. Information asymmetry. Stakeholder theory. Over-investment

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1. Introduction

Modigliani and Miller (1963) assume that investors have the same information about a firm's future prospects as its management – symmetric information.[1] In practice, however, managers often have better information than outside stockholders and non-investing stakeholders. This information asymmetry has important implication on corporate social responsibility (CSR) because managers know much better about the firm's CSR engagement in terms of its goal, plan, program, and related activities than outsiders, and CSR can be used as a signal of expected firm's future prospects between firm and outsiders. Recently, corporations across the globe have become more alert on CSR issues and CSR has continued to be highly topical subjects among academics, practitioners, and policy makers. Jo and Harjoto (2011, 2012) among others suggest that while the definitions of CSR vary, it generally refers to serving people, communities, and the environment in ways that go above and beyond what is legally required of a firm. Overall, CSR is an extension of firms' efforts to foster the sustainability of firms via sound business practices that promote accountability and information transparency.

Recent studies have examined various beneficial aspects of CSR and have found evidence that CSR is beneficial to the firm, such as lower cost of equity (Dhaliwal, et al., 2011), higher analyst following (Hong and Kacperczyk, 2009), receive more favorable analysts recommendation (Ioannou and Serafeim, 2010), higher analyst forecast accuracy (Dhaliwal, et al., 2010), increasing financial communications to shareholders (Fieseler, 2011), more effective corporate governance and higher firm value (Waddock and Graves, 1997;

[1]Akerlof (1970) discusses information asymmetry, which occurs when the seller knows more about a product than the buyer in the used car market. He describes how the interaction between quality heterogeneity and asymmetric information can lead to the disappearance of a market where guarantees are indefinite.

Blazovich and Smith, 2011; Jo and Harjoto, 2011, 2012). Others focus on the cost side of CSR engagement. For instance, Sprinkle and Maines (2010) provide recent anecdotal evidence for the costs of CSR such as immediate cash outflows and opportunity cost of spending on CSR. Similar to Friedman (1970), Barnea and Rubin (2010) maintain that if CSR initiatives do not maximize firm value, such initiatives are a waste of valuable resources. While many recent studies examine various benefits and costs of CSR, direct evidence of empirical association between CSR and information asymmetry remains largely overlooked. Our study attempts to fill that void.

The central aim of this paper is to document the relation between information asymmetry and a firm's engagement of CSR activities in U.S. public equity market. Specifically, we aim to empirically examine the causal and simultaneous relation between information asymmetry and CSR activities. While the role of information asymmetry on firm value and the empirical relation between CSR activities and financial performance have been documented extensively, the empirical linkage between a firm's choice of CSR activities and information asymmetry remains less explored. We consider that the empirical association between CSR and information asymmetry is pivotal because the theory of information asymmetry is one of the most important modern developments in accounting, economics, finance, and management. Thus, we aim to fill the gap by examining a simultaneous and causal investigation of the linkage between information asymmetry and CSR in a systematic fashion. To the best of our knowledge, no prior empirical studies have examined the impact of CSR on information asymmetry controlling for endogeneity issues.

To perform the above tasks, we undertake and develop two relevant, but competing explanations regarding the impact of CSR engagement on information asymmetry and vice

versa. First, there is an information-asymmetry-reduction hypothesis through conflict resolution (e,g., Freeman, 1984; Jo and Harjoto, 2011, 2012). Freeman's (1984) stakeholder theory, for instance, states that firms should use CSR as a mechanism to communicate better between managers and non-investing stakeholders. Similarly, Jo and Harjoto (2011, 2012) consider CSR engagement as a vehicle to reduce conflicts of interest among various stakeholders. If the information-asymmetry-reduction hypothesis through conflict resolution is valid, then the level of information asymmetry should be inversely related to CSR engagement, because various information production channels, i.e., security analysts and/or brokerage services will cover more on firms' CSR engagement to the extent that CSR mitigates conflicts of interest between managers and other stakeholders, thereby reducing information asymmetry.

Second, based on Friedman (1970) and Jensen and Meckling's (1976) agency theory, Barnea and Rubin (2010) propose the over-investment hypothesis, which suggests that insiders tend to overinvest in CSR at the cost of outside shareholders to enhance their own personal reputation as socially responsible executives. Because over-investment adversely affects firm value, further increases firm risk, and makes information environment further opaque, the over-investment explanation predicts a positive (or at best unclear) relation between CSR engagement and the magnitude of information asymmetry.

Our results based on the U.S. sample during 1991-2010, suggest an inverse association between CSR engagement and information asymmetry after controlling for various firm characteristics. In addition, we find that the lag of CSR engagement decreases the magnitude of information asymmetry more than the lag of information asymmetry reduces the magnitude of CSR. Furthermore, we confirm the negative relation between CSR and information asymmetry even after we control for endogeneity based on dynamic panel generalized

methods of moment (GMM). The contributions of this paper are twofold. First, we examine the previously untested causal effect in the CSR-information asymmetry sphere and find that the lag of CSR has a causal effect on the level of information asymmetry. Second, after controlling for the simultaneity bias and endogeneity issues, the paper finds a negative CSR-information asymmetry relation, supporting the information-asymmetry-reduction hypothesis that is based on stakeholder theory, but not the overinvestment explanation based on agency theory. Overall, our results suggest that firms' engagement in CSR activities reduce information asymmetry.

The remainder of the paper is organized as follows. Section 2 briefly describes the literature review and hypothesis development. We then discuss the sample and measurement of CSR and information asymmetry as well as our research design in Section 3. Section 4 presents the empirical results. The final section summarizes our conclusions.

2. Literature Review and Hypotheses Development

Recently, researchers have examined the benefits of CSR engagement using direct financial measures of corporate financial performance and have found evidence that CSR is beneficial to the firm, such as higher analyst following (Hong and Kacperczyk, 2009), receive more favorable analysts recommendation (Ioannou and Serafeim, 2010), higher analyst forecast accuracy (Dhaliwal, et al., 2010), increasing financial communications to shareholders (Fieseler, 2011), more effective corporate governance and higher firm value (Blazovich and Smith, 2011; Jo and Harjoto, 2011, 2012), and lower cost of equity (Dhaliwal, et al., 2011).

Despite the fact that there is no universal rationale behind the association between

CSR engagement and information asymmetry, we take two representative, but competing explanations, agency theory versus stakeholder theory, to determine their relative importance regarding the CSR-information asymmetry nexus**.** First, while it may not be completely possible to satisfy all related stakeholders, there is a growing literature on conflict resolution (e,g., Jensen, 2002; Calton & Payne, 2003; Sherer et al., 2006; Jo and Harjoto, 2011, 2012), in which the role of the corporation is also subject to discursive scrutiny by non-investing stakeholders (i.e., social or environmental activists) besides the shareholders. Cespa and Cestone (2007) propose a theoretical model investigating the conflicts of interest among managers, shareholders, and other non-investing stakeholders, even when managers are not performing. Jo and Kim (2007) also indicate that an improved corporate transparency through frequent voluntary disclosure will reduce the information asymmetry between insiders and outsiders, discourage managerial self-dealings, and enhance firm value. In addition, management also considers firms' fiduciary and moral responsibilities toward stakeholders (Jensen, 2002; Aguilera, et al., 2007; Cai et al., 2011).

Other studies interpret CSR as non-financial information that influence capital market decisions since it reduces asymmetric information between managers and external investors. El Ghoul et al. (2011) claim that information asymmetry is likely to be more severe for low CSR firms. Dhaliwal, et al. (2011) show evidence that initiation of a voluntary CSR disclosure provides information to the market such that it reduces the firm's cost of capital and reduces analyst divergence. Dhaliwal, et al. (2010) find that the presence of CSR reports lead to lower analyst forecast errors, especially for countries with more opaque information environment. They conclude that social disclosure plays a complementary role to financial transparency. Ioannou and Serafeim (2010) provide evidence that socially responsible firms receive

favorable analysts' recommendations in recent years. They find that firms with higher visibility are more likely to receive more favorable recommendation when they engage in CSR activities. Fieseler (2011) shows that the equity analysts in the German stock exchange perceive economic, legal, ethical and philanthropic CSR strategies as value creations since these CSR strategies increase information disclosure and dialog between managers and shareholders. He also claims that the importance of communicating CSR not only to socially responsible investors but also to the mainstream of the financial community is gaining importance in a more competitive capital market environment. In addition, CSR reports might be of additional value to outside market participants in several other ways. These might include the informed response to social pressure (Baron et al., 2011), information on which to better gauge firms' engagement of earnings management (Kim et al., 2012), and to supplement the incentive to avoid costly litigation (Tzavara, 2009). Taken together, above studies imply that CSR reports, as voluntary disclosure, tend to provide additional information to the financial markets, improve transparency, and therefore, could reduce information asymmetry between insiders and outsiders.

