# Debt Markets Retort to Mandatory Corporate Social Responsibility

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**Abstract**

This study examines the debt markets' response to mandatory CSR as prescribed by the Indian Companies Act 2013. Implementing this rule results in a 43 basis point increase in primary market yield spreads for compliant firms, counteracting the Act's debt-reducing provisions. The secondary market yield spread for affected firms' bonds increased by 59 basis points over three days following the CSR rule. The upsurge is attributed to the negative impact of mandatory CSR on expected cash flow. Leveraging a generative artificial intelligence (AI) model, the analysis distinguishes between mandatory CSR governance and expenditure. The former modestly boosts the issue-to-sales ratio by 1.2%, while the latter significantly drives the rise in yield spreads, illuminating the complex effects of mandatory CSR on debt market behavior.

**KEYWORDS**: Corporate Social Responsibility (CSR), Debt Markets, Indian Companies Act 2013, Free Cash Flow.

***JEL Codes***: G30, M14.

# I. INTRODUCTION

In academic discussions of Corporate Social Responsibility (CSR), it is commonly acknowledged that markets are not always capable of efficiently pricing and providing public goods. However, it is emphasized that firms cannot and should not be expected to voluntarily act in socially or environmentally responsible ways and should focus on profit maximization. Managing externalities and providing public goods is the role of governments, as public preferences and democratic empowerment guide them. This separation of corporate and government responsibility toward society is commonly referred as the classical dichotomy (Friedman, 1970). Recent research has moved beyond questioning the existence of CSR to exploring its effects on the economy, shareholder value, and stakeholder welfare. Research in this area concentrated on understanding the motive of CSR - value creation (or win-win scenario), delegated philanthropy (Benabou and Tirole, 2010), or manifestation of agency problems.[1] However, in these studies, CSR activities are voluntary, making it difficult to discern the underlying motives driving the outcomes. To overcome this challenge, my research focuses on the debt markets in India, where a mandatory CSR spending requirement is imposed on profitable firms. This unique setting enables me to explore how mandatory CSR influences the pricing of debt securities.[2]

Previous research examining the relationship between CSR and credit markets has generally identified a negative correlation between CSR engagement and the cost of debt. For example, studies by Oikonomou, Brooks, and Pavelin (2014), as well as Cooper and Uzun (2015), demonstrated that firms actively engaging in CSR activities tend to see improvements

[1] Flammer, 2015; Hong, Kubik, and Scheinkman, 2012; Edmans, 2011; Lins, Servaes, Tamayo, 2017. For reviews of the literature on CSR, see Griffin and Mahon (1997), Orlitzky and Benjamin (2001), Orlitzky, Schmidt and Rynes. (2003), Margolis and Walsh (2003), Margolis, Elfenbein, and Walsh (2009) and Kitzmueller and Shimshack (2012). Detail discussion of past literature is provided in the next section.

[2] The reason for focusing on the debt market is two-fold. First, mandatory CSR expenditure is a direct hit to current cash flows needed for interest payment and future cash flows by current investment and this can change the bond pricing. Second, companies often engage in the debt market more frequently than in the equity market. Therefore, the impact of mandatory CSR on repeat issuances of debt is also analyzed.

in their credit ratings and reductions in their debt costs. Similarly, Goss and Roberts (2011) observed comparable outcomes in the context of bank loans. However, it's important to note that in all these instances, the decision to engage in CSR was made voluntarily. Therefore, it remains challenging to determine whether the observed relationships between CSR and the cost of debt are (i) genuinely causal, or (ii) simply a result of model misspecification due to unobserved firm-level heterogeneity related to CSR, as discussed by Himmelberg, Hubbard, and Palia (1999). Additionally, as pointed out by Hong, Kubik, and Scheinkman (2012), reverse causality could influence the outcomes, with financially healthier firms more likely to invest in CSR activities. Given these potential endogeneity issues, including reverse causality and omitted variable bias, highlighted by Margolis, Elfenbein, and Walsh (2009), the mandatory CSR regulation in India provides a unique opportunity to investigate the causal relationship between CSR and the cost of debt.

Both houses of the Indian parliament, namely the Lok Sabha (lower house) and the Rajya Sabha (upper house), passed the mandatory CSR rule (Clause 135) under the Companies Act on August 29th, 2013. This marked one of the world's largest experiments in introducing CSR as a mandatory provision by imposing statutory obligations on companies to undertake CSR projects for social welfare activities.[3] According to this rule, if a firm has a net worth of at least Indian Rupees (INR) 5,000 million (approximately U.S. $83 million), sales of INR 10,000 million (about U.S. $167 million), or a net profit of INR 50 million (around U.S. $0.83 million) or more during any fiscal year, it must spend 2% of its average net profits from the last three years on CSR-related activities. Notably, the Indian government not only mandated CSR expenditure for targeted firms but also imposed requirements for CSR governance. Firms affected by this rule must establish a CSR committee comprising at least three directors, including one independent director. This committee is responsible for for-

[3]https://www.csr.gov.in/content/csr/global/master/home/home.html. Complete timeline on adoption and enactment of this rule is in Figure I.

mulating the CSR policy, recommending expenditure levels, and periodically monitoring its implementation. This regulatory event provides an opportunity to explore the debt market's response to the mandatory CSR rule and to evaluate whether enhanced CSR governance and transparency in expenditure disbursement influence this response. Since the CSR rule is intertwined with the financial provisions of the Indian Companies Act, the impact on the control group reflects the effects of the financial provisions alone, while the impact on the treatment group (firms affected by the rule) shows the combined effects of the financial provisions and mandatory CSR. This would help to distinguish the impact of financial regulation from that of mandatory CSR regulation.

For the empirical analysis, I utilize bond issuance data from the SDC Platinum database, covering three years before and three years after the enactment date of August 29th, 2013. The dataset is refined to exclude preferred stock issues and bonds with special features like step-up and convertible bonds, ensuring a focus on standard bond issuances. Firm characteristics are gathered from the CMIE's ProwessDx database, widely recognized for studies on the Indian market. Through a detailed data cleaning process, the final sample comprises 183 firms and 2,413 bond issues, analyzed over a six-year span from August 30th, 2010, to August 30th, 2016.

Empirical evidence indicates that the mandatory CSR regulation escalates the yield spread by 43 basis points for targeted firms, counteracting the benefits of financial provisions of the Act. This effect echoes findings by Klock, Mansi, and Maxwell (2013), where robust anti-takeover measures decreased debt costs by 34 basis points, although the focus here shifts from anti-takeover dynamics to the broader influence of mandatory CSR on debt costs. After controlling for bond and firm characteristics, as well as industry-fixed effects through a difference-in-differences approach, the yield spread for affected firms' bonds rose by 103 basis points relative to their counterparts. A multi-dimensional regression discontinuity design refined these insights, highlighting a greater yield spread for bonds from firms

just exceeding the CSR threshold versus those just below. Analysis of each CSR criteria independently confirmed that mandatory CSR spending obligates firms to endure heftier yields and spreads, underscoring the rule's significant, elevating effect on cost of debt.

The dual mandate of CSR expenditure and governance complicates the identification process, making it challenging to discern whether observed changes in yield spread and issuance volume among affected firms stem from mandatory CSR expenditure or governance. To tackle this, I utilize generative artificial intelligence (AI) through Large Language Models (LLMs) to extract information on CSR committees and governance from CSR reports.[4] Utilizing the 'ESG Chatbot', developed with a Large Language Model (LLM), I gather comprehensive information on CSR governance, including details about CSR committees, the specific CSR activities undertaken, their implementation, and adherence to CSR regulations. The chatbot is fine-tuned with five random reports, directing the model to focus on key information such as firm name, report year, expenditure on CSR activities, unspent amounts, and explanations for any non-expenditure before deploying it for data collection. By using this novel database to proxy the number of CSR committee members for mandatory CSR governance, I find that it leads to a 1.2% increase in the amount issued relative to sales for affected firms but does not impact the yield spread. This suggests that the effects on yield spread are primarily driven by mandatory CSR expenditure.

The variation in yield spreads among firms impacted by the CSR rule may be linked to transparency issues in the disbursement of CSR funds. To delve deeper, I utilize the NSE Infobase dataset, which offers detailed insights into firm-level CSR spending, including the types of CSR projects, allocated and actual expenditures, and the geographic locations of

[4]LLM models represent a significant advancement in artificial intelligence, capable of processing and generating text with a high degree of coherence and adaptability across multiple tasks. These models are a form of machine learning tools that specialize in understanding and generating human language, developed through training on extensive datasets. They utilize deep learning algorithms to grasp the intricacies and patterns of language, enabling them to respond to a wide array of queries and prompts with human-like accuracy. A detailed discussion on the large-language model and the development of the 'ESG Chatbot' application is presented in the methodology section.

these initiatives.[5] My findings show that affected firms which closely adhere to the prescribed spending amounts and disclose the agencies handling their CSR expenditures incur less penalty in the debt market. This supports the notion that capital markets reward firms for maintaining transparency in their CSR disbursements. Hence, it is crucial for firms to be transparent about their CSR expenditures as it can significantly influence their cost of capital.

Until now, I have documented an increase in the yield and yield spread for firms affected by the CSR rule but have not thoroughly explained the underlying reasons. To clarify how the mandatory CSR rule influences yield and yield spread, I employ a two-stage least squares regression analysis. The results indicate that the mandatory CSR rule affects yield and yield spread primarily through its impact on free cash flow (FCF). Specifically, allocating 2% of profits to CSR activities leads to a reduction in expected FCF, which in turn causes an increase in both yield and yield spread. Mandatory CSR obligations limit a company's ability to invest in ways that might generate future cash flows necessary for meeting debt obligations. This limitation negatively impacts market perceptions of bond value, ultimately elevating capital costs for the company.

To validate the robustness of my findings, I conduct a series of checks and sub-sample analyses focused particularly on corporate governance and ownership structure. The analysis reveals that firms with substantial promoter holdings or government ownership exhibit higher yield spreads, suggesting less effective utilization of their mandatory CSR funds. Conversely, firms affiliated with business groups tend to show lower yield spreads, likely due to their ability to coordinate CSR efforts across the group. Further examination into the impact of corporate governance on bond pricing shows that companies with robust external

[5]While the data does not specify expenditures on individual projects, it indicates that 80-90% of affected firms spend less than the mandatory requirement under the CSR rule, and that 40-50% of CSR projects and 60-65% of CSR spending are directed towards poverty alleviation, healthcare, education, and rural development, suggesting that the mandatory CSR rule operates on a 'Comply and Explain' basis.

governance—marked by a significant presence of independent directors or the engagement of BIG4 auditors—experience lower yield spreads. This indicates that well-governed companies are more adept at strategically planning and executing their CSR initiatives, thereby optimizing the benefits of such expenditures.

In addition to analyzing the primary market, I also examined the impact of the mandatory CSR rule on the yield and yield spread of affected firms' bonds in the secondary market. Consistent with the results from the primary market, I found that the three-day cumulative yield spread for the bonds of affected firms increased by 59 basis points after the implementation of the CSR rule.

Overall, this study demonstrates that while the enactment of the Act reduces debt costs for unaffected firms, the mandatory CSR regulation adversely impacts affected firms, negating the benefits of other provisions of the Act. This results in a 103 basis points increase in the yield spread for affected firms compared to their unaffected counterparts. Consequently, affected firms reduced their amount issued (liquidity), and only those with robust CSR governance manage to maintain their liquidity levels. Further analysis indicates that the increased yield spread is primarily due to a decrease in future cash flows, which complicates financial management for these firms. However, strong governance, affiliation with larger business groups, and transparent disclosure of CSR fund utilization can mitigate the negative impacts of mandatory CSR.