If managers indeed use CSR engagement as a signaling channel to enhance communication to shareholders and to resolve conflicts among stakeholders, then CSR engagement should reduce information asymmetry. We label this relation as the information-asymmetry-reduction role of CSR and we expect the following;

Hypothesis 1: CSR engagement reduces the level of information asymmetry after controlling for the confounding factors.

Next, there are studies that emphasize the cost side of CSR. For instance, Friedman

(1970) criticize that CSR is a distribution of shareholder wealth for pursuit of managers' own interests. Based on Friedman (1970) and Jensen and Meckling's (1976) agency theory, Barnea and Rubin (2010) consider CSR engagement as a principal-agent relation between managers and shareholders. They argue that affiliated insiders have an interest in overinvesting in CSR if doing so provides private benefits of reputation building as good social citizens, possibly at a cost to shareholders. They claim that managers engage in socially responsible activities even when the costs of CSR actions are higher than the benefits to shareholders because they reap private benefits, such as awards and other expressions of appreciation, from those promoting CSR.

In a related vein, Bertrand and Mullainathan (2003) argue that when managers are not closely monitored and insulated from takeovers, active empire building may not be the norm and managers may prefer to enjoy a quiet life. Malmendier and Tate (2005) suggest that there is some evidence of over-investment by overconfident CEOs. Further, Goel and Thakor's (2007) theoretical model also shows that overconfident managers sometimes make value-destroying investments. CSR overinvestment caused by managerial overconfidence can make information environment opaque, and thus, financial markets consider CSR overinvestment negatively. In addition, to the extent that signaling of private information results in overinvestment or other misallocations of capital (Spence, 1973) and imperfect information and short-term objectives leads to overinvestment (Bebchuk and Cohen, 2005), we expect a positive (at least an opaque) association between CSR and information asymmetry.

Recently, Harjoto and Jo (2012) examine whether CSR activities attract better quality analysts and brokerage firms, in terms of their experience and resources, or instead, experienced analysts and reputable brokerage firms tend to put social pressures to firms that

they are covering to conduct more CSR activities. They find that CSR activities do not attract experienced analysts and reputable brokerage firms. They interpret the results rejecting the asymmetric information theory.[2] This view implies that CSR engagements are potentially costly activities and could be a waste of scarce resources (Friedman, 1970; Barnea and Rubin, 2010), and therefore the financial market penalizes firms for over-investing in CSR activities, at least partially due to information opaqueness. We label this relation as an over-investment explanation and expect the following;

Hypothesis 2: CSR engagement positively (at least opaquely) influences the level of information asymmetry after controlling for the confounding factors.

3. Data and Measurement

3.1. Data and Measurements of CSR Variables

We use an extensive and combined data set from the Kinder, Lydenberg, and Domini's (KLD's) Stats database from 1991 through 2010. KLD's Stats inclusive social rating criteria covers approximately 80 strengths and concerns ratings in seven major qualitative issue areas including community, corporate governance, diversity, employee relations, environment, human rights and product. KLD also has exclusionary screens, such as alcohol, gambling, military, nuclear power, and tobacco. Because KLD's exclusionary screens differ from the inclusive screens in that only concern ratings, but no strength ratings, are assigned, we only use the inclusive screens in our main tests. Prior to 2001, KLD contains data from

[2]They, however, do not directly measure information asymmetry. Instead, they find that firms which are covered by experienced analysts and reputable brokerage firms tend to increase their CSR activities. They consider the above results as supporting evidence for the social pressure hypothesis that analysts and reputable brokerage firms have the ability to put pressures on firms that increase their CSR activities, and therefore support broader stakeholder theory in which social pressures from various stakeholders are responded by more CSR activities.

approximately 650 firms listed on the S&P 500 or Domini 400 Social Indexes as of August of each year. For 2001 and 2002 (2003 and thereafter), the KLD's ratings are a summary of strengths and concerns assigned to approximately 1,100 (3,100) firms listed on the S&P 500, the Domini 400 Social Indexes, or the Russell 1,000 (Russell 3,000) Indexes as of December 31st of each year. Since 2002, KLD renamed the other category as corporate governance and reassigned the presentation of data in the non-U.S. operations from community category. Ratings in the human rights area were mostly taken from the former Non-U.S. Operations category. We include all seven KLD inclusionary categories and assign zero value for categories that were not yet created or were reassigned.

The sample from KLD database is merged with the Compustat and the Center for Research in Security Prices (CRSP) databases for their financial information, stock prices and volatility of monthly stock returns. After matching across all these three databases and accounting for lags and changes in CSR and information asymmetry variables, the combined sample consists of approximately 21,492 firm-year observations from 1991 to 2010 (see Table 1). Actual samples used in the regression analyses are slightly different than the combined sample since data availability for variables varies across different regression models. In our empirical analysis, all financial variables are taken from Compustat.

Appendix B lists definitions and constructions of all variables that are used in this study. KLD strength and concern criteria are assigned with zero or one value, and the number of measures varies across the years, so an index is used to aggregate the individual activities, which are rated under different categories, including community, corporate governance, diversity, employee relations, environment, etc. Based on the ratings, we first construct CSR index following Hillman and Keim (2001) and Baron, et al. (2011). For each category, we let

C^{ijt} denote an indicator variable of CSR for firm i with strength j for year t, C^{ikt} an indicator variable of CSR for firm i with concern k for year t, and C^{jt} and C^{kt} the maximum number of KLD strengths and concerns, respectively, in year t for any firm, the index C^{it} of each category for firm-year observation i_t is

$$C^{it} = \frac{\Sigma_j C^{ijt} - \Sigma_k C^{ikt} + C^{kt}}{C^{jt} + C^{kt}}$$

Finally, we take the arithmetic average of indices for each category and get CSR composite (CSRIDX_I). See the list of the strength and concern items in the KLD database in Appendix A.

To obtain robust results, we also take an alternative CSR composite (CSRIDX_II) by scaling CSR net counts to create the CSR index that ranges from 0 to 1 to facilitate comparison of CSR scores across years, which is important in measuring changes in CSR performance from year to year. We use a transformation that preserves the relative distances between the values of CSR net count for firm i in year t in the same Fama-French 48 industry. Specifically, we construct our CSR index (CSRIDX_II), based on the following formula:

CSRIDX_II for firm i in year t =

$$\frac{\text{(Net CSR counts for firm } i \text{ in year } t - \text{Min. net CSR counts for firm } i \text{ industry in year } t)}{\text{(Max. net CSR counts for firm } i \text{ industry in year } t - \text{Min. net CSR counts for firm } i \text{ industry in year } t)}$$

3.2. Construction of Asymmetric Information Index

There have been various measures of information asymmetry (IA) in previous literature. For example, Vermaelen (1981) suggests that IA tends to decrease with firm size.

Smith and Watts (1992) maintains that IA tends to increase with growth opportunity. Aboody and Lev (2000) find that IA tends to increase with R&D expenditure. Both Krishnaswami and Subramaniam (1999) and Thomas (2002) find that IA decreases with analyst coverage. These measures are somewhat correlated with each other but each contains unique information. Most empirical papers, however, use only one or two variables to measure IA.

In this paper, similar to Cai et al. (2009), we develop a comprehensive measure by constructing an index of asymmetric information based on various previous measures of IA. Specifically, our asymmetric information index (AIIDX) is based on the percentile rankings of firm size (total assets and market value of equity), R&D expenditures, Tobin's Q, the number of analysts following the firm (NAF), analyst forecast errors (AFE) and the number of shareholders (NSH) over the sample period (See Appendix B for the construction of AIIDX).

Diamond and Verrecchia (1991) and Harris (1994) claim that large firms face less IA because they tend to be more mature and receive more attention from the market and regulators. El Ghoul et al (2011) argue that larger firms attract wider media and analyst coverage, which reduces information asymmetry. Thus, we use the inverse of two measures of firm size (total assets and market value of equity) as a component of our AIIDX. We also use R&D expenditures as another component of AIIDX because Aboody and Lev (2000) find that insider trading gains are significantly higher in R&D-intensive firms than in firms without R&D, and they claim that R&D is a major contributor to information asymmetry. We measure a firm's R&D intensity by its R&D expenses scaled by assets. Consistent with prior studies, we set R&D expenses to zero if they are missing. Smith and Watts (1992) and McLaughlin et al. (1998) maintain that the asymmetric information problem is more severe for firms with significant growth opportunities. Because Tobin's Q is widely used as a measure of growth

opportunities, we include Tobin's Q as another component of AIIDX. [3]

Brennan and Subrahmanyam (1995), Chung and Jo (1996), and Yu (2008) document that the more security analysts follow the firm, the more information is discovered and revealed to the public and the less asymmetric information the firm suffers. Berk and DeMarzo (2011) suggest that financial analysts gather as much information as they can, becoming an expert on the firm and its competitors by pouring over a firm's financial statements and filings. Basically, as an information intermediary, security analysts can reduce the information asymmetry between corporate insiders and outside public and discourage managerial self-dealings. Thus, we use the number of analysts following the firm (NAF) as a proxy for the supply of information about a firm and include as a component of our AIIDX. In addition, Gilson et al. (1997) and Krishnaswami and Subramaniam (1999) use analysts' earnings forecasts errors (AFE) as a proxy for IA. Because analysts' knowledge of a firm represents what the market knows about a firm and AFE can proxy the extent of IA between insiders and outsiders. We obtain NAF and AFE from I/B/E/S database and include both in our AIIDX measure. Following previous convention, we measure AFE as the ratio of the absolute difference between actual annual earnings per share and the mean forecast, standardized by the stock price at the fiscal year end. Finally, Allen (1993) argues that a higher number of shareholders (NSH) may increase the amount of information available to the market, thus reducing information asymmetry. Thus we use the inverse of NSH as our final

[3]Tobin's Q is widely used as a measure of growth opportunities in accounting, finance, and economics area. See, for example, Chung and Pruitt (1994) among others. Following Chung and Pruitt (1994), we calculate Tobin's Q as: {[Market value of common stock + Book value of preferred stock + Book value of long-term debt + Book value of current liabilities – (Book value of current assets –Book value of Inventories)] / Book value of total assets}.

component of our AIIDX measure. We average the percentile rankings across all the component variables to compute the value of AIIDX. A higher AIIDX score indicates a greater degree of IA.[4]

3.3. Research Design

To gain insights on the relation between CSR and information asymmetry and obtain baseline results, we first regress the level of information asymmetry on the lag of CSR index constructed from KLD data along with control variables.

$$AIIDX_{i,t} = \alpha_0 + \alpha_1 CSRIDX_{i,t-1} + \sum_{j=2}^{n} \alpha_j CONTROL\ VARIABLES_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

Our choice of control variables generally follows Gompers, Ishii, and Metrick (2003), Cai et al. (2009), and Jo and Harjoto (2011, 2012). Prior research shows that the level of information asymmetry is associated with factors such as performance, risk, size, R&D and advertising, and corporate governance. Accordingly, we include various firm's financial characteristics including total debt ratio (DEBTR) as a measure of bankruptcy risk, advertising expense ratio (ADVR), capital expenditure ratio (CAPXR), one year sales growth rate (SALEGRW), R&D expenditures divided by sales revenue (RNDR), firm size measured by the natural log of total assets (SIZE), and also the Fama-French (1997) 48 industry dummy variables. Based on finance and accounting literature, we also control firm risk by measuring

[4] Because our main goal is to examine the relation between CSR and information asymmetry, we focus on corporate finance measures and analyst related variables to gauge the asymmetric information between firm insiders and non-investing stakeholders. Thus, when we construct AIIDX, we do not include market microstructure measures of information asymmetry, such as, the Huang and Stoll's (1997) bid-ask spread component model or the Easley et al.'s (2002) PIN (probability of informed trading) measure that examines information asymmetry between informed and uninformed investors. In additional tests section, however, we employ PIN measure and examine whether the CSR's information-asymmetry-reduction role further influences information environment among traders.

firm's total risk from the volatility (standard deviation) of monthly stock returns (DEVRET). CSRIDX and Lag(CSRIDX) are the contemporaneous and one year lag of CSR index for firm. We include the lag effect of CSR to capture any lag effect of CSR on information asymmetry. Because the inverse of firm size and R&D variables are included as components of the AIIDEX measure, we construct AT_CSR_ RES to control size effect on information asymmetry as the predicted residual from the OLS regressions of firm size using Log(Total Asset) as the dependent variable on CSRIDX as the independent variable. We also construct RND_CSR_RES as the predicted residual from the regressions of R&D expense on CSRIDX. Cai et al. (2009) show that information asymmetry is closely related with corporate governance. Thus, we control corporate governance using the governance index (GINDEX) developed by Gompers, Ishii, and Metrick (2003) as well as board independence measured by the proportion of outside independent directors (PCTINDEP) to control for board governance.

To establish the reverse causality by examining how CSR activities respond to information asymmetry, we regress CSR index constructed from KLD data on the lag of information asymmetry measure along with control variables.

$$CSRIDX_{i,t} = \alpha_0 + \alpha_1 AIIDX_{i,t-1} + \sum_{j=2}^{n} \alpha_j CONTROL\ VARIABLES_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

Jo and Harjoro (2011, 2012) suggest that in addition to other controls, corporate governance also influences CSR while CSR does not cause corporate governance. Thus, in order to control the effect of corporate governance on CSR, we control corporate governance using GINDEX. As the basic ingredients for the GINDEX are anti-takeover provisions (ATPs) and the RiskMetrics reports 24 ATPs at the firm level, the GINDEX ranges from 0 to 24. A

high value indicates stronger managerial power (less takeover pressure), and therefore a greater potential for managerial entrenchment. In addition, Hermalin and Weisbach (1998, 2003) and Linck, Netter, and Yang (2007) suggest that the independent outside director often plays a monitoring role, and the director's effectiveness is an important function of the board's "independence" from management. Thus, we use board independence measured by the proportion of outside independent directors (PCTINDEP) to control for board governance. In addition, we control risk, performance, leverage, R&D, and advertising expenses in CSR equation following Jo and Harjoto (2011, 2012).

Next, since both CSR engagement and information asymmetry can affect each other concurrently, we employ three-stage least square (3SLS) simultaneous equation framework to handle potential simultaneity bias.

$$AIIDX_{i,t} = \alpha_0 + \alpha_1 CSRIDX_{i,t} + \sum_{j=2}^{n} \alpha_j CONTROL\ VARIABLES_{i,t} + \varepsilon_{i,t}$$

$$CSRIDX_{i,t} = \alpha_0 + \alpha_1 AIIDX_{i,t} + \sum_{j=2}^{n} \alpha_j CONTROL\ VARIABLES_{i,t} + \varepsilon_{i,t} \quad (3)$$

Although the above simultaneous equation system can handle potential simultaneity bias, there could be other remaining types of endogeneity issue. Endogeneity in the relation between CSR and information asymmetry may arise not only from simultaneity, but also from dynamic nature of the relation as well. Thus, to further alleviate the remaining endogeneity issue, following Wintoki, Linck, and Netter (2012), we employ a well-developed dynamic panel generalized method of moment (GMM) estimator to the determinants of information asymmetry, and compare the results to those obtained from OLS or traditional fixed-effects estimates.

$$AIIDX_{i,t} = \alpha_0 + \alpha_1 CSRIDX_{i,t} + \sum_{j=2}^{n} \alpha_j CONTROL\ VARIABLES_{i,t} + \kappa_1 AIIDX_{i\,t-1} + \kappa 2 AIIDXi\,t-2+\eta i+\varepsilon i,t \quad (4)$$

See variable definitions in Appendix C.

4. Empirical Results

4.1. Descriptive Statistics

In Table 1, we present the means and medians of the main and control variables. The mean of CSRIDX_I is 0.4280, while CSRIDX_II is 0.4024, which indicates that the firms in our samples during 1991 to 2010 have more CSR strengths scores than concerns scores since out of 80 KLD ratings. The average number of AIIDX is 52.11% indicating that the average number of asymmetric information for each firm is approximately 52%. The average of ROA is 0.022 and the average volatility of monthly stock returns during the year is 0.104. The averages of firms' financial characteristics reported in Table 1 are comparable with samples in Ioannou and Serafeim (2010), Baron, et al., (2011), Dhaliwal et al. (2011), and Jo and Harjoto (2012).

[Table 1 about here]

Table 2 presents the Spearman correlation matrix for the variables discussed in the previous section. Consistent with the expected negative association between CSR engagement status (CSRIDX) and information asymmetry index (AIIDX), CSR is negatively related to AIIDX. The Spearman correlation coefficient between CSRIDX_I (CSTIDX_II) and AIIDX is relatively high in absolute numbers, at -0.235 (-0.238). Likewise, the Spearman correlation coefficient between CSRIDX_I (CSRIDX_II) and risk (DEVRET) is negative, -0.158 (-0.150),

respectively. The Spearman correlation coefficient between AIIDX and DEVRET is relatively large and positive, 0.435. All of the above correlations are statistically significant, at least at the five percent level.

[Table 2 about here]

4.2. Multivariate Regression Results

Table 3 presents results from the baseline OLS regression of the level of AIIDX on the lag of CSR with controls. We find that the impact of CSRIDX_I or CSRIDX_II on AIIDX is negative and statistically significant at the one percent level. Specifically, when we use CSRIDX_I, robust t-statistics range -15.22 to -20.34 and robust t-statistics range -23.83 to -30.26 for the CSRIDX_II case. This significantly negative relation between CSRIDX and AIIDX is generally consistent with our hypothesis 1 of the information-asymmetry-reduction role of CSR, but not the over-investment hypothesis. As anticipated, we find a positive association between AIIDX and risk measure of DEVRET at the one percent level.