The next section discusses the contributions and limitations of this study. Section III provides a brief review of the literature and hypotheses development. Section IV describes the data and Section V explains the methodology. Section VI presents the results, and Section VII offers the conclusions.

## II. CONTRIBUTIONS AND LIMITATIONS

I make several contributions to the literature. First, I provide a causal link between CSR and cost of debt. Establishing causality between CSR and cost of debt is difficult due to potential confounding factors that may also contribute to a firm's decision to engage in CSR. To overcome this hurdle, I use a difference-in-differences and MRDD around regulatory change which forced certain firms to spend on CSR, as a mechanism to examine whether CSR indeed affects yield and yield spread. This research setting significantly mitigates endogeneity concerns and makes it more likely that changes in cost of debt can be attributed to CSR. Second, I unbundled the impact of other requirements of Act from mandatory CSR rule. The unbundling further strengthens the identification and show that, although other requirements of the Act reduced the cost of debt, but the mandatory CSR rule reduced those benefits to the affected firms. Hence, unbundling helped in understanding the increase in the yield spread for the affected firms compare to unaffected ones.

Third, firms participate in the debt market frequently compare to equity market. I further investigate whether the positive relation between CSR and yield spread changes with repeat issuances. I find that yield spread increases further if the affected firm issues debt repeatedly. This is intuitive as firms get affected by the rule repeatedly and keep on issuing debt to compensate, the debt market incorporates the risk to the cash flows and would demand a higher yield. Fourth, acknowledging the role of ownership and corporate governance in bond pricing (Anderson, Mansi, and Reeb (2003)), I explore how ownership and governance measures affect this positive relationship between CSR and yield spread. I show that strong governance system and belonging to a bigger business group helps in mitigating the cost of mandatory CSR rule up to certain extent. This finding aligns with previous literature, such as Bhojraj and Sengupta (2003), which shows that a better governance system can reduce the cost of debt. Fifth, my analysis reveals that affected firms that maintain transparency

about their CSR expenditures and disclose details about the NGOs utilized for disbursing these funds face less penalization by the debt market. This supports existing research, like Duffie and Lando (2001), which suggests that reducing information asymmetry and enhancing transparency can lower the cost of capital.

Sixth, this paper also contributes to the growing body of research on CSR/ESG governance, particularly focusing on the establishment of CSR committees, management of CSR expenditure, and the implementation of CSR activities. Iliev and Roth (2023) highlight that boards with enhanced sustainability expertise can improve a firm's overall sustainability performance by 7.1%, with gains evident in both environmental and social practices. Similarly, Dyck, Lins, Roth, Towner, and Wagner (2023) argue that board renewal mechanisms are essential for aligning investor preferences with actual environmental sustainability practices within firms. Their research, which examines the adoption of majority voting for directors and the inclusion of female directors as governance mechanisms, finds a significant positive correlation with future environmental performance. Building on this discourse, my study disentangles the effects of mandatory CSR expenditure from those of CSR governance. I demonstrate that while debt markets penalize firms subject to mandatory CSR by increasing yield spreads due to potential cash flow losses, these firms can offset some of the negative impacts by exhibiting robust CSR governance. Firms with stronger CSR governance mechanisms are able to raise larger amounts, indicating a market recognition of their governance efforts despite the cost implications of mandatory CSR expenditure. Lastly, this paper contributes to the burgeoning field of 'AI in Finance,' which explores the use of large language models—a type of generative Artificial Intelligence (AI)—for predicting asset prices or extracting information from documents.[6] By employing a large language model to accurately extract information on CSR governance from CSR reports, I further enrich this emerging body of literature.

[6]Refer to Gabaix et al. (2023), Lopez-Lira and Tang (2023), among others.

**Limitations:** Like any other study, this has also limitations. First, generalizability can be an issue. It can be argued that the mandatory CSR activities prescribed by the Act 2013 are different in nature from the voluntary CSR seen in the rest of the world. Although the findings are relevant to India, it is unclear whether these findings can be applied to other parts of the world which have different economic and regulatory environments. Despite this limitation, the key findings of this paper have implications for efforts to encourage CSR in other economies. Second, due to positive correlation between stock prices and bond yields through their shared component- cash flows (Shiller and Beltratti, 1992; Campbell and Ammer, 1993), one can argue that it is unsurprising to discover similar findings to those of Machiraju and Rajgopal (2017). However, it is essential to acknowledge that this correlation is not constant and can be influenced by many factors - different expectations of future cash flows by the stock market and bond market, composition effect (bond issuer firms might be different from those covered in Machiraju and Rajgopal (2017)), and macroeconomic factors such as business cycles, inflation, monetary policy, and volatility (Campbell and Taksler (2003)). Gulko (2002) has also provided research supporting this notion. Therefore, analyzing the yield spread is employed to obtain an independent perspective on the bond market while mitigating the influence of the stock market. Nevertheless, stock return volatility could be a link between stock returns and the bond market, as volatility hurts bondholders because it increases the probability of default; however, it has a positive effect on equity holders. Thus, volatility drives up the yield and yield spread for new and seasoned corporate bonds (Campbell and Taksler (2003)). To mitigate such concerns, I show that the results are robust even controlling for stock return volatility.

Third, as information on voluntary CSR is not available, this can generate an upward bias. To overcome this concern to an extent, I use the CSR database by Karmayog (non-profit organization) to know whether affected firms did CSR in the pre-rule period. Karmayog used to collect information on CSR expenditure by the top 500 Indian firms before the mandatory

CSR implemented. Using this information, it provided CSR ratings to these firms on the scale of 1 to 5. This database helped to know which bond issuers used to do voluntary CSR before the rule. Using fuzzy matching and manual check, I could able to match 74 firms (out of 103 debt issuers in post-CSR period) which did CSR voluntarily and also issued bonds in the pre-CSR rule period. Using this voluntary CSR data on affected firms, I confirm my findings that mandatory CSR increase the cost of debt but firms which were involved in voluntary CSR in pre-rule period penalized less.

Despite the limitations, this study contributes to the literature and conveys that mandatory CSR increases the cost of debt by affecting the cash flow. However, a better governance system and transparency in CSR expenditure can marginally mitigate the cost of CSR.

## III. RELATED LITERATURE AND HYPOTHESES DEVELOPMENT

The debate surrounding CSR has shifted from the question of whether it should exist to how it impacts firm value and how investors perceive CSR expenses in securities pricing.[7] About the impact of CSR on firm value, theoretical as well as empirical papers provide mix results in evaluating the relation between CSR performance and firm value. One set of theoretical papers concludes that CSR could create value either by increasing cash flow or by decreasing discount rate (see, Baron (2007, 2008); Fatemi et al. (2015); Albuquerque et al. (2019)). Other sets of papers argue that CSR activities could reflect managerial agency

[7]On the debate about the existence of CSR and the 'objective of the firm', over the course of several decades, scholars from various disciplines have put forth and extensively discussed a wide range of firm 'objectives.' These include, but are not limited to, shareholder value maximization (Berle (1932); Friedman (1970); Jensen and Meckling (1976)), stakeholder theory (Freeman (1984)), long-term firm value maximization (Jensen (2002)), shareholder welfare maximization (Hart and Zingales (2017)), and shareholder wealth maximization with stakeholder interests (Bhagat and Hubbard (2020); Edmans (2020)). On one extreme, stakeholder governance (or stakeholderism) suggests that a firm should invest in public goods through CSR as it improves the efficiency of implicit contracting between a firm and stakeholders. Thus, social, environmental or ethical preferences of stakeholders can induce CSR activities (Baron (2001), McWilliams and Siegal (2001)). Such strategically motivated CSR activities can be profitable and the management literature terms this thesis as "doing well by doing good." On the other extreme, Friedman argues that CSR involves managers spending shareholders' money and CSR is a waste of the firm's valuable resources that should be utilized for increasing the firm value.

problems and that corporate managers engage in these activities in order to enhance their own utility rather than the welfare of shareholders (Benabou and Tirole (2010)). This argument reflects the possibility that firms with greater value or performance have the capability to expend resources on CSR activities (Hong et al. 2012), a version of a free cash flow agency problem. In this case, the causality is in the opposite direction. Regarding empirical evidence, Margolis, Elfenbein, and Walsh (2009) in meta-analysis of 167 studies, find that some studies document a positive effect when they regress firms' financial performance (either accounting based ROA or stock returns) on corporate goodness while others find a negative effect. [8]

In terms of cost of capital, Dhaliwal, Li, Tsang, and Yang [2011] conclude that the voluntary disclosure of CSR activities (i) attracts institutional investors and analysts; and (ii) reduces the firm's cost of capital. Chava (2014) finds that the cost of capital (both equity and debt) is higher for firms with poor environmental profiles. In addition, Ng and Rezaee (2015) conclude that a negative relationship exists between environmental and governance performance and the cost of equity capital, but no such relationship exists for social performance. Breuer et al. (2018) estimate that the relation between CSR performance and firms' cost of capital is conditional on the investor protection laws in the country in which the firm is located; higher ESG/CSR performance reduces (increases) the cost of capital in countries with strong (weak) investor protection. Goss and Roberts (2011) examine ESG/CSR concerns and find that firms with greater concerns pay higher interest rates on their bank loans. In sum, when CSR is voluntary, the cost of capital reduces with expenditure.

While these studies have intuitive results, it is difficult to infer causality. The level of CSR

[8]See, Masulis and Reza (2015), Servaes and Tamayo (2013), Humphrey et al. (2012) for negative relation between CSR and firm value, and Gillan et al. (2010), Gao and Zhang (2015), Borghesi et al. (2014), Ferrell et al. (2016), Iliev and Roth (2020), and Liang and Renneboog (2017a) for positive relation between CSR and firm value. Friede et al. (2015) conducted the meta-analysis of this literature and conclude: "Roughly 90% of studies find a nonnegative ESG/CFP [Corporate financial performance] relation. More importantly, the large majority of studies reports positive findings."

activity is an endogenous choice of the firm, and it is likely that well-performing firms engage in CSR activity. Therefore, it is hard to disentangle the effect of CSR from the strategic investment behavior of management. Several researchers have tried to resolve the endogeneity issue and the associated reverse causality problems. Chen, Hung and Wang (2017) examined how mandatory CSR disclosure impacts firm performance in China. China made CSR disclosure mandatory for a subset of firms in 2008. Using this as an exogenous shock, the authors examined how CSR activities affect the profitability and social externalities of firms listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange from 2006-2011. They found that treatment firms experience a decrease in return on assets (ROA), return on equity (ROE), and sales revenue and increases in operating costs and impairment charges. On the other hand, the industrial wastewater discharge and the level of SO2 emissions were reduced after the CSR disclosure mandate. As mandatory CSR disclosure does not suggest significant CSR expenditure and hence does not fully resolve the endogeneity issue. Therefore, I consider the implications of mandatory CSR in India, as imposed by the Companies Act to investigate how debt markets price CSR expenditure.

I acknowledge that this is not the first paper that has used mandatory CSR rule under the Companies Act 2013 for identification. Manchiraju and Rajgopal (2017) used this unique setting to examine the impact on shareholder value, and found a significant negative abnormal return associated with the passage of the CSR rule. The companies that advertise their CSR activity do not have negative abnormal returns. They concluded that mandatory CSR has a negative impact on shareholder value. Using the hand-collected data on CSR expenditure, Dharmpala and Khanna (2018) show that the firms pivot their CSR expenditure around the cut-off i.e., firms initially spending less than 2% increased their CSR activity, large firms initially spending more than 2% reduced their CSR expenditures. Using the same exogenous shock, Rajgopal and Tantri (2022) confirm the finding of Dharmapala and Khanna (2018) that firms that voluntarily engaged in CSR before the mandate reduce their

CSR spending afterward. They also suggest that despite increasing advertisement expenditure likely to offset the lost signaling value of voluntary CSR, stock prices and operating performance of former voluntary CSR spenders who qualify under the law decline.

Due to the positive correlation between stock prices and bond yields through their shared component- cash flows (Shiller and Beltratti, 1992; Campbell and Ammer, 1993), one can argue that it is unsurprising to discover similar findings to those of Machiraju and Rajgopal (2017) and Rajgopal and Tantri (2022). However, it is essential to acknowledge that this correlation is not constant and can be influenced by macroeconomic factors such as business cycles, inflation, monetary policy, and volatility (Gulko (2002)). Therefore, analyzing the yield spread is employed to obtain an independent perspective on the bond market while mitigating the influence of the stock market.

**Hypotheses Development:** There are several reasons to believe why mandatory CSR activities and their disclosure may not benefit, and might even harm, debtholders. Once CSR spending and its reporting become mandatory, the government could start prescribing how the CSR money should be spent, thereby limiting a firm's flexibility in coming up with its CSR policies. Moreover, various interest groups may find it easier to lobby management to advance their environmental and social goals. Finally, mandatory CSR also comes with compliance obligations such as administrative costs associated with reporting information and the need for the board to monitor the firm's CSR activities. Finally, as discussed earlier, firms could use CSR activities to signal their commitment toward their implicit contracts. Mandatory CSR requires a firm to make its CSR policies more formalized and visible, which, in turn, could strengthen such a commitment. Hence, the terms of the firms' explicit contracts could become more favorable to the firm. There are several ways in which CSR can either have a positive or negative impact on debt valuation. Based on this discussion, I propose the first hypothesis:

**H1**: Debt markets price the mandatory CSR.

In their survey, Shleifer and Vishny (1997) broadly define corporate governance as "the ways through which suppliers of capital to corporations assure themselves of getting a return on their investment."Corporate governance is important for the bondholders to mitigate – agency risk and information risk. If corporate social responsibility (CSR) arises from agency risks, an enhancement in governance mechanisms could enhance the firm's ratings and decrease the yield. Similarly, information risk, which refers to managers withholding private information that could negatively impact default risk, could be mitigated as governance mechanisms can prompt firms to disclose information promptly. This implies that governance mechanisms can indirectly impact bond ratings and yields by reducing information risk (Bhojraj and Sengupta, 2003). Taking this into account, I posit a second hypothesis.

**H2**: Corporate governance affects the debt markets' pricing of mandatory CSR.

Duffie and Lando (2001) proposed that incomplete accounting information contributes to imprecise knowledge of firm value, leading to different predictions for the shape of the yield spread term structure. This suggests that information asymmetry on CSR expenditure is crucial as it could impact the default probabilities. There is no dearth of research which shows investors demand an extra return to induce them to hold assets subject to high information asymmetry.[9] Wittenberg-Moerman investigated the same for the debt market and show that information asymmetry increases the cost of debt capital and decreases debt maturity. If it is true, information on CSR expenditure and NGOs used for disbursement would mitigate the chances of agency issues and would help in better pricing of debt. This

[9]See, Diamond and Verrecchia (1991), Easley and O'Hara (2004), Berger et al. (2006), Core et al. (2006), and others for the same.

provides the third hypothesis,

**H3**: Transparency on CSR disbursement affects the debt markets' pricing of mandatory CSR.

## IV. DATA

I obtained information on Indian bond issuances from the SDC Platinum database, which includes 6,607 bond issues between January 1, 2010, and December 31, 2016. I excluded bonds with contingent features as they are rare and can complicate the data. The remaining sample merged with the Center for Monitoring Indian Economy (CMIE) ProwessDx database which provides information on firm characteristics. However, due to missing identifiers for some observations, I had to match datasets using fuzzy matching and manual verification, resulting in a match for 3,737 bond issues. I further eliminated bond issues without offer yield to maturity data, reducing the sample size to 3,281. Furthermore, to ensure balance, I selected a sample of bond issues three years before and three years after the enactment date (i.e., 29th August 2013), and referred to them as the pre-CSR and post-CSR periods, respectively. This step eliminated 868 bond issues, resulting in a final sample of 2,413 bonds issued by 183 firms. The details on the selection criteria can be found in Table I.

### IV.A. Bond Issuances: Affected versus Unaffected Firms

The distribution of bond issues each year is shown in Panel A of Table II. There is no clear pattern in the yearly distribution of bond issuances. To analyze the impact of the CSR Mandate, I define two periods: the pre-CSR period from August 30th, 2010 to August 28th, 2013, and the post-CSR period from August 29th, 2013 to August 30th, 2016. During the pre-CSR period, 1,434 bonds were issued, while 979 bonds were issued during the post-CSR period.

To be subjected to CSR mandates, firms must meet one of the following criteria: (1) a net worth of at least 83 million USD (approximately 5 billion INR), (2) sales of at least 167 million USD (approximately 10 billion INR), or (3) a net profit of at least 0.83 million USD (approximately 50 million INR). By knowing whether the firm crossed these thresholds, I created three variables ($R1$, $R2$, and $R3$) based on the profit, net worth, and sales thresholds, respectively. These variables are expressed as percentage differences from the cutoff threshold.

(1)

$$R1 = (\text{Pre-Tax Income} - 0.83)/0.83$$
$$R2 = (\text{Net Worth} - 83)/83$$
$$R3 = (\text{Total Revenue} - 167)/167$$

All values are in USD.

In order to meet all three criteria with one measure, I develop a construct called $M$. This measure takes on the lowest positive value of $R1$, $R2$, or $R3$ if at least one of these variables is positive. If all three variables are negative, the measure takes on the highest value. The computation of measure M is as follows:

(2)

$$\text{M}= \begin{cases} \min(R1, R2, R3) & if R1 \geq 0, R2 \geq 0, \text{and } R3 \geq 0 \\ \min(R1, R2) & if R1 \geq 0, R2 \geq 0, \text{and } R3 < 0 \\ \min(R2, R3) & if R1 < 0, R2 \geq 0, \text{and } R3 \geq 0 \\ \min(R1, R3) & if R1 \geq 0, R2 < 0, \text{and } R3 \geq 0 \\ \max(R1, R2, R3) & if R1 < 0, R2 < 0, \text{and } R3 < 0) \end{cases}$$

Determining the value of $M$ is a non-linear process. I must find the minimum positive value if at least one of the three variables is positive, and the maximum negative value if all three variables are negative. The algorithm chooses the minimum positive value if any of the three metrics are positive. If all three measures are negative, it switches to the maximum negative value. Based on these metrics, I have developed four variables to identify the firms impacted by the CSR rule.

(3)

$$\text{Affected} = 1 \text{ if } M > 0, \text{ otherwise } 0$$
$$\text{Affected_R1} = 1 \text{ if } R1 > 0, \text{ otherwise } 0$$
$$\text{Affected_R2} = 1 \text{ if } R2 > 0, \text{ otherwise } 0$$
$$\text{Affected_R3} = 1 \text{ if } R3 > 0, \text{ otherwise } 0$$

$M$ and *Affected* are the primary measures I use to reflect the requirements of the Act 2013. For robustness, I run the empirical tests using the component-specific criteria- $R1$, $R2$, and $R3$, as well. Difference-in-differences and RDD tests require that the post-CSR treatment effects are truly exogenous. While managers have discretion regarding reported income, they are unlikely able to simultaneously manipulate the total revenue of the firm, its net worth and its total profit.

Panel A of Table II shows data on the total amount of capital raised by bond issuers. The average bond issue by affected firms in 2010 was USD 96 million and peaked at USD 98.595 million in 2014 before falling to USD 77.776 million by 2016. For the unaffected firms, the value of bonds issued increased from USD 2.097 million in 2011 to USD 84.247 million in 2016. Surprisingly, the average size of a bond issued by unaffected firms in 2015 and 2016 is greater than that of affected firms. This shows how the mandatory CSR rule impacted the amount issued for affected firms compare to others.

Panel B of Table II shows the distribution of bonds issued by affected/unaffected firms based on the criteria described above. There are 2,352 bonds issued by affected firms and 61 bonds issued by firms not affected by the mandatory CSR spending requirement. Net profit and net worth criteria are the primary criteria for determining whether a firm is subject to mandatory CSR spending.

### IV.B. Mandatory CSR Governance and Generative AI

By harnessing the power of generative artificial intelligence (AI) through Large Language Models (LLMs), I gather information on CSR governance, including specifics about CSR committees, the details of CSR activities, their implementation, and adherence to CSR rules. Large Language Models (LLMs) represent a significant advancement in artificial intelligence, capable of processing and generating text with a high degree of coherence and adaptability across multiple tasks. These models are a form of machine learning that specialize in understanding and generating human language, developed through training on extensive datasets. They utilize deep learning algorithms to grasp the intricacies and patterns of language, enabling them to respond to a wide array of queries and prompts with human-like accuracy.

To this end, I have developed an app based on an open-source LLM model to extract data from CSR reports. The model is fine-tuned using the five random reports, focusing the model on prompts related to essential information such as firm name, report year, expenditure on CSR activities, unspent amounts, details of these activities, and reasons for not spending prescribed amount of CSR expenditure.

The effectiveness of app is evidenced in Table C1 of Appendix C, which displays its proof-of-work. For example, when I upload the CSR report of a Asian Hotels (West) Limited for 2015-16 and input relevant prompts, app accurately furnishes all requested information, verified through manual cross-checking with the original report. Table C2 of Appendix C

provides a glimpse into the raw data for five firms, collated efficiently using app. This demonstrates the app's capability to streamline data collection and analysis in the realm of CSR governance, offering a powerful tool for extracting nuanced insights from complex reports.

The initial phase of the process involves gathering all CSR reports and converting them into plain text. To facilitate efficient processing by the large language model (LLM), this text is first segmented into chunks and subsequently broken down into tokens. The size of these tokens is limited to the maximum number of tokens the LLM can process at one time, ensuring efficient operation.

In the next step, using the word embeddings of an open-source LLM model, these tokens are transformed into vectors and stored in a vector database. Once this database is established, a query or prompt is inputted into the LLM. To retrieve relevant pages for the model, an embedding for the query is generated. This embedding is then utilized to locate similar pages within the vector database, based on their vector similarities.

An essential architecture underpinning LLMs is the transformer model. This neural network model excels in understanding context and meaning by analyzing relationships in sequential data, such as words in text. Transformers employ a set of mathematical techniques known as attention or self-attention. These techniques enable the model to detect and interpret the complex inter-dependencies between distant elements in a data series. The transformer model updates the hidden state for each word in the input text through a two-step process: an attention step and a feed-forward step. In the attention step, words exchange relevant contextual information with each other. In the feed-forward step, each word contemplates the information acquired in the attention step to predict subsequent words.

The various components of the transformer, which are instrumental in enabling it to respond to queries, are detailed in Appendix D. This structure facilitates the model's ability

to comprehend and process large volumes of text, making it a powerful tool for analyzing CSR reports and extracting meaningful insights.

The development of 'ESG Chatbot' plays a pivotal role in constructing a database from CSR reports of firms affected by the CSR rule from 2014-2016.[10] This CSR governance database is then contemporaneously matched with the debt data of the affected firms.

Among the 932 bonds issued during this period, I successfully align 247 bonds with their corresponding information in the CSR governance database. This matching process is key to analyzing the relationship between the firms' financial decisions and their CSR commitments. It highlights the utility of 'ESG Chatbot' in seamlessly integrating CSR reporting with financial data, offering a novel perspective on the effects of CSR governance on debt market behaviors.