[Table 3 about here]

Because we use cross-sectional and time-series combined panel data, we need to employ fixed effects regressions to account for fixed effects within each firm in the sample and to impose time independent effects for each variable that are possibly correlated with the regressors. A fixed effects model is a typically used statistical model when the observed quantities in terms of explanatory variables are treated as if the quantities were non-random.[5] The fixed-effects regressions are reported in Table 4. As in our baseline OLS regressions, we

[5] This is in contrast to random effects or mixed effects models in which either all or some of the explanatory variables are treated as if they arise from the random causes.

find a significant and negative relation between CSRIDX and AIIDX. While both the coefficients and corresponding t-statistics are somewhat smaller in fixed effects regressions, robust t-statistics are still significantly negative at the one percent level, ranging from -14.69 to -19.60 for CSRIDX_I and ranging from -19.24 to -25.82 for CSRIDX_II. Other coefficients closely mirror the baseline OLS regressions results. Again, the fixed effects regressions results are also consistent with the information-asymmetry-reduction role of CSR.

[Table 4 about here]

To examine the reverse causality, we present the regression results of CSR index on the lag of information asymmetry measure along with control variables in Table 5. The coefficients on the lag of AIIDX also are significantly negative at the one percent level with robust t-values of -6.18 for CSRIDX_I and -7.83 for CSRIDX_II, respectively. Although significant at the one percent level, robust t-values are quite lower than those of the baseline OLS or the fixed effects regressions, suggesting that the impact of CSR activities on information asymmetry is more substantial than the impact of information asymmetry on CSR.

[Table 5 about here]

Previous studies (Ioannou and Serafeim, 2010; Jo and Harjoto, 2011, 2012) suggest that firm's CSR engagement is endogenous. To address these issues properly, we attempt to conduct an endogeneity correction employing two approaches including simultaneous system equations and dynamic panel generalized method of moment (GMM). We first use the three-stage least square (3SLS) simultaneous equations regression method to estimate the effect of CSR on information asymmetry. The results reported in Panel A of Table 6 suggest that CSRIDX_I affects AIIDX more substantially than AIIDX influences CSRIDX_I. Specifically, we find that robust t-values of the coefficients on CSRIDX_I in AIIDX regressions range

from -42.33 to -64.22 while robust t-values of the AIIDX in CSRIDX_I regressions range from -3.18 to -17.71, although all the coefficients on CSRIDX_I and AIIDX are significant at the one percent level. Explanatory powers of various 3SLS models also are relatively high because system weighted R^2 ranges from 0.7317 to 0.7725. This finding is generally consistent with the interpretation of the information-asymmetry reduction role of CSR after controlling for the reverse causality. We also find similar results for CSRIDX_II case reported in Panel B.

[Table 6 about here]

Next, to further deal with remaining endogeneity issue, we conduct dynamic panel generalized method of moment (GMM) adopted by Wintoki, Linck, and Netter (2012). The dynamic panel GMM model enables us to estimate the CSR/information asymmetry relation while including both past information asymmetry and fixed-effects to account for the dynamic aspects of the CSR/asymmetry relation and time-invariant unobservable heterogeneity, respectively. Table 7 presents the regression results of dynamic GMM. The results show that when we include fixed-effects in a dynamic model and estimate via system GMM, the coefficient on CSRIDX_I as well as CSRIDX_II are still negative and significant, at least at five percent level (robust t-values range from -2.268 to -2.585). Although statistical significance gets a bit weaker than that of simultaneous 3SLS regressions and is in sharp contrast to what we have found in OLS and fixed effect regressions, it still seems that shareholders interpret the CSR as an information signaling tool from the firm. The AR(1) and AR(2) tests for first-order and second-order serial correlation in the first-differenced residuals suggest that under the null hypothesis of no serial correlation, AR(1) is serially correlated, but AR(2) is uncorrelated. The Hansen test of over-identifying restrictions indicate that our

instrumental variables are valid, i.e. uncorrelated with error terms. We use lagged three- and four-periods as instruments. All the regressors except industry dummies and year dummies are assumed to be endogenous. The difference-in-Hansen test of exogeneity suggests that the subsets of instruments that we use in the levels equations are exogenous. Overall, our dynamic GMM results also support our hypothesis 1 of information-asymmetry-reduction as opposed to the over-investment hypothesis.

[Table 7 about here]

4.3. Additional Tests

So far, we find that firm's CSR engagement reduces information asymmetry between insiders and outsiders. As an alternative proxy of information asymmetry, we also employ the dispersion in analyst forecasts following Li and Zhao (2008), and we perform various OLS regressions. We measure analyst forecast dispersion as the dispersion of analyst earnings forecast (DISP) as a proxy of disagreement among analysts based on the standard deviation of analysts' earnings estimates relative to the absolute value mean of earnings estimates stated in percentage (Diether et al., 2002). As reported in Table 8, we find a negative and significant association between DISP and both CSR composites, further supporting the information-asymmetry-reduction role of CSR.[6]

[Table 8 about here]

To further examine the issue whether CSR activities could improve information

[6] The dispersion in analyst forecast (DISP) is closely related to analyst forecast error and the number of analysts following the firm that we use in our AIIDX composition. Thus, the negative association between DISP and CSRIDX that we find is not surprising.

transparency and provide some domino effect on information-asymmetry-reduction among investors, we adopt an alternative measure of information asymmetry, the probability of informed trading (PIN) developed by Easley et al. (2002) which is unobservable.[7] The idea of PIN is to measure the information asymmetry between informed and uninformed trades in a market by constructing a ratio of informed trades over total trades,

$$PIN = \frac{\alpha\mu}{\alpha\mu + \varepsilon_B + \varepsilon_S}$$

where α is the probability of an information event occurs, μ is the daily arrival rate of informed traders, ε_B is the daily arrival rate of uninformed buy orders and ε_S is the daily arrival rate of uninformed sell orders. All of these structural parameters are estimated using numerical maximization of a likelihood function containing these parameters.

Because the interpretation of PIN is that the higher PIN implies higher probability of informed trading, we expect a positive and significant relation between PIN and CSR to the extent that firm's CSR activities provide certain domino and spillover effect to informed as well as uninformed investors. Otherwise, we expect an insignificant association between PIN measure and CSR because CSR is only firm inside information, and therefore, CSR should affect information asymmetry between firm and outsiders as opposed to information asymmetry between informed and uninformed traders.

Table 9 presents the PIN regression results of dynamic GMM. The results show that the coefficients on CSRIDX_I as well as CSRIDX_II in PIN regressions are all insignificant.

[7] The PIN value we use in this paper is available from the website of Soeren Hvidkjaer. They provide the PIN data from 1983 to 2001. We use the PIN data during the period of 1991-2001 for our additional tests. See http://www.insead.edu/facultyresearch/faculty/profiles/shvidkjaer/.

Thus, dynamic GMM results are supportive of the premise that CSR only influences information asymmetry between firms and outsiders, but not the information asymmetry between informed and uninformed traders.

[Table 9 about here]

4.4. Discussion

As the evolution of CSR in corporations continues, we expect that a future study that examines the CSR and information asymmetry relation over time would significantly contribute to our understanding of the causality and relations between information asymmetry and CSR from survey data based on managers' and participants' responses and aggregate firm-level data. Thus, some future study of the information asymmetry-CSR nexus using large-scale survey data should be worthwhile. Further work also needs to take into account the impact of information asymmetry and CSR on long-term financial performance across nations. Research on why and how firms' engagement in CSR differs across nations may provide additional understanding regarding the complex relations among CSR, information asymmetry, socially responsible investing, stock price, and firm value. Future research should also examine the contextual determinants of ethical decision making and moral reasoning of CSR across cultures.

Despite these limitations, our findings contribute to managerial practice by providing evidence on the causal effect of CSR on information asymmetry. We also provide empirical evidence that CSR engagement-information asymmetry nexus is consistent with stakeholder-theory based information-asymmetry-reduction hypothesis rather than agency-theory based over-investment explanation.

5. Conclusion

In spite of the important roles of information asymmetry and corporate social responsibility (CSR), only limited empirical evidence examines the causality and endogeneity issues between information asymmetry and CSR. To fill that void and to determine the relative importance of stakeholder theory vs. agency theory regarding the relations between information asymmetry and CSR, we examine whether information asymmetry is causing CSR or CSR is causing information asymmetry. Based on the information-asymmetry-reduction hypothesis derived from stakeholder theory, we expect a negative relation between information asymmetry and CSR. Based on the overinvestment hypothesis stemming from agency theory, we expect managers to overinvest in CSR and therefore a positive relation between information asymmetry and CSR.