### IV.C. Descriptive Statistics

The dependent variables for this study are *Yield* (measured as the offer yield to maturity), *Yield Spread* (measured as the offer yield to maturity minus a reference Treasury bill rate), and the *Amount Issued* (measured as the principal amount issued, scaled by sale). The maturity of reference Treasury bills is based on the frequency of bonds in the sample and their maturity:

(4)

$$Maturity_{(Ref,Tbill)} = \frac{1}{N} \sum (N_i \text{x} Maturity_i)$$

$Maturity_{(Ref,Tbill)}$ for the sample is four years, and therefore, the reference treasury bill rate is the interest rate of the treasury bill with four years of maturity. The four year t-bill

[10] This period is selected because firms impacted by the CSR rule start to provide detailed information on their CSR activities, committees, and expenditures following the rule's implementation.

rate didn't change much during the sample period, it is average 8.22 % in pre-CSR rule period and 7.76% in post-CSR period. The difference is statistically insignificant.

Table III presents the summary statistics for the variables used in the analysis. The mean (median) *Yield* is 9.558% (9.550%). The mean (median) *Yield Spread* is 1.876% (1.464%). These data suggest the cost of capital for firms in India is relatively high, but most of it is due to the base level of interest rates in the economy rather than the high credit spreads of bond issuers. The control variables used are *Size, Leverage, Tobin's Q, Credit Rank,* and *Maturity. Firm Size, Leverage,* and *Tobin's Q* are calculated as the log of total assets, the ratio of long-term debt to total assets, and the ratio of the market value of equity plus the value of long-term debt to the book value of assets, respectively, and are for the lagged fiscal year. All three variables were winsorized at the 1% level. The mean (median) *Tobin's Q* level is 2.218 (1.938), indicating that bond issuers have strong growth potential. *Credit Rank* is a rank for the securities rating grades assigned based on ratings given by different agencies. Three rating agencies (CARE, ICRA, and CRISIL) dominate the market and rate various corporate securities. ProwessDx provides a composite rating grade that considers ratings from all three rating agencies and ranks the bond in terms of safety in eight categories: highest safety, high safety, moderate safety, adequate safety, inadequate safety, substantial risk, high risk, and default. I convert these rating grades into ranks from 8 (highest safety) to 2 (high risk) and develop a *Credit Rank* measure. As seen in Table III, the mean (median) credit rank is 7.465% (7.5%), with a standard deviation of 0.648%. Bond maturity (Maturity) is calculated as the difference between the issued year and the maturity year. The mean (median) *Maturity* is 6.598 (3.000) years, suggesting that Indian firms largely issue short-term bonds, with some firms issuing longer-term bonds.

I have created two metrics to evaluate the transparency of CSR expenditure disbursement among issuers. These metrics leverage data from NSE Infobase, specifically examining the actual amounts allocated to CSR and identifying the agencies responsible for distributing

these funds. Panel A of Table B1 displays CSR spending data for the top 10 firms with the largest CSR expenditures, including Reliance Industries Ltd., NTPC Ltd., and Power Finance Corp. Ltd., with spending ranging from $1.714 million to $8.006 million. Panel B of Table B1, found in Appendix B, details the agencies utilized by these top spenders for the distribution of their CSR funds. For instance, Reliance Industries manages its CSR activities through an affiliated in-house NGO, whereas companies like HDFC collaborate with external NGOs.

Drawing from the data on CSR expenditure amounts and the methods through which these funds are disbursed, I develop two proxy measures for assessing the transparency of firms in their CSR spending. *Amount Spent* captures the absolute deviation of actual CSR expenditure from the expected value, measured in percentage. As Table III, Panel C, shows, the mean (median) ratio of the deviation to the expected CSR spending is about 67% (100%). This clearly implies that the majority of the firms spend less than the expected CSR expenditure required by law. NSE Infobase also discloses the details of agencies (NGOs) that affected firms use to channel their CSR efforts during the post-CSR period. I generate an indicator variable (*NGO Indicator*) using the same that takes a value of 1 if an issuer maintains transparency and provides agency names; otherwise 0.

Utilizing the CSR governance data collated by 'ESG Chatbot', I employ the number of CSR committee members as an indicator of CSR governance. This dataset also sheds light on the reasons companies cite for not spending the prescribed CSR amount. A common justification among firms is the challenge in identifying suitable CSR activities or implementing agencies, leading to underinvestment in prescribed areas. Another frequent approach is cautious investment: firms often initiate pilot projects to 'test the waters' and, based on their success, decide on further investments in CSR.

Other prevalent reasons include issues related to law and order, capital constraints or due to business expansions. To provide a clearer understanding of these factors, Table C3 in the

appendix presents selected excerpts from CSR reports, categorizing the various reasons that companies give for their spending decisions or lack thereof. This detailed analysis not only offers insights into the dynamics of CSR expenditure but also underscores the complexities businesses face in aligning their CSR activities with regulatory requirements and operational realities.

## V. RESEARCH DESIGN

To examine the effect of post-CSR on a firm's cost of debt, I compare the yield to maturity of affected firms to those of unaffected firms in the pre-CSR and post-CSR periods. I use two comparison approaches: a difference-in-differences approach and an MRDD.

### V.A. Difference-in-Differences Design

The debt market reaction to the CSR rule is evaluated by examining changes in yield and yield spread before and after the CSR rule came into effect. Yield and yield spread can change for many reasons (observables or unobservables) irrespective to the CSR mandate. To mitigate such concerns, I use a difference-in-differences approach to understand the relative yield (or yield spread) changes for the affected firms compare to unaffected firms using the following regression specification:

(5)

$$\mathrm{Y}_{i,j} = \alpha + \beta_1 \, \textit{Affected}_j + \beta_2 \, \textit{CSR Rule} + \beta_3 \, \textit{Affected} \times \textit{CSR Rule}_j + \gamma \, X_j + \delta_{Industry} + \epsilon_{i,j}$$

Here, i represents a bond and j represents a firm. Y is *Yield, Yield Spread, and Amount Issued* (scaled by sale). The coefficient of interest is $\beta_3$, the coefficient on the interaction term *Affected* X *CSR Rule* that captures the impact of the CSR rule on the bonds of affected firms compare to bonds of unaffected firms. X is the vector of firm- and bond-level controls

in the regression; $\delta_{Industry}$ is industry fixed effects. For robustness, I also use component-specific measures (*Affected_R*1, *Affected_R*2, and *Affected_R*3) and the respective interaction variables to capture their interaction with the CSR rule.

### V.B. Multi-Dimensional Regression Discontinuity Design

I also use an RDD to document the effect of the CSR rule on yield-spreads. The RDD technique has been used in prior research—for example, Flammer (2015), Manchiraju and Rajgopal (2017) and Iliev (2010)—for resolving endogeneity concerns. For RDD to work, it is important that the critical value that causes a discontinuity is truly exogenous and cannot be manipulated. As the CSR mandate involves three separate thresholds, it is difficult for firms to manipulate all three to determine whether they fall under the minimum CSR spending requirement. The inferences drawn under an RDD approach are considered to be credible because the assignment of individuals in treatment and control groups is "as good as randomized," given that individuals cannot precisely control the assignment variable near the exogenously determined cutoffs (Lee and Lemieux, 2010). My research setting differs from the basic RDD applications listed above in that the mandatory post-CSR relies on more than one rating score to determine treatment status. Therefore, I implement multi-dimensional RDD (MRDD). To estimate the treatment effects under MRDD, I follow the method of Reardon and Robinson (2012). Their methodology is simple, easy to use and reframes the multi-dimensional vector of rating scores into a single dimension for determining treatment status; hence, it ensures minimal loss of observations in estimations. I fit the following model using zero as the critical value of the binding score.

(6)

$$\mathrm{Y} = \alpha + F(M) + \gamma X + \epsilon$$

Here, Y is Yield or Yield Spread. In the RD setting, there are two underlying relationships between Y and X, represented by $E[Y(M > 0)|X]$ and $E[Y(M < 0)|X]$. However, by definition of the RD design, all observations to the right of the cutoff (M=0) are exposed to treatment and all those to the left are in control group. The discontinuity at cut-off can be computed as follows:

(7)

$$\text{Discontinuity at cut-off} \begin{cases} = \lim_{h->0}(E[Y|X, M = 0 + h) - \lim_{h->0}(E[Y|X, M = 0 - h) \\ = E[Y(M > 0) - Y(M < 0)|X, M = 0] \end{cases}$$

This is the average treatment effect (ATE) at the cutoff ($M = 0$) within the bandwidth h. The bandwidth selection creates a trade-off between bias and precision. Using a wider bandwidth incorporates additional observations further from the cutoff, which can be beneficial for fitting higher-order polynomials that more accurately capture non-linearities in a flexible manner (e.g., Imbens and Lemieux, 2008; Lee and Lemieux, 2010). However, to balance precision with the risk of bias from extraneous events, I restrict the analysis to a narrower bandwidth. Specifically, I conduct a quadratic polynomial regression on both sides of the cutoff point, denoted as $M = 0$, within a bandwidth of $h = 10$. This approach helps to precisely gauge the discontinuity while minimizing the influence of unrelated variables.

In this regression analysis, M serves as the primary binding score. To ensure the robustness of the results, I also consider individual components - R1, R2, and R3 - as alternative metrics. This approach enables a clear differentiation between firms that are affected by the mandatory CSR rule, which are those to the right of the zero cutoff, and those that are unaffected on the left. The discontinuity in yield spread at this cutoff point effectively captures the impact of the externally imposed mandate for minimum CSR spending.

## VI. EMPIRICAL RESULTS

In this section, I examine the effects of mandatory CSR on bond characteristics, including yield, yield spread, and amount issued. I validate these findings through multi-dimensional regression discontinuity designs (RDD) and explore the mechanisms driving these impacts. Additionally, I analyze how governance related to mandatory CSR and transparency in the disbursement of CSR funds shape the debt market's response to mandatory CSR requirements.

### VI.A. Debt Markets Response to Mandatory Corporate Social Responsbility

*Impact of Mandatory CSR on Yield and Yield Spread.* Figure II illustrates the shifts in yield and yield spread for affected and unaffected firms during the pre-rule to post-rule period. The results indicate that unaffected firms experience a decrease of 1.56% in yield and 1.08% in yield spread. In contrast, affected firms observe a reduction of only 80 and 65 basis points, respectively. This suggests that the mandatory CSR expenditure requirement absorbs 43 basis points of the yield spread for the affected firms. [11]

Table IV shows the results for difference-in-differences regressions for the offering yield on the bonds in my sample. Eight models are presented. Panel A presents the results when controlling only for the post-CSR period and the interaction term between whether firms are affected and the post-CSR period. Column (1) uses the overall metric Affected, which uses the three criteria depending on net worth, profit, and sales, for determining whether the firm is affected by CSR rule. Columns (2)-(4) present the case when the individual measures alone are used to determine whether firms are affected by the post-CSR period. In these

[11] I further validate these findings by performing separate regression analyses for bonds issued by affected and unaffected firms, and subsequently comparing the coefficients. In the untabulated baseline regression that includes industry fixed effects, the loss of benefits for affected firms compared to unaffected firms is 48 basis points. With additional controls, this loss extends to 107.8 basis points. These latter results are presented in Table B2.

regressions, I replace the variable *Affected* with *Affected_R*1, *Affected_R*2, and *Affected_R*3. CSR Rule is equal to 1 for the post-CSR period and is equal to 0 in the pre-CSR period. All the regressions are run with industry-fixed effects based on the Fama-French 49 industry classifications. Panel B augments the regressions in Panel A by including control variables. As in Panel A, Column (1) uses the overall metric Affected and in Columns (2)-(4), I replace *Affected* with the component metrics *Affected_R*1, *Affected_R*2, and *Affected_R*3. Again, all the regressions are run with industry-fixed effects based on the Fama-French 49 industry classification.[12]

I find that the coefficient on *CSR Rule* is negative in all models. This suggests that yield is somewhat lower for bonds issued after 29th Aug 2013 (post-CSR rule). The coefficients of the *Affected* measures are mostly negative, except for in Model 4 in Column A, where the sign on *Affected_R*3 is positive and significant. Unsurprisingly, firms affected by the CSR mandate have a lower yield than unaffected firms, as affected firms are likely to be large and profitable and, therefore, have lower yields. These findings are consistent with the observations in Figure II, indicating that in the absence of the mandatory CSR rule, both yield and yield spread would have decreased for all firms, with a greater impact on affected firms given their larger size and profitability. However, implementing the CSR mandate offset these advantages for the affected firms.

Results also suggest that bond and firm characteristics only partially explain the yield variation. The interaction variables between *Affected* and *CSR Rule*, the variable of interest that captures the impact of exogenously imposed CSR activity, are positive and statistically significant in all eight models. Thus, the impact of the *CSR Rule* is robust when using the overall measure M or the individual components *R1, R2,* or *R3*, in determining whether firms are affected by *CSR Rule*, both with and without controls. The magnitude of the coefficient varies and reflects the variations in the sample of firms that would be affected by *CSR Rule*

[12]Complete tables showing the coefficients of all control variables are provided in Online Appendix D.

using these alternate specifications. Using the criteria for mandatory CSR as specified by the Act 2013 (i.e., firms are subject to mandatory CSR if at least one of the measures is positive), I find that *Yield* increases for firms affected by *CSR Rule*. This result is consistent with the notion that mandating CSR expenditures reduces future cash flows and increases the perceived costs of financial distress.

The table also shows the sign and significance of the control variables. Bonds issued by larger firms have lower credit spreads, as large firms are likely to have large future cash flows and sufficient assets that can serve as collateral. Interestingly, bonds issued by firms that have higher leverage have lower spreads. This is perhaps because firms with higher leverage have greater debt capacity. The coefficient on Credit Rank is negative and significant. As expected, higher-rated firms have lower spreads.

An additional variable examined is *Yield Spread*, which is the difference between the offered yield to maturity (*Yield*) and a benchmark Treasury bill. Table V displays the outcomes of the difference-in-differences regressions for yield spread. The findings for *Yield Spread* closely resemble those for the offering yield. The interaction coefficients between CSR Rule and the Affected are consistently positive and significant across all regressions, indicating that firms impacted by the CSR regulation experience increased yield spreads following the implementation of CSR rule compared to before.

The negative coefficient on *CSR Rule* implies a general reduction in the cost of debt since 2013, likely due to the financial provisions provided by the Act. Nevertheless, the mandatory CSR negates these advantages for the impacted companies by 103 basis points. This rise in yield spread demonstrates the substantial causal economic impact of the enforced CSR. These findings diverge from previous research indicating that voluntary CSR could have a beneficial effect on bond markets; however, such research may be influenced by endogeneity and reverse causality. The empirical methodology of this study addresses these econometric problems and facilitates the analysis of the effects of mandated CSR expenditures on bond

markets.

These findings indicate that mandatory CSR has a detrimental effect on the firm's cost of debt. The mandate for CSR spending targets large and profitable firms, but the lack of flexibility reduces the cash flows available to firms to meet their debt obligations. Such a lack of flexibility harms the market's perceptions of bond value, leading to a higher cost of capital for firms. Mandatory CSR also exacerbates the moral hazard between insider managers and shareholders. Firms must pick from an approved list of acceptable CSR activities, which could give private benefits to the insider manager. It is also plausible that all allowed types of CSR activity benefit society without benefiting the firm. As noted by John, Nair and Senbet (2005), socially conscious investments that generate non-monetizeable benefits to society but are negative net present value (NPV) for the firm should be rejected by the firm. If such projects are mandated, shareholders and bondholders can lose value.

*Impact of Mandatory CSR on the Amount Issued.* The demand side outcomes (Yield and Yield Spread) are presented above, specifically focusing on how debtholders assess the value of mandatory CSR. However, it is also important to consider the possibility of supply-side changes. To explore this aspect, I examine how both affected and unaffected firms adjusted their debt-raising behavior in response to the CSR rule. The findings of this analysis can be observed in Table VI, where the dependent variable is the scaled issue amount. Column (1) presents the regression results for the issued amount using "Affected" as the metric to indicate firms subject to the CSR rule. The coefficient of "Affected X CSR Rule" is -0.144, with marginal significance at 10%. This indicates that, compared to unaffected firms, those affected by the CSR rule reduced their debt issuance by 14.4%. Columns (2)-(4) demonstrate the outcomes for firms impacted by sales, net worth, or profits, using "*Affected_R*1", "*Affected_R*2", and "*Affected_R*3" respectively. The control variables exhibit expected results that align with previous studies. These findings suggest that despite the penalization imposed by the debt market through increased yield spread, the affected firms anticipated

this outcome and consequently decreased their debt-raising activities.

**Regression Discontinuity Analysis.** I proceed to analyze the significance of the mandatory CSR rule using a regression discontinuity approach. There exists an externally set criterion for enforcing a minimum CSR spending in the period following the CSR implementation, leading me to anticipate a discontinuity at scale measures ($M$, $R1$, $R2$, and $R3$) centered at zero. This expectation is confirmed by my findings. Results and visualizations for the binding score MRDD are displayed in Table VIII and Figure III. Table VIII indicates that the post-CSR RDD variable's coefficient is positive and significantly significant. Figure III illustrates the MRDD plots during the post-CSR phase for yield (Figure A) and yield spread (Figure B), revealing a discontinuity at $M$ equal to 0. The MRDD test and these figures verify the rise in yield and yield spread following the enactment of the CSR mandate.

### VI.B. Mandatory CSR Governance

The CSR rule mandates a 2% CSR expenditure for affected firms, simultaneously necessitating the establishment of CSR governance. As per the mandate, these firms must form a CSR committee tasked with developing a CSR policy, recommending expenditure amounts, and periodically monitoring the policy. Table XIII presents the effects of CSR governance, measured by the number of CSR committee members, on the debt market for the affected firms. In columns (1) to (4), which focus on yield spread and yield, baseline results indicate that CSR governance is inversely related to both yield spread and yield, reducing them by approximately 10-15 basis points. However, this association diminishes upon the inclusion of firm and bond-level control variables, suggesting that the increase in yield spread is primarily driven by mandatory CSR expenditure.

Further, columns (5) and (6) examine the impact on the amount issued-to-sale ratio. These findings demonstrate that firms with stronger CSR governance experience an increase in their issued-to-sale ratio by 1-1.2%. This underscores the positive influence of effective

CSR governance on financial performance, distinct from the costs associated with mandatory CSR expenditure.

### VI.C. Transparency in CSR Funds Disbursement

As there is a dispersion in the yield spread of companies affected by the CSR rule, and this could be due to a lack of transparency on CSR spending. To investigate this further, I collected data from the NSE Infobase on CSR expenditure. The data provides firm-level information on prescribed CSR spending, the actual amount spent, broad categories of CSR projects, the amount allocated and spent under these broad categories and the geography of the projects. It also has information on granular-level details of CSR projects but does not have information on the amount spent on each project under the broad categories. Utilizing the data on CSR expenditure, I examine the hypothesis that decreasing the information asymmetry regarding the disbursement of CSR funds is recognized positively by the debt market.

To test the hypothesis, I calculated two variables: the *NGO Indicator* and *Amount Spent*. The *NGO Indicator* is a dummy variable that takes a value of 1 if a company provides information on the agency used to disburse CSR expenditure and a value of 0 otherwise. The *Amount Spent* is the difference between the expected amount of spending and the actual amount spent, scaled by the expected amount. Columns (1)-(3) of Table X show the impact of disclosing information about NGOs on *Yield*, *Yield Spread*, and *Amount Issued*. The negative and significant coefficient of *NGO Indicator X Affected* suggests that a company can receive a rebate in the debt market if it provides information about the NGOs used to distribute CSR expenses. This indicates that the debt market is concerned about the potential loss of cash flow due to CSR and how it will be utilized, given that affected firms are obligated to allocate a minimum of 2% towards CSR expenditure.

The regression results for "Amount Spent" are displayed in columns (4)-(6). It is clear

from the findings that companies not meeting the expected CSR expenditure are penalized severely by the debt market compared to other companies. This indicates that the capital market expects firms affected by the CSR rule to maintain transparency on disbursement of CSR expenditure. This demonstrates the debt market's monitoring function concerning affected firms, ensuring the appropriate utilization of CSR expenses.

### VI.D. Free Cash Flow, Mandatory CSR, and Bond Yield

Mandatory CSR rule directly impacted the firm's cash flows by transferring the 2% of profits to CSR expenditure and this could be a possible channel by which CSR rule impacted the yield and yield spread. To investigate it further, I run a two-stage structural model. The first stage estimates the impact of the CSR mandate on future cash flows, and the second stage examines the impact of the predicted future free cash flow ($FCF$) on bond yield and yield spread. The future FCF is computed as

(8)

$$\text{FCF}_{t+1} = Log((NOPAT_{t+1} - I_{t+1}))/(AT_{t+1})$$

Here, $NOPAT$ is net operating profits after taxes, I is investment, and AT is total assets. All these measures are at t+1. Table VII shows the results of this test. Column (1) of Panel A shows that the coefficient of the interaction variable, *Affected X CSR* Rule, is negative and highly significant, implying that the cash flows for affected firms decrease significantly relative to unaffected firms in the post-CSR rule period when compared to the pre-CSR rule period. Column (2) shows that the coefficient of $FCF_{t+1}$ (fitted value) is also negative and highly significant, implying that the increased capital expenditure due to the CSR rule has a negative impact on cash flow, which, in turn, leads to an increase in yield spreads. Therefore, I conclude that mandatory CSR impacted the cost of debt by affecting cash flows.

## VII.ADDITIONAL TESTS

In this segment, attention is given to how mandatory Corporate Social Responsibility (CSR) influences yield spread. Moreover, examination is undertaken on how various factors, including ownership structure, corporate governance, repeat issuances, stock volatility, and pre-rule voluntary CSR practices impact this relationship. Furthermore, to ensure the validity of the findings, rigorous methodologies such as analysis of a balanced sample and the execution of placebo tests are employed.

### VII.A. Balanced Sample: Nearest Neighbor Matching

To ensure accuracy, I conducted a robustness check by analyzing a balanced sample. This is important because an uneven distribution of affected and unaffected bonds could potentially impact the results. To achieve balance, I utilized the nearest neighbor matching algorithm, as recommended by Larcker and Watts (2019), Flammer (2021), and others. In Table IX, I present the findings for the balanced sample. Panel A displays the distribution of affected and unaffected bonds during the pre- and post-rule periods. Specifically, there were 28 affected bonds and seven unaffected bonds in the pre-CSR rule sample. In the post-CSR rule sample, there were 58 affected bonds and 21 unaffected bonds.

In Panel B, a comparison is made between the characteristics of affected and unaffected bonds in a balanced sample. The t-statistics show that the sample is balanced in terms of *Tobin's Q, Maturity*, and *Credit Rank*. Moving on to Panel C, the difference-in-differences results for the balanced sample are presented, showing that the coefficient of *Affected X CSR Rule* for *Yield* and *Yield Spread* are 2.404 and 1.277 respectively. Both coefficients are significant at 5%. These findings confirm that debt holders demand higher yields from affected firms than from unaffected firms. Additionally, I analyzed the amount of debt issued by affected versus unaffected firms and discovered that the amount of debt issued by affected

firms decreased due to the CSR rule, although the coefficient is insignificant.