Employing a comprehensive sample of U.S. firms with CSR engagement during the 1991 to 2010 period, we find that different measures of CSR index have a negative effect on information asymmetry. Furthermore, by using the fixed effect method, simultaneous 3SLS approach, and dynamic panel GMM approach, we still find that CSR significantly reduces information asymmetry even after considering a potential simultaneity and endogeneity bias, supporting the information-asymmetry-reduction explanation. CSR, however, does not influence information asymmetry between informed and uninformed investors. So, does CSR reduce information asymmetry? Yes, it seems to be to the certain extent.

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Appendix A. List of the strength and concern items in the KLD database

KLD Inclusive Social Ratings		
Category	*Strength Items*	*Concern Items*
Community	Generous Giving	Investment Controversies
	Innovative Giving	Negative Economic Impact
	Support for Housing	Indigenous Peoples Relations ('00-'01)
	Support for Education (added '94)	Other Concern
	Indigenous Peoples Relations (added '00, moved '02)	
	Non-U.S. Charitable Giving	
	Other Strength	
Environment	Beneficial Products & Services	Hazardous Waste
	Pollution Prevention	Regulatory Problems
	Recycling	Ozone Depleting Chemicals
	Alternative Fuels	Substantial Emissions
	Communications (added '96)	Agricultural Chemicals
	Property, Plant, and Equipment (ended '95)	Climate Change (added '99)
	Other Strength	Other Concern
Diversity	CEO	Controversies
	Promotion	Non-Representation
	Board of Directors	Other Concern
	Family Benefits	
	Women/Minority Contracting	
	Employment of the Disabled	
	Progressive Gay & Lesbian Policies	
	Other Strength	
Employee Relations	Strong Union Relations	Poor Union Relations
	No Layoff Policy (ended '94)	Health Safety Concern
	Cash Profit Sharing	Workforce Reductions
	Employee Involvement	Pension/Benefits (added '92)
	Strong Retirement Benefits	Other Concern
	Health and Safety Strength (added '03)	
	Other Strength	
Product Quality and Safety	Quality	Product Safety
	R&D/Innovation	Marketing/Contracting Controversy
	Benefits to Economically Disadvantaged	Antitrust
	Other Strength	Other Concern

Notes: We borrow this Appendix from Jo and Harjoto (2012). All items are listed in their corresponding category. Unless otherwise indicated, the item has been included in the data from 1991-2010. Items that were added to the data or discontinued (i.e., ended) in intermediate years are indicated, as are the cases in which an item was moved from one category to another. Further details on the definition of each indicator are available from KLD Research & Analytics, Inc. at http://www.kld.com/research/ratings_indicators.html

Appendix B. Construction of AIIDX and summary statistics

Panel A. AIIDX – Cai et al.'s (2009) method

variable	N	mean	median	stdev	min	max
Total assets	21,595	8415.590	1524.190	23087.180	50.578	170706.000
Market value of equity	21,590	6253.280	1463.420	15609.480	61.739	112698.320
R&D/Assets	21,595	0.037	0.000	0.075	0.000	0.435
Tobin's q	21,595	1.470	1.095	1.310	0.260	7.414
Number of Analysts (NAF)	21,595	9.908	8.000	7.439	1.000	33.000
Analysts' forecast error (AFE)	21,412	0.024	0.004	0.079	0.000	0.647
Number of shareholders (NSH)	21,595	22.096	3.134	61.866	0.020	462.745
AIIDX	21,595	52.108	52.617	16.527	10.274	97.257

Panel B. AIIDX using inverse of certain items

variable	N	mean	median	stdev	min	max
Inverse of total assets	21,595	0.00197	0.00066	0.00333	0.00001	0.01977
Inverse of MV equity	21,590	0.00162	0.00068	0.00254	0.00001	0.01620
R&D/Assets	21,595	0.03705	0.00000	0.07454	0.00000	0.43507
Tobin's q	21,595	1.47016	1.09501	1.30984	0.26007	7.41387
Inverse of NAF	21,595	0.21314	0.12500	0.23699	0.03030	1.00000
Analysts' forecast error (AFE)	21,412	0.02413	0.00433	0.07922	0.00000	0.64706
Inverse of NSH	21,595	2.99914	0.31908	7.43937	0.00216	50.00000
AIIDX	21,595	52.108	52.617	16.527	10.274	97.257

Notes: Panel A reports descriptive statistics of variables used to construct *AIIDX*. Panel B displays descriptive statistics, containing inverse of some variables, such as total assets, MV equity, number of analyst following, and number of shareholders. The sample period is from 1991-2010. *AIIDX* is based on the percentile ranking of each variable.

Appendix C. Variable descriptions

Variables	Definitions
CSRIDX_I	CSR Composite, measured as the arithmetic average of the combined scores of strengths and concerns of each dimension,
CSRIDX_II	Scaled Net CSR Counts, measured as dividing net CSR counts minus minimum net CSR counts in the same industry by the difference between the maximum and minimum net CSR counts in the same industry
AIIDX	Information Asymmetry Index, measured as the average percentile ranking across seven dimensions
CAPEXA	Capital expenditure expense divided by total sales
SALEG	Sales growth rate from t-1 to t (in %)
FCF	Free Cash Flow, measured as cash flow from operating activities minus common and preferred dividends, scaled by total assets (Lang et al. 1991; Core and Guay 1999).
DEVRET	Standard deviation of monthly stock returns for the past year prior to current year
ROA	Operating income before depreciation divided by total assets
DEBTR	Long-term debt divided by total asset
ADVR	Advertising expense divided by total sales
ASSETRESIDUAL	Residuals from a regression of asset on AIIDX
RNDRESIDUAL	Residuals from a regression of R&D on AIIDX
AT_CSR_RESIDUAL	Residuals from a regression of asset on CSRIDX_I (CSRIDX_II)
RND_CSR_RESIDUAL	Residuals from a regression of R&D on CSRIDX_I (CSRIDX_II)
PCTINDEP	Percent of independent directors, measured as the number of independent outside directors divided by the number of total directors (source: Risk-Metrics database)
GINDEX	Gompers, Ishii and Metrick index (source: RiskMetrics database)
FF48 INDUSTRY	Fama and French (1997) 48 industry classification
PIN	Probability of information-based trading measure defined as in Easley, Hvidkjaer and O'Hara (2002).

Notes: This table reports presents definitions of the variables used in the empirical tests

Table 1 Descriptive statistics

Variables	Observation	Mean	Min	Median	Max
CSRIDX_I	21,492	0.4280	0.2163	0.4259	0.7235
CSRIDX_II	20,485	0.4024	0.0000	0.3684	1.0000
AIIDX	21,492	52.1211	10.2743	52.6293	97.2567
CAPEXA	21,149	0.0494	0.0000	0.0332	0.3016
SALEG	21,374	0.1282	-0.5412	0.0831	1.7738
FCF	19,984	0.0744	-0.4543	0.0793	0.3210
DEVRET	20,664	0.1042	0.0326	0.0898	0.3044
ROA	20,807	0.0218	-0.708	0.0418	0.2678
DEBTR	20,737	0.1912	0.0000	0.1501	0.8665
ADVR	20,809	0.0110	0.0000	0.0000	0.1512
ASSETRESIDUAL	21,492	-0.0034	-1.7105	-0.0299	2.1901
RNDRESIDUAL	21,492	-0.0025	-0.0924	-0.0149	0.3390
AT_CSR_RESIDUAL(CSRIDX_I)	21,492	-0.0032	-3.4774	-0.1220	4.5376
RND_CSR_RESIDUAL(CSRIDX_I)	21,492	-0.0026	-0.0414	-0.0388	0.3967
AT_CSR_RESIDUAL(CSRIDX_II)	20,485	-0.0029	-3.4304	-0.1387	4.5587
RND_CSR_RESIDUAL(CSRIDX_II)	20,485	-0.0025	-0.0622	-0.0291	0.3895
PCTINDEP	10,885	0.7160	0.0000	0.7500	1.0000
GINDEX	11,116	9.3245	1.0000	9.0000	18.0000

Notes: This table displays descriptive statistics for the 21,492 firm year observations from 1991 to 2010. Sample size varies due to data availability. Mean, median, minimum, and maximum are reported. The definitions of variables are provided in Appendix C.