### VII.B. Shifting the CSR Rule to Commencement Date: Placebo Test

The choice of the enactment or commencement date could affect the outcomes. However, the findings remain consistent regardless of the selected date. The results of this test are presented in Table B5. In Column (2), the coefficient of *CSR Rule (Comm.) X Affected* is 1.402, signifying statistical significance at a 5% level. This indicates that there is a 1.4% increase in the yield spread for bonds of affected firms compared to unaffected ones. The same pattern is observed in Column (1) for *Yield* and Column (3) for the $Amount\,Issued$.

### VII.C. Ownership Structure

To examine the influence of ownership structure on relation between mandatory CSR and yield spread, three measures are employed. Firstly, a dummy variable ($Conc_Hldg$) is defined as 1 if the shareholding of the firm's promoters exceeds the median promoter holdings in the sample, and 0 otherwise. Secondly, another dummy variable ($Govt_Owned$) is constructed as 1 if either the central Indian government or individual state governments possess an equity stake in the firm, and 0 otherwise. Lastly, a third dummy variable ($BG$) is developed as 1 if the firm is affiliated with a business group.

Table XI presents the results of these tests. Columns (1)-(3) present the models for the concentration holding variable ($Conc_Hldg$), Columns 4-6 present the results for the government-owned variable ($Govt\text{-}Owned$), and Columns 7-9 present the results for the business group affiliates ($BG$). As before, I use several control variables and industry-fixed effects. I find that the coefficient in the triple interaction terms differs for the different ownership measures. For Yield Spread, the coefficient on the triple interaction term is positive and significant for high concentration holding ($Conc_Hldg$) and government ownership ($Govt_Owned$), suggesting that such firms are not efficient in strategically using their manda-

tory CSR spending. The coefficient on the triple interaction term with BG is negative and significant. Firms belonging to business groups can coordinate their CSR spending with other firms in the group, thus maximizing their potential benefits. Group affiliation also increases the resources and expertise to manage the CSR spending of the firm better. The table also shows the coefficients on the dummies $Conc_Hldg/Govt_Owned/BG$ and the coefficients on the interaction term between *CSR Rule* and *Affected*. The latter coefficient is in line with the main results of the paper.

### VII.D. Corporate Governance

I next analyze the influence of corporate governance on the relationship between the CSR rule and yield spreads. It is anticipated that firms with strong corporate governance will be better positioned to strategically leverage the visibility and impact of CSR expenditures, including those mandated by regulations. Therefore, I expect well-governed firms to mitigate mandatory CSR's overall negative impact. To examine this hypothesis, I consider two measures of good corporate governance. The first measure relates to the degree of board independence. A board composed largely of independent directors is considered an indicator of good corporate governance. Therefore, I create a dummy variable ($BI$) equal to 1 if the independent board fraction exceeds the median for the sample; otherwise, 0. Next, I examine the impact of the quality of the firm's auditors. I develop another dummy variable ($BIG4$) that is equal to 1 if the auditing firm is an affiliate of multinational auditing firms Deloitte Touche, PWC, E &Y or KPMG; otherwise 0. As foreign auditing firms are not allowed to conduct business in India due to the norms of the 1949 Chartered Accountants Act; these auditing firms present in the country through affiliates. I determine the affiliations based on disclosure on auditing company websites. *BIG4* is 1 for bonds issued by firms audited by the following accounting companies; otherwise, 0:

$$\text{Affiliates of Deloitte \& Touche:} \begin{cases} C.C.ChokshiCo., S.B.BillimoriaCo, A.F.FergusonCo \\ FraserRoss, MCACo \\ P.C.Hansotia \\ DeloitteHaskinsSells. \end{cases}$$

$$\text{Affiliates of KPMG:} \begin{cases} BharatS.RautCo. \\ SRBCCO. \\ SRBASSOCIATES \end{cases}$$

$$\text{Affiliates of PWC:} \begin{cases} PriceWaterhouseCo. \\ LovelockLewes \\ DalalShah. \end{cases}$$

$$\text{Affiliates of Ernst \& Young:} \begin{cases} S.R.BatliboiCo \\ S.R.BatliboiAssociates \end{cases}$$

Table XII presents the results of these tests. Columns (1) and (2) present models that use the entire sample of bond issues, and Columns (3) and (4) present models that only examine bonds sold by affected firms. Columns (1) and (3) use *BI* as the proxy for good governance, and Columns (2) and (4) use *BIG4* as the proxy for good governance. All regressions are run with control variables and industry-fixed effects. The table shows that the coefficient in the triple interaction term between *Affected, CSR Rule* and *BI/BIG4* is -0.785%/-0.456%, which is statistically significant. Similarly, the coefficients on *CSR Rule* and *BI/BIG4* in Models 4-6 are -0.769%/-0.458%, which are also statistically significant. These results are consistent with the hypothesis that good governance alleviates the negative impact of mandated CSR expenditure. As in Table V, the coefficient on the interaction term

*Affected* X *CSR Rule* captures the impact of the CSR rule on affected firms. The coefficient is positive and statistically significant, consistent with my base case results. The sum of the coefficients on CSR Rule and the interaction term *Affected* X *CSR Rule* in Columns (1) and (2) is similar in magnitude and significance to the coefficient on CSR Rule in Models 3 and 4, confirming the increase in yield spreads in regressions using only affected firms. The results for the other control variables are similar to my base case results.

### VII.E. How Mandatory CSR Affects Repeat Debt Issuances?

In contrast to the equity market, repeat issuances in the debt market are common. This allows examining how mandatory CSR rules affect companies with repeat issuances. Based on FIGURE III, the coefficient for the interaction term (*Affected* X *CSR Rule*) increases with each repeat issuance. This indicates that if a firm is affected by the rule again and issues debt, the debt market requires a higher yield due to further hit on future cash flows. The data shows that yield increases to 1.535% for second-time repeat issuances and 2.031% for third-time repeat issuances. These results are compared to unaffected companies' debt.

### VII.F. Mandatory CSR, Debt Market, and Stock Volatility

One might compare these results to those of Machiraju and Rajgopal (2017), arguing that they are expected due to the positive correlation between stock and bond returns. However, this correlation does not consistently remain positive and fluctuates with macroeconomic conditions. Campbell and Taksler (2003) explain why corporate bond prices might diverge from equity prices. First, they suggest that pessimistic (or optimistic) expectations about future corporate profits impact stock markets more significantly than debt markets. In the context of mandatory CSR, the anticipated decline in future profits due to CSR spending is likely to affect the stock market more severely than the debt market. Second, there may be a composition effect, where the corporate bonds are issued by different firms than those

studied by Machiraju and Rajgopal (2017). Third, volatility has contrasting effects on stock and bond prices. While volatility increases the risk of default and therefore is detrimental to bondholders, it can benefit equity holders by offering higher potential returns. Therefore, volatility is likely to increase yields on both new and seasoned corporate bonds. Campbell and Taksler (2003) identify volatility as a key factor influencing corporate bond yield spreads, considering composition effects, the demand for liquidity provided by Treasury bonds, and specific features of corporate bonds.

Given the significance of stock volatility in linking stock returns to bond yields, I present results controlling for stock volatility. These results are detailed in Table B3. The coefficients for '*Affected* X *CSR Rule*' for yield and yield spread are consistent in sign and magnitude, indicating that the findings are not influenced by changes in the stock market. Furthermore, affected firms respond by reducing the amount issued, a result that also holds steady against stock volatility.

### VII.G. Voluntary CSR and Debt Market

Previous research suggests that voluntary CSR activities can reduce the cost of debt (Goss and Gordon 2011; Flammer 2021). Before the mandatory CSR rule was enacted, firms were engaging in CSR voluntarily, either for philanthropic reasons or as a signaling mechanism. With the introduction of the rule, it is possible that firms anticipated to be affected may alter their CSR behavior (Dharmapala and Khanna 2018; Rajgopal and Tantri 2022), which could lead to different impacts on their yield and yield spread.

To explore this, I source data on firms that are involved in CSR activities during the pre-rule period from the Karmayog database. Using fuzzy matching and manual verification, I am able to match 74 out of 103 firms from that period. Focusing on the bonds issued by affected firms, I observe that the debt market still penalizes them, albeit to a lesser extent. The detailed results of this analysis are presented in Table B4.

### VII.H. Mandatory CSR and Secondary Debt Market

In addition to the impact of the mandatory CSR rule in the primary bond market, I also analyze how this rule changed the yield and yield spread in the secondary market for the affected firms. The secondary debt market trading data comes from CMIE ProwessDx. Unfortunately, CMIE provides the data for only trading days and not for each day. Therefore, to calculate the cumulative yield and yield spread for 3-days and 5-days, it is imperative to smoothen the data at the security level. To do that, I assume yield is unchanged on the non-trading days which is a valid assumption.

The results for this test are provided in Table XIV. The findings suggest that 3-days and 5-days yield of affected firms' bonds increased by 2.5 % (83 bps/day) and 4.2 % (84 bps /day) post-CSR rule. The same test using 3-days and 5-days yield spread suggests the increment of 0.059 % (1.9 bps/day) and 0.063% (1.26 bps/day). These results are significant at 1% and 5%, and are in line with the main results as in Table VI.

## VIII. CONCLUSION

This study critically examines the implications of mandatory Corporate Social Responsibility (CSR) on debt markets, particularly within the Indian context where CSR obligations are enforced by law. The 2013 Company Act mandates profitable firms, or those with significant sales or net worth, to allocate at least 2% of their profits to CSR initiatives. This regulation provides a unique setting to assess the direct impact of CSR on the pricing of debt securities, free from the endogeneity issues present in voluntary CSR environments.

Utilizing bond data from Indian firms, I employ a difference-in-differences approach alongside multi-dimensional regression discontinuity designs to rigorously analyze how compulsory CSR spending affects bond yields and yield spreads. The empirical evidence reveals a significant widening of the yield spread by 43 basis points for firms subjected to the CSR mandate

compared to their counterparts. This effect intensifies to 103 basis points when controlling for bond characteristics, firm attributes, and industry-fixed effects, underscoring a substantial negative impact of mandatory CSR on bond pricing. This suggests that mandatory CSR may divert funds from potentially profitable investments, adversely affecting the firm's cash flows and thus bondholder value.

Empirical findings suggest that while CSR mandates aim to enhance social welfare, they may inadvertently place a financial burden on firms by diverting resources from potentially profitable investments. This diversion can negatively impact the cost of debt, as evidenced by the increased yield spreads. This phenomenon is particularly pronounced in firms with frequent bond issuances and is somewhat mitigated in entities that demonstrate transparency in their CSR expenditures.

To address these challenges, this paper advocates for refined CSR governance mechanisms that prioritize transparency and accountability in the allocation and reporting of CSR expenditures. Enhancing transparency not only aids in mitigating the adverse impacts on bond pricing but also serves to align CSR initiatives more closely with shareholder and bondholder interests. Effective governance should ensure that CSR activities are implemented in a manner that maximizes societal benefits without unduly compromising financial performance.

In a series of tests, I also check how the negative impact of mandatory CSR on debt markets changes due to ownership structures, governance quality, market reactions to repeat issuances, and the volatility of stock prices.

In addition to analyzing the primary market, I also examined the impact of the mandatory CSR rule on the yield and yield spread of affected firms' bonds in the secondary market. Consistent with the results from the primary market, I found that the three-day cumulative yield spread for the bonds of affected firms increased by 59 basis points after the implementation of the CSR rule.

In summary, while mandatory CSR initiatives are designed to advance societal welfare, but they increase the cost of debt for firms, as indicated by the widened yield spreads. This increase suggests that mandatory CSR may benefits socially but imposes financial burdens on firms by diverting funds from investments. To mitigate these financial implications, it is crucial to enhance CSR governance and transparency. This analysis is essential for policy-makers, corporate managers, and investors as they navigate the complexities of integrating social responsibility with financial sustainability in regulated environments.

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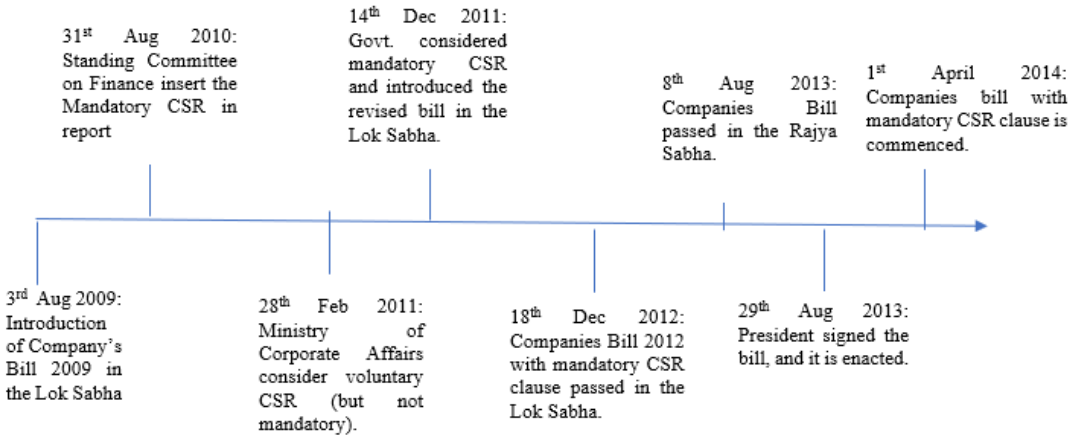
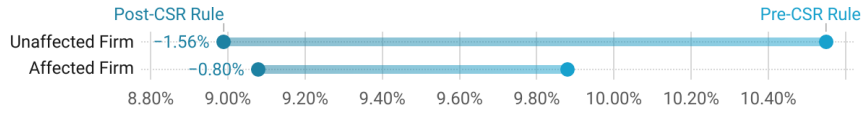


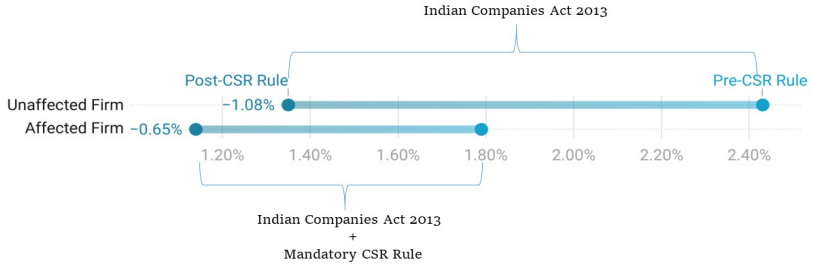

**FIGURE I**

Timeline of the corporate social responsibility (CSR) rule implementation

*Notes.*This figure describes the events around the adoption of the mandatory CSR rule. The rule is discussed in section 135 of the Indian Companies Act 2013.




Panel A: Yield




Panel B: Yield Spread

**FIGURE II**

Bond Pricing and Mandatory CSR

*Notes.*These figures show the impact of Mandatory CSR rule on offer yield to maturity and yield spread. Figure A shows the change in offer yield to maturity from pre-CSR rule period to post-CSR rule period. Figure B shows the change in yield spread from pre-CSR rule period to post-CSR rule period. Change in yield and yield spread from pre-CSR period to post-CSR period captures the impact of Indian Companies Act 2013 for unaffected firms but captures the impact of Indian Companies Act 2013 with Mandatory CSR Rule for affected firms.

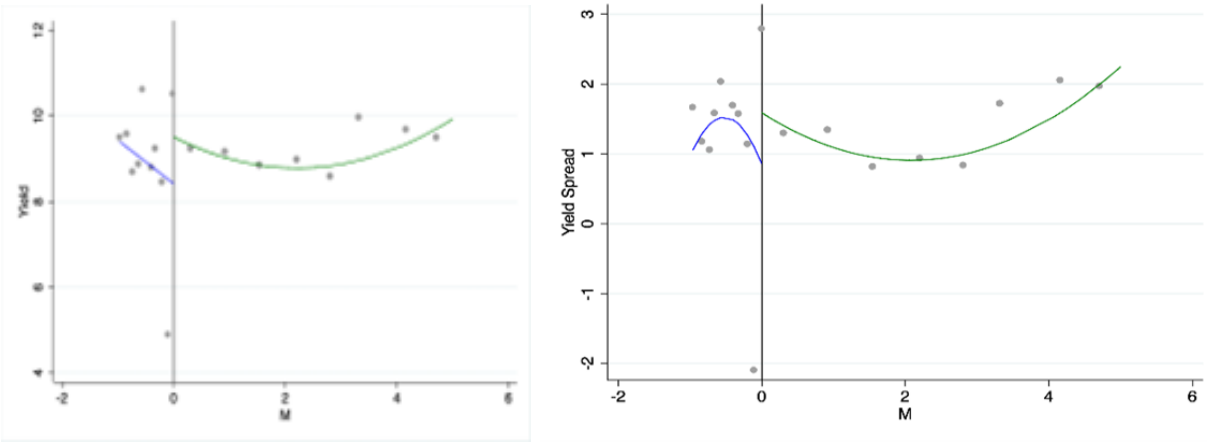



**FIGURE III**

RDD Plots for Yield and Yield Spread.

*Notes.*These figures show the results of multi-dimensional regression discontinuity design (MRDD) in the post-CSR rule period. Figure A shows the MRDD graph of bond yield between affected and unaffected firms post-CSR rule. Figure B shows the MRDD graph of yield spread between affected and unaffected firms post-CSR rule. Refer to Appendix A for the detailed definitions of variables.

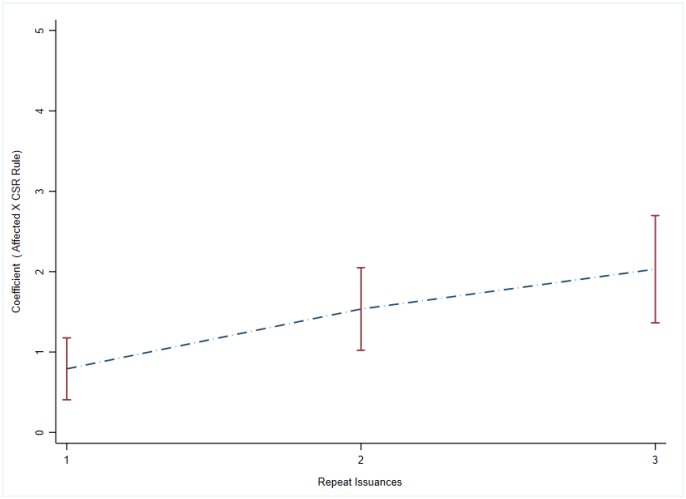



**FIGURE IV**

Yield on Repeat Interaction with Debt Markets.

*Notes.* This graph shows the change in yield of affected firms around CSR rule compared to their counterparts on repeat interaction with debt markets. Refer to Appendix A for the detailed definitions of variables.

**TABLE I**
SAMPLE SELECTION

| Filtering Criteria | Issues |
|---|---|
| Number of Indian bonds issued between 1st Jan 2010 and 31st December 2016. | 6,607 |
| Manual matching with the Prowess CMIE Database. | 3,737 |
| Missing 'Offer Yield to Maturity' | 3,281 |
| Issued between 30th Aug 2010 and 31st Aug 2016 | 2,413 |

*Notes.* This table reports the filtering criteria used to reach the sample data. The source of Indian bond data is SDC Platinum.

**TABLE II**
BOND ISSUE SAMPLE

**PANEL A**: AVERAGE AMOUNT ISSUED BY AFFECTED AND UNAFFECTED FIRMS

| | (1) | (2) | (3) |
|---|---|---|---|
| Calendar Period | Number | Affected | Unaffected |
| 30th Aug 2010 – 31st Dec 2010 | 112 | 96.032 | - |
| 1st Jan 2011 – 31st Dec 2011 | 460 | 76.405 | 42.097 |
| 1st Jan 2012 – 31st Dec 2012 | 615 | 53.555 | 12.955 |
| 1st Jan 2013 – 31st Dec 2013 | 304 | 89.133 | 56.12 |
| 1st Jan 2014 – 31st Dec 2014 | 326 | 98.595 | 31.937 |
| 1st Jan 2015 – 31st Dec 2015 | 307 | 91.651 | 124.263 |
| 1st Jan 2016 – 29th Aug 2016 | 289 | 77.776 | 84.247 |
| | 2,413 | | |

**PANEL B**: AVERAGE AMOUNT ISSUED BY AFFECTED AND UNAFFECTED FIRMS BEFORE AND AFTER MANDATORY CSR RULE

| | (1) | (2) | (3) |
|---|---|---|---|
| | Pre-Rule | Post-Rule | Total |
| Unaffected | 14 | 47 | 61 |
| Affected | 1,420 | 932 | 2,352 |
| Total | 1,434 | 979 | 2,413 |

*Notes.* This table reports the distribution of bond issuances. Panel A reports the yearly distribution of bond issuances and their average value (in USD) based on affected and unaffected firms. Panel B reports the distribution of bonds before and after the enactment of the corporate social responsibility (CSR) rule by affected and unaffected firms. Amounts issued are in million USD.

## TABLE III
SUMMARY STATISTICS

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Variable | #N | Mean | Standard Deviation | Median | Min | Max |
| Yield | 2413 | 9.558 | 1.317 | 9.550 | 4.316 | 13.4 |
| Yield Spread | 2413 | 1.876 | 1.473 | 1.464 | 0.111 | 8.2 |
| Issued_Sale | 2413 | 0.092 | 0.372 | 0.023 | 0.001 | 3.389 |
| Sale | 2413 | 2134.944 | 2417.945 | 1103.833 | 0.769 | 8656.865 |
| Net Profit | 2413 | 277.293 | 271.602 | 182.09 | -109.483 | 774.837 |
| Net Worth | 2413 | 1900.948 | 1776.322 | 1134.706 | -71.045 | 5188.324 |
| Size | 2413 | 8.83 | 1.431 | 8.912 | 3.330 | 11.685 |
| Tobin's Q | 2413 | 2.218 | 1.275 | 1.938 | 0.409 | 6.018 |
| Leverage | 2392 | 0.519 | 0.248 | 0.585 | 0.022 | 0.899 |
| Maturity | 2413 | 6.598 | 13.190 | 3 | 0 | 100 |
| Credit Rank | 2317 | 7.465 | 0.648 | 7.500 | 3 | 8 |
| CSR Spent | 744 | 0.670 | 0.342 | 0.805 | 0 | 1 |
| NGO Indicator | 979 | 0.285 | 0.452 | 0 | 0 | 1 |
| Mandatory CSR Governance | 242 | 4 | 1 | 3 | 2 | 8 |

*Notes.*This table reports the summary statistics of the variables used for regression analysis. *Yield* is the offer yield to maturity. *Yield Spread* is the spread between offer yield and the Treasury bill rate. *Yield* and *Yield Spread* are measured in percentages. *Sales* is total firm sales in year t. *Net Profits* is the net profit of a firm in year t. *Net Worth* is measured as the difference between current assets and current liabilities. *Size* is the logarithm of total assets. Sales, net profits, current assets, and current liabilities are in million USD. *Tobin's Q* is measured as the ratio of the market value of equity plus the value of long-term debt to the book value of assets. *Leverage* is measured as total debt by total assets. *Maturity* is the number of years in which a bond is going to mature. $Issued_Sale$ is the amount issued scaled by sale. Amount issued and sale are in million USD. $CreditRank$ is the credit rating of a bond. *CSR Spent* is the excess CSR spending over the CSR expenditure required by law, expressed as a percentage of required spending. $NGOIndicator$ is a dummy variable that takes a value of 1 if a firm provides information about the NGOs through which their CSR expenditures are implemented and is otherwise 0. Refer to Appendix A for detailed definitions of variables.