Table 2 Bivariate correlation coefficients

No		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	CSRIDX_I	1															
2	CSRIDX_II	0.6679*	1														
3	AINDEX	-0.2352*	-0.2381*	1													
4	CAPEXA	-0.0005	0.1793*	-0.0311*	1												
5	SALEG	-0.0134*	-0.0274*	0.0972*	0.0864*	1											
6	FCF	0.1005*	0.1225*	-0.1771*	0.2690*	-0.0195*	1										
7	DEVRET	-0.1584*	-0.1499*	0.4348*	-0.0520*	-0.0088	-0.1487*	1									
8	ROA	0.0930*	0.1151*	-0.2877*	0.0805*	0.0468*	0.6496*	-0.3094*	1								
9	DEBTR	-0.0904*	0.0610*	-0.1012*	0.0730*	-0.0298*	-0.0834*	-0.01468*	-0.0996*	1							
10	ADVR	0.1228*	0.0578*	-0.0012	0.0041	-0.0034	0.0705*	-0.0099	0.0450*	-0.0190*	1						
11	ASSETRESIDUAL	-0.0554*	0.0044	0.0092	-0.1306*	-0.0323*	-0.1321*	0.0684*	-0.1300*	0.2670*	-0.0733*	1					
12	RNDRESIDUAL	0.1448*	-0.0486*	-0.0701*	-0.1176*	0.0700*	-0.3510*	0.0718*	-0.4157*	-0.1458*	-0.0275*	-0.0102	1				
13	AT_CSR_RESIDUAL	0.0003	0.0927*	-0.8750*	-0.0288*	-0.1019*	0.0808*	-0.3381*	0.1856*	0.2289*	-0.0547*	0.4352*	0.0353*	1			
14	RND_CSR_RESIDUAL	0.0108	-0.1642*	0.4155*	-0.12228	0.1123*	-0.4043*	0.2729*	-0.5132*	-0.1800*	-0.0271*	-0.0048	0.8778*	-0.3858*	1		
15	PCTINDEP	-0.0611*	0.0618*	-0.0749*	-0.0613*	-0.0874*	-0.0452*	-0.0927*	-0.0273*	0.0602*	-0.0332*	0.1390*	0.0656*	0.1424*	0.0192*	1	
16	GINDEX	0.0207*	0.0571*	-0.1440*	0.0061	-0.0499*	-0.0337*	-0.1474*	0.0256*	0.0491*	-0.0286*	-0.0912*	-0.0180*	0.0827*	-0.1003*	0.1639*	1

Notes: This table reports Spearman correlation coefficients among variables of main interest for the 21,492 firm year observations from 1991 to 2010. See Appendix C for variable definitions. * indicates the 5% level of significance or less.

Table 3 The impact of lagged CSR index (CSRIDX) on AI index (AIIDX)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	AIIDX	AIIDX	AIIDX	AIIDX	AIIDX	AIIDX
LAG(CSRIDX_I)	-0.5718***	-0.5319***	-0.5922***			
	(-20.34)	(-16.05)	(-15.22)			
LAG(CSRIDX_II)				-0.1323***	-0.1294***	-0.1325***
				(-30.26)	(-23.83)	(-24.29)
LAGCAPEXA	-6.5338***	-7.3650***	-4.6028	-6.4828***	-7.3777***	-3.2650
	(-3.47)	(-2.64)	(-1.61)	(-3.41)	(-2.63)	(-1.18)
LAGSALEG	-0.8896***	-1.9319***	-0.6971*	-0.8901***	-1.9339***	-0.8948**
	(-3.96)	(-5.25)	(-1.95)	(-3.95)	(-5.25)	(-2.57)
DEVRET	33.5091***	28.4943***	29.1241***	33.6419***	28.3475***	29.4148***
	(17.07)	(6.84)	(10.47)	(17.12)	(6.77)	(10.87)
LAG_ROA	-3.7139***	-5.3008***	-6.4497***	-3.7278***	-5.2541***	-5.0514***
	(-4.92)	(-3.63)	(-5.17)	(-4.92)	(-3.59)	(-4.07)
LAGDEBTR	6.1946***	5.1279***	3.8389***	6.1078***	5.0868***	4.1502***
	(10.74)	(5.93)	(4.10)	(10.53)	(5.85)	(4.44)
LAGADVR	-5.4885	-2.6195	-5.7474	-5.3645	-2.5115	-3.6275
	(-1.36)	(-0.47)	(-1.04)	(-1.32)	(-0.45)	(-0.68)
LAGFCF	-4.2064***	-7.0252***	-6.4753***	-4.2064***	-6.9011***	-7.4505***
	(-4.86)	(-4.51)	(-4.23)	(-4.86)	(-4.42)	(-4.87)
LAGGINDEX		-0.2192***			-0.2193***	
		(-4.19)			(-4.17)	
LAGAT_CSR_RESIDUAL	-7.8116***	-7.7262***		-7.7913***	-7.7084***	-7.5907***
	(-97.56)	(-63.82)		(-94.46)	(-62.26)	(-68.10)
LAGRND_CSR_RESIDUAL	10.0886***	16.1831***		9.8452***	16.5388***	20.8111***
	(5.35)	(5.30)		(5.19)	(5.40)	(6.53)
LAG_PCTINDEP			-1.0525			-0.7448
			(-1.30)			(-0.95)
CONSTANT	67.5361***	67.8716***	69.1147***	48.5183***	50.4388***	49.9327***
	(30.76)	(26.55)	(28.34)	(24.17)	(22.83)	(34.06)
FF48 INDUSTRY DUMMY	YES	YES	YES	YES	YES	YES
YEAR DUMMY	YES	YES	YES	YES	YES	YES
OBSERVATIONS	16,257	8,931	9,687	16,236	8,917	9,687
ADJ. R^2	0.8544	0.8242	0.8089	0.8540	0.8239	0.8240

Notes: This table displays OLS regressions for the sample over the period of 1991-2010. The dependent variable is AIIDX in columns (1) through (6). The variable of interest is CSR Composite in columns (1)- (3), while scaled net CSR count is the main independent variable in columns (4) through (6). Robust t-statistics are presented in parentheses. The definitions of variables are provided in Appendix C.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4 The impact of lagged CSR index on AI index (fixed effects)

VARIABLES	(1) AIIDX	(2) AIIDX	(3) AIIDX	(4) AIIDX	(5) AIIDX	(6) AIIDX
LAG(CSRIDX_I)	-0.3440***	-0.3264***	-0.3224***			
	(-19.60)	(-15.26)	(-14.69)			
LAG(CSRIDX_II)				-0.0766***	-0.0736***	-0.0765***
				(-25.82)	(-19.24)	(-19.57)
LAGCAPEXA	-3.2523**	-5.0513***	-1.8001	-3.0117**	-5.2148***	-1.2570
	(-2.51)	(-2.67)	(-1.01)	(-2.32)	(-2.74)	(-0.70)
LAGSALEG	-0.4648***	-0.5510**	-0.3732*	-0.4735***	-0.5590**	-0.4292*
	(-3.17)	(-2.32)	(-1.68)	(-3.22)	(-2.34)	(-1.92)
DEVRET	17.2022***	20.8664***	16.3288***	17.2972***	20.8409***	16.3885***
	(14.16)	(8.41)	(9.78)	(14.21)	(8.39)	(9.81)
LAG_ROA	-3.4750***	-3.0107***	-4.0728***	-3.4282***	-3.0289***	-3.9083***
	(-7.33)	(-3.58)	(-5.82)	(-7.21)	(-3.59)	(-5.57)
LAGDEBTR	3.2106***	3.2856***	2.5363***	3.3371***	3.5138***	2.5989***
	(7.70)	(5.56)	(4.59)	(7.94)	(5.90)	(4.65)
LAGADVR	-2.0995	-3.2028	-8.4213	-0.8302	-1.3310	-8.9563
	(-0.57)	(-0.69)	(-1.54)	(-0.22)	(-0.28)	(-1.64)
LAGFCF	-2.3078***	-2.4801**	-2.7021***	-2.2329***	-2.3589**	-2.6326***
	(-3.87)	(-2.55)	(-3.01)	(-3.74)	(-2.41)	(-2.92)
LAGGINDEX		-0.1855***			-0.1783***	
		(-2.99)			(-2.85)	
LAGAT_CSR_RESIDUAL	-5.1056***	-4.8364***	-4.7705***	-5.0732***	-4.7923***	-4.7703***
	(-44.46)	(-30.30)	(-29.74)	(-43.97)	(-29.88)	(-29.45)
LAGRND_CSR_RESIDUAL	-1.0947	-0.3074	2.0326	-1.3655	-0.8003	2.0539
	(-0.63)	(-0.11)	(0.77)	(-0.79)	(-0.28)	(0.77)
LAG_PCTINDEP			0.5452			0.4538
			(1.11)			(0.92)
CONSTANT	59.5916***	57.6490***	58.0170***	48.0124***	46.6220***	47.4545***
	(76.26)	(51.28)	(54.14)	(134.97)	(66.70)	(97.10)
FF48INDUSTRY DUMMY	YES	YES	YES	YES	YES	YES
YEARDUMMY	YES	YES	YES	YES	YES	YES
OBSERVATIONS	16,364	8,985	9,764	16,241	8,921	9,689
NUMBER OF Firms	2,884	1,512	1,636	2,867	1,502	1,625
ADJ. R^2	0.0305	-0.0150	-0.001	0.0283	-0.0174	-0.0028

Notes: This table displays fixed-effect regressions for the sample over the period of 1991-2010. The dependent variable is AIIDX in columns (1) through (6). The variable of interest is CSR Composite in columns (1)- (3), while scaled net CSR count is the main independent variable in columns (4) through (6). Robust t-statistics are presented in parentheses.
The definitions of variables are provided in Appendix C.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5 The impact of lagged AI index on CSR index – reverse causality

VARIABLES	(1) CSRIDX_I	(2) CSRIDX_II
LAG(AIIDX)	-0.0450***	-0.2749***
	(-6.18)	(-7.83)
DEVRET	-0.0176	0.0610
	(-1.29)	(0.89)
LAG_ROA	0.0278***	0.1521***
	(5.84)	(6.18)
LAGADVR	0.1023***	0.6700***
	(3.08)	(3.75)
LAGDEBTR	-0.0112***	-0.0653***
	(-3.01)	(-3.43)
LAGATRESIDUAL	0.0042***	0.0220***
	(2.94)	(3.43)
LAGRNDRESIDUAL	0.0745***	0.2761***
	(5.21)	(4.04)
CONSTANT	0.3994***	0.5824***
	(29.21)	(4.95)
FF48INDUSTRYDUMMY	YES	YES
YEARDUMMY	YES	YES
OBSERVATIONS	16,904	16,904
ADJ. R^2	0.2987	0.2067

Notes: This table displays OLS regressions for the sample over the period of 1991-2010. The dependent variable is CSR Composite in columns (1), and scaled net CSR count in column (2). The independent variable is AIIDX in columns (1) and (2). Robust t-statistics are presented in parentheses. The definitions of variables are provided in Appendix C. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6 System of equation estimation results

Panel A: Based on CSRIDX_I

VARIABLES	(1) AIIDX	(2) CSRIDX_I	(3) AIIDX	(4) CSRIDX_I	(5) AIIDX	(6) CSRIDX_I
CSRIDX_I	-0.7200***		-0.6060***		-0.6019***	
	(-64.27)		(-43.72)		(-42.33)	
AIINDEX		-0.0442***		-0.0180***		-0.0134***
		(-17.71)		(-4.41)		(-3.18)
CAPEXA	-3.4072***		-5.3328***		-2.7603*	
	(-4.04)		(-3.80)		(-1.80)	
SALEG	0.3014**		0.1221**		-0.3119	
	(2.02)		(2.17)		(-1.18)	
DEVRET	29.8485***	-3.3875***	25.2100***	-7.3295***	25.6441***	-5.6582***
	(26.47)	(-4.40)	(12.08)	(-4.79)	(13.54)	(-4.10)
ROA	-1.7599***	1.2433***	-4.4172***	3.0356***	-4.7941***	3.1581***
	(-4.72)	(5.98)	(-7.18)	(7.41)	(-6.16)	(7.27)
DEBTR	6.0918***	-0.6670***	5.5064***	-1.1056***	4.6782***	-1.3050***
	(26.51)	(-4.27)	(15.40)	(-4.26)	(11.35)	(-4.46)
ADVR	-2.6051**	3.3847***	-2.8951	9.8448***	-3.0074	9.8629***
	(-2.32)	(4.50)	(-1.31)	(6.08)	(-1.15)	(5.88)
FCF	-1.4234		-3.3232***		-4.7009***	
	(-0.31)		(-4.08)		(-4.83)	
GINDEX			-0.2204***			
			(-9.96)			
PCTINDEP					-1.0062**	
					(-2.40)	
ASSETRESIDUAL		0.0699		0.3539***		0.3695***
		(1.59)		(5.42)		(5.74)
RNDRESIDUAL		6.7867***		12.9923***		16.1098***
		(11.18)		(12.07)		(13.78)
AT_CSR_RESIDUAL	-7.9216***		-7.8912***		-7.7881***	
	(-246.35)		(-171.90)		(-171.83)	
RND_CSR_RESIDUAL	13.6377***		16.2032***		22.3324***	
	(14.99)		(11.10)		(13.95)	
CONSTANT	74.2088***	43.3644***	71.1806***	42.3937***	70.5029***	43.3414***
	(69.67)	(67.00)	(50.33)	(45.07)	(52.54)	(49.95)
FF48 INDUSTRY DUMMY	YES	YES	YES	YES	YES	YES
YEAR DUMMY	YES	YES	YES	YES	YES	YES
OBSERVATIONS	19358		10426		10158	
SYSTEM WEIGHTED R^2	0.7725		0.7326		0.7317	
SYSTEM WEIGHTED MSE	0.9988		1.000		1.000	

Table 6 Continued

Panel B: Based on CSRIDX_II

VARIABLES	(1) AIIDX	(2) CSRIDX_II	(3) AIIDX	(4) CSRIDX_II	(5) AIIDX	(6) CSRIDX_II
CSRIDX_II	-0.1935***		-0.1522***		-0.1585***	
	(-79.94)		(-54.55)		(-54.17)	
AIIDX		-0.3800***		-0.2900***		-0.2700***
		(-27.47)		(-12.32)		(-11.23)
CAPEXA	-1.8279*		-3.4809**		-1.2448	
	(-1.94)		(-2.43)		(-0.80)	
SALEG	-0.0009		0.1099*		-0.3846	
	(-0.58)		(1.91)		(-1.43)	
DEVRET	31.333***	15.2875***	27.0794***	0.5039	28.6229***	14.8388*
	(26.90)	(3.56)	(12.63)	(0.06)	(14.78)	(1.89)
ROA	-1.3359***	6.1074***	-3.8882***	12.1981***	-3.8694***	12.0685***
	(-3.49)	(5.27)	(-6.15)	(5.07)	(-4.86)	(5.30)
DEBTR	5.6588***	-0.6785	4.9753***	-4.5120***	4.1416***	-5.8695***
	(23.80)	(-0.78)	(13.51)	(-2.95)	(9.79)	(-3.54)
ADVR	-0.7059	18.0139***	1.3731	62.7164***	1.7387	55.9385***
	(-0.61)	(4.29)	(0.60)	(6.59)	(0.64)	(5.87)
FCF	0.0674		-3.2207***		-4.7188***	
	(0.15)		(-3.99)		(-4.79)	
GINDEX			-0.2181***			
			(-9.68)			
PCTINDEP					-0.8686**	
					(-2.04)	
ASSETRESIDUAL		-3.9781***		-2.2591***		-2.2815***
		(-16.50)		(-5.94)		(-6.30)
RNDRESIDUAL		31.7582***		63.9873***		83.4007***
		(9.37)		(10.11)		(12.57)
AT_CSR_RESIDUAL	-7.7428***		-7.7205***		-7.6173***	
	(-232.75)		(-163.87)		(-164.46)	
RND_CSR_RESIDUAL	13.4381***		16.6249***		23.8394***	
	(14.27)		(11.07)		(14.54)	
CONSTANT	56.3091***	75.4404***	54.1990***	65.5518***	52.5113***	54.2869***
	(56.11)	(20.89)	(40.53)	(11.85)	(42.40)	(11.03)
FF48INDUSTRY DUMMY	YES	YES	YES	YES	YES	YES
YEARDUMMY	YES	YES	YES	YES	YES	YES
OBSERVATIONS	19358		10426		10158	
SYSTEM WEIGHTED R^2	0.7676		0.7212		0.7317	
SYSTEM WEIGHTED MSE	0.9551		0.9790		0.9882	

Notes: This table displays 3 SLS regressions. In Panel A, the variable of interest is CSR Composite, while scaled net CSR count is the main independent variable in Panel B. Robust t-statistics are presented in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7 Dynamic panel GMM estimation results

	(1)	(2)	(3)	(4)
VARIABLES	AIIDX	AIIDX	AIIDX	AIIDX
CSRIDX_I	-0.2104***	-0.2660**		
	(-2.585)	(-2.268)		
CSRIDX_II			-0.0464**	-0.0633**
			(-2.502)	(-2.451)
SALEG	-0.0887	0.9813	-0.4919	-0.0757
	(-0.035)	(0.264)	(-0.210)	(-0.021)
CAPEXA	-41.1279**	-17.7485	-35.1823**	-18.6975
	(-2.467)	(-1.411)	(-2.203)	(-1.438)
DEVRET	-6.0493	-3.7189	-4.3775	-1.5371
	(-0.601)	(-0.338)	(-0.477)	(-0.125)
ROA	-24.4294**	2.6881	-21.6448**	4.2133
	(-2.252)	(0.346)	(-2.204)	(0.507)
DEBTR	2.6524	3.1602	3.0269	3.6171
	(1.335)	(1.259)	(1.501)	(1.421)
ADVR	-10.2921	-7.5586	-12.1773	-11.8950
	(-0.741)	(-0.441)	(-0.911)	(-0.724)
FCF	18.8348*	-13.2363	14.8624	-11.8916
	(1.647)	(-1.247)	(1.481)	(-1.082)
AT_CSR_RESIDUAL	-3.6054***	-3.8097***	-3.9831***	-3.3225**
	(-3.499)	(-2.681)	(-3.254)	(-2.486)
RND_CSR_RESIDUAL	-7.7439	10.2513	-4.7942	13.8567
	(-1.002)	(1.033)	(-0.681)	(1.397)
PCTINDEP		-0.9364		-1.1912
		(-0.242)		(-0.299)
AIIDX(*t*-1)	0.5067***	0.4397*	0.4555**	0.5159**
	(3.191)	(1.935)	(2.497)	(2.384)
AIIDX(*t*-2)	0.0719	0.0578	0.0799	0.0327
	(1.435)	(0.990)	(1.443)	(0.589)
CONSTANT	32.6224***	41.1214***	27.7620***	29.1004***
	(3.504)	(2.878)	(3.579)	(2.860)
INDUSTRY DUMMY	YES	YES	YES	YES
YEAR DUMMY	YES	YES	YES	YES
Observations	13,049	8,032	12,964	7,978
# OF FIRMS	2,480	1,485	2,465	1,476
AR(1) test (p-value)	(0.000)	(0.004)	(0.000)	(0.000)
AR(2) test (p-value)	(0.621)	(0.564)	(0.785)	(0.319)
Hansen test over-identification (p-value)	(0.596)	(0.079)	(0.594)	(0.250)
Diff-in-Hansen test of exogeneity (p-value)	(0.777)	(0.454)	(0.582)	(0.964)

Table 7 Continued

Notes: This table displays dynamic GMM regressions for the sample over the period of 1991-2010.
The dependent variable is AIIDX in columns (1) through (4). The variable of interest is CSR Composite in columns (1)- (2), while scaled net CSR count is the main independent variable in columns (3) through (4).
The AR(1) and AR(2) tests are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test of over-identifying restrictions is a test with the joint null hypothesis that instrumental variables are valid, i.e. uncorrelated with error terms. We use lagged three- and four-periods as instruments. All the regressors except industry dummies and year dummies are assumed to be endogenous. The difference-in-Hansen test of exogeneity is a test with the null hypothesis that the subsets of instruments that we use in the levels equations are exogenous. Robust t-statistics are presented in parentheses. The definitions of variables are provided in Appendix C.
***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 8 Regressions of analyst dispersion on CSRIDX

VARIABLES	(1) DISP	(2) DISP	(3) DISP	(4) DISP	(5) DISP	(6) DISP
LAG(CSRIDX_I)	-0.2117***	-0.2257***	-0.1872**			
	(-3.075)	(-2.585)	(-2.317)			
LAG(CSRIDX_II)				-0.0410***	-0.0368**	-0.0388**
				(-2.909)	(-2.140)	(-2.138)
LAGLNASSET	0.0205***	0.0178***	0.0176***	0.0207***	0.0178***	0.0178***
	(11.132)	(9.061)	(10.403)	(10.935)	(8.860)	(10.180)
LAGRNDA	0.1654***	0.0814	0.0288	0.1608***	0.0748	0.0272
	(4.525)	(1.632)	(0.834)	(4.469)	(1.492)	(0.762)
LAGCAPEXA	-0.0015	-0.0280*	-0.0212	-0.0015	-0.0279*	-0.0211
	(-0.176)	(-1.904)	(-1.552)	(-0.173)	(-1.898)	(-1.541)
LAGSALEG	0.0072	-0.0663	-0.0580	0.0095	-0.0639	-0.0543
	(0.167)	(-0.811)	(-0.766)	(0.221)	(-0.796)	(-0.730)
DEVRET	0.5829***	0.7950***	0.6598***	0.5878***	0.7959***	0.6626***
	(8.386)	(4.674)	(6.765)	(8.462)	(4.642)	(6.736)
LAGROA	-0.0377*	-0.0848*	-0.0260	-0.0375*	-0.0853*	-0.0252
	(-1.716)	(-1.823)	(-0.633)	(-1.684)	(-1.795)	(-0.600)
LAGDEBTR	0.0242	0.0305*	0.0052	0.0235	0.0300*	0.0038
	(1.484)	(1.942)	(0.307)	(1.448)	(1.914)	(0.225)
LAGADVR	-0.2100***	-0.1990***	-0.1939***	-0.2045***	-0.1993***	-0.1873***
	(-4.343)	(-3.835)	(-3.835)	(-4.192)	(-3.901)	(-3.782)
LAGFCF	0.0145	0.1904*	0.1844**	0.0149	0.1885*	0.1841**
	(0.371)	(1.883)	(2.165)	(0.381)	(1.876)	(2.166)
LAGGINDEX		0.0000			0.0000	
		(0.006)			(0.007)	
LAGPCTINDEP			0.0378***			0.0378***
			(2.641)			(2.593)
CONSTANT	-0.0705***	-0.0858**	-0.1135***	-0.1506***	-0.1858***	-0.1841***
	(-2.723)	(-2.184)	(-3.390)	(-6.911)	(-4.822)	(-5.338)
YEAR DUMMY	YES	YES	YES	YES	YES	YES
FF INDUSTRY DUMMY	YES	YES	YES	YES	YES	YES
Observations	14,983	8,497	9,235	14,964	8,484	9,225
Adjusted R^2	0.075	0.135	0.145	0.075	0.135	0.146

Notes: This table displays OLS regressions for the sample over the period of 1991-2010. The dependent variable is analysts' forecast dispersion (DISP) in columns (1) through (6) as an alternative proxy of information asymmetry between firms and outsiders. The variable of interest is CSR Composite in columns (1)-(3), while scaled net CSR count is the main independent variable in columns (4) through (6). Robust t-statistics are presented in parentheses. The definitions of variables are provided in Appendix C.

***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 9 Dynamic panel GMM estimation results for the impact of CSR on PIN

VARIABLES	(1) PIN	(2) PIN	(3) PIN	(4) PIN
CSRIDX_I	-0.0009	-0.0017		
	(-1.16)	(-0.76)		
CSRIDX_II			-0.0003	-0.0004
			(-1.57)	(-1.62)
SALEG	-0.0136	-0.0098	-0.0208	-0.0037
	(-0.57)	(-0.31)	(-1.09)	(-0.13)
CAPEXA	-0.2571	-0.1082	-0.1733	-0.0853
	(-1.56)	(-0.42)	(-1.06)	(-0.34)
DEVRET	0.0122	-0.1105	-0.1055	-0.0882
	(0.04)	(-0.42)	(-0.35)	(-0.33)
ROA	0.0714	0.0585	0.0777	0.0794
	(0.77)	(0.49)	(0.91)	(0.71)
DEBTR	0.0102	-0.0236	0.0590	-0.0021
	(0.25)	(-0.49)	(1.50)	(-0.05)
ADVR	-0.2833*	-0.0523	-0.2147	-0.0932
	(-1.88)	(-0.14)	(-1.28)	(-0.30)
FCF	0.0735	-0.1342	0.1013	-0.0917
	(0.64)	(-1.41)	(0.98)	(-1.01)
AT_CSR_RESIDUAL	-0.0141**	-0.0226**	-0.0147***	-0.0219**
	(-2.50)	(-2.57)	(-2.74)	(-2.25)
RND_CSR_RESIDUAL	-0.0585	-0.0469	-0.1610	-0.0282
	(-0.25)	(-0.16)	(-0.77)	(-0.09)
GINDEX			0.0036	
			(1.07)	
PCTINDEP		0.0144		0.0327
		(0.30)		(0.56)
PIN(T-1)	0.0963*	0.0675	0.1318**	0.0492
	(1.79)	(1.21)	(2.45)	(0.93)
CONSTANT	0.1547***	0.2247	0.0871**	0.1436*
	(2.87)	(1.50)	(2.22)	(1.94)
OBSERVATIONS	1,995	1,241	1,948	1,231
NUMBER OF FIRMID	309	296	300	294
AR(1) test (p-value)	0.000	0.000	0.000	0.000
AR(2) test (p-value)	0.508	0.276	0.550	0.316
Hansen test over-identification (p-value)	0.165	0.317	0.253	0.204
Diff-in-Hansen test of exogeneity (p-value)	0.574	0.465	0.214	0.311

Notes: This table displays dynamic GMM regressions for the sample over the period of 1991-2001. The dependent variable is the probability of informed trading (PIN) that measures information asymmetry between informed and uninformed investors. The variable of interest is CSR Composite in columns (1)- (2), while scaled net CSR count is the main independent variable in columns (3) through (4). The AR(1) and AR(2) tests are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Hansen test of overidentifying restrictions is a test with the joint null hypothesis that instrumental variables are valid, i.e. uncorrelated with error terms. We use lagged two- and three-periods as instruments. All the regressors except industry dummies and year dummies are assumed to be endogenous. The difference-in-Hansen test of exogeneity is a test with the null hypothesis that the subsets of instruments that we use in the levels equations are exogenous. Robust t-statistics are presented in parentheses. The definitions of variables are provided in Appendix C.

***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.