**TABLE IV**
BONDS YIELDS AND MANDATORY CSR

| VARIABLES | (1) Yield | (2) Yield | (3) Yield | (4) Yield | (5) Yield | (6) Yield | (7) Yield | (8) Yield |
|---|---|---|---|---|---|---|---|---|
| CSR Rule | -1.569*** | -1.349*** | -0.997*** | -0.975*** | -2.230*** | -2.174*** | -0.863*** | -0.833*** |
| | (0.381) | (0.332) | (0.109) | (0.074) | (0.436) | (0.358) | (0.102) | (0.066) |
| Affected | -0.653* | | | | -0.548 | | | |
| | (0.337) | | | | (0.400) | | | |
| Affected x CSR Rule | 0.791** | | | | 1.683*** | | | |
| | (0.385) | | | | (0.438) | | | |
| Affected_R1 | | -0.623** | | | | -0.743** | | |
| | | (0.298) | | | | (0.319) | | |
| Affected_R1 x CSR Rule | | 0.562* | | | | 1.626*** | | |
| | | (0.336) | | | | (0.361) | | |
| Affected_R2 | | | -1.069*** | | | | -0.210*** | |
| | | | (0.068) | | | | (0.077) | |
| Affected_R2 x CSR Rule | | | 0.421*** | | | | 0.343*** | |
| | | | (0.122) | | | | (0.114) | |
| Affected_R3 | | | | -0.919*** | | | | 0.236*** |
| | | | | (0.064) | | | | (0.079) |
| Affected_R3 x CSR Rule | | | | 0.434*** | | | | 0.465*** |
| | | | | (0.100) | | | | (0.089) |
| Constant | 10.53*** | 10.49*** | 10.62*** | 10.34*** | 18.514*** | 18.689*** | 17.645*** | 18.577*** |
| | (0.335) | (0.296) | (0.057) | (0.045) | (0.521) | (0.475) | (0.375) | (0.382) |
| Observations | 2,413 | 2,413 | 2,413 | 2,413 | 2,317 | 2,317 | 2,317 | 2,317 |
| R-squared | 0.099 | 0.1 | 0.192 | 0.181 | 0.348 | 0.347 | 0.343 | 0.354 |
| Controls | No | No | No | No | Yes | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes.* This table reports the regression results of offer yield on mandatory CSR. Panel A reports the results of the baseline regression. Panel B reports the results of the complete model (i.e., with all the controls). CSR Rule is a dummy variable that takes a value of 1 if a bond is issued post 29th August 2013; otherwise, it takes a value of 0. *Affected_R*1 is a dummy variable that takes a value of 1 if the $R1$ (i.e., percentage difference between the firm's net profit and 0.83 million USD) is positive; otherwise, it takes a value of 0. *Affected_R*2 is a dummy variable that takes a value of 1 if the $R2$ (i.e., the percentage difference between the firm's net worth and 83 million USD ) is positive; otherwise, it takes a value of 0. *Affected_R*3 is a dummy variable that takes a value of 1 if the $R3$ (i.e., the percentage difference between the firm's sale and 167 million USD ) is positive; otherwise, it takes a value of 0. Affected is a dummy variable that takes a value of 1 if the firm is affected by the mandatory CSR rule i.e., $R1, R2$, or $R3$ is positive; otherwise, it takes a value of 0. Yield is the offer yield to maturity, measured as a percentage. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Industry is industry fixed effects. Refer to Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

**TABLE V**
BONDS YIELD-SPREAD AND MANDATORY CSR

| VARIABLES | (1) Yield Spread | (2) Yield Spread | (3) Yield Spread | (4) Yield Spread |
|---|---|---|---|---|
| CSR Rule | -1.418*** | -1.548*** | -0.585*** | -0.616*** |
| | (0.418) | (0.343) | (0.098) | (0.063) |
| Affected | -0.228 | | | |
| | (0.384) | | | |
| Affected x CSR Rule | 1.030** | | | |
| | (0.420) | | | |
| Affected_R1 | | -0.583* | | |
| | | (0.306) | | |
| Affected_R1 x CSR Rule | | 1.157*** | | |
| | | (0.346) | | |
| Affected_R2 | | | -0.164** | |
| | | | (0.074) | |
| Affected_R2 x CSR Rule | | | 0.211* | |
| | | | (0.109) | |
| Affected_R3 | | | | 0.307*** |
| | | | | (0.076) |
| Affected_R3 x CSR Rule | | | | 0.390*** |
| | | | | (0.085) |
| Constant | 9.890*** | 10.205*** | 9.382*** | 10.406*** |
| | (0.499) | (0.455) | (0.358) | (0.365) |
| Observations | 2,317 | 2,317 | 2,317 | 2,317 |
| R-squared | 0.338 | 0.338 | 0.335 | 0.349 |
| Controls | Yes | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes | Yes |

*Notes.* This table reports the regression results of yield spread on mandatory CSR. *CSR Rule* is a dummy variable that takes a value of 1 if a bond is issued post 29th August 2013; otherwise, it takes a value of 0. *Affected_R*1 is a dummy variable that takes a value of 1 if the R1 (i.e., percentage difference between the firm's net profit and 0.83 million USD) is positive; otherwise, it takes a value of 0. *Affected_R*2 is a dummy variable that takes a value of 1 if the $R2$ (i.e., percentage difference between the firm's net worth and 83 million USD) is positive; otherwise, it takes a value of 0. *Affected_R*3 is a dummy variable that takes a value of 1 if the $R3$ (i.e., percentage difference between the firm's sale and 167 million USD) is positive; otherwise, it takes a value of 0. *Affected* is a dummy variable that takes a value of 1 if the firm is affected by the mandatory CSR rule i.e., $R1, R2$, or $R3$ is positive; otherwise, it takes a value of 0. $YieldSpread$ is the spread between the offer yield and the Treasury bill rate. *Yield* and *Yield Spread* are measured in percentages. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Industry is industry fixed effects. Refer Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

**TABLE VI**
BOND AMOUNT ISSUED AND MANDATORY CSR

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| VARIABLES | Issued_Sale | Issued_Sale | Issued_Sale | Issued_Sale |
| CSR Rule | 0.136* | 0.303*** | 0.156*** | 0.043*** |
| | (0.079) | (0.065) | (0.020) | (0.013) |
| Affected | -0.796*** | | | |
| | (0.073) | | | |
| Affected x CSR Rule | -0.144* | | | |
| | (0.079) | | | |
| Affected_R1 | | -0.422*** | | |
| | | (0.059) | | |
| Affected_R1 x CSR Rule | | -0.309*** | | |
| | | (0.066) | | |
| Affected_R2 | | | 0.039*** | |
| | | | (0.015) | |
| Affected_R2 x CSR Rule | | | -0.162*** | |
| | | | (0.022) | |
| Affected_R3 | | | | -0.007 |
| | | | | (0.016) |
| Affected_R3 x CSR Rule | | | | -0.033* |
| | | | | (0.017) |
| Constant | 0.682*** | 0.349*** | 0.105 | 0.134* |
| | (0.094) | (0.086) | (0.072) | (0.075) |
| Observations | 2,317 | 2,317 | 2,317 | 2,317 |
| R-squared | 0.303 | 0.245 | 0.091 | 0.072 |
| Controls | Yes | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes | Yes |

*Notes.*This table reports the regression results of the bond amounts issued on mandatory CSR. $Issued_Sale$ is the amount issued scaled by sale. Amount Issued and Sale are in million USD. *CSR Rule* is a dummy variable that takes a value of 1 if a bond is issued post 29th August 2013; otherwise, it takes a value of 0. *Affected_R*1 is a dummy variable that takes a value of 1 if the R1 (i.e., percentage difference between the firm's net profit and 0.83 million USD) is positive; otherwise, it takes a value of 0. *Affected_R*2 is a dummy variable that takes a value of 1 if the $R2$ (i.e., percentage difference between the firm's net worth and 83 million USD) is positive; otherwise, it takes a value of 0. *Affected_R*3 is a dummy variable that takes a value of 1 if the R3 (i.e., percentage difference between the firm's sale and 167 million USD) is positive; otherwise, it takes a value of 0. *Affected* is a dummy variable that takes a value of 1 if the firm is affected by the mandatory CSR rule i.e., $R1, R2$, or $R3$ is positive; otherwise, it takes a value of 0. Industry is industry fixed effects. Refer to Appendix A for detailed definitions of variables. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

**TABLE VII**
FUTURE CASH FLOWS, YIELD SPREAD, AND MANDATORY CSR

| | (1) | (2) |
|---|---|---|
| VARIABLES | $FCF_{t+1}$ | Yield Spread |
| CSR Rule | 0.517*** | |
| | (0.120) | |
| Affected | 0.047 | -0.08 |
| | (0.114) | (0.343) |
| Affected x CSR Rule | -0.495*** | |
| | (0.120) | |
| $FCF_{t+1}$(Fitted) | | -2.260*** |
| | | (0.831) |
| Constant | 0.091 | 9.940*** |
| | (0.131) | (0.552) |
| Observations | 2,203 | 2,317 |
| R-squared | 0.135 | 0.357 |
| Controls | Yes | Yes |
| Industry | Yes | Yes |

*Notes.*This table provides the results of the two stage least square (2SLS) regression and endogeneity tests. Column (1) provides the results for the first stage, with future cash flow($FCF$) as the dependent variable. Column (2) provides the results of the second stage, where $YieldSpread$ is the dependent variable. *CSR Rule* is a dummy variable that takes a value of 1 if a bond is issued after 29th August 2013; otherwise, it takes a value of 0. $R1$ is the percentage difference between the firm's net profit and 0.83 million USD. $R2$ is the percentage difference between the firm's net worth and 83 million USD. $R3$ is the percentage difference between the firm's sale and 167 million USD is positive. *Affected* is a dummy variable that takes a value of 1 if the firm is affected by the mandatory CSR rule i.e., $R1, R2$, or $R3$ is positive; otherwise, it takes a value of 0. $FCF_{t+1}$ is free cash flow of the firm at $t+1$. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Industry is industry fixed effects. Refer to Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

**TABLE VIII**
MULTI-DIMENSION REGRESSION DISCONTINUITY DESIGN

| Affected Criteria | Method | Covariates | (1) Yield | (2) Yield Spread |
|---|---|---|---|---|
| Criteria I | Bias-corrected | Yes | 1.255*** | 0.765* |
| | | | (0.427) | (0.425) |
| Criteria II | Bias-corrected | Yes | 0.466** | -0.563*** |
| | | | (0.020) | (0.185) |
| Criteria III | Bias-corrected | Yes | 0.069 | 1.044*** |
| | | | (0.135) | (0.095) |
| All Three Criteria | Bias-corrected | Yes | 2.408* | 1.322 |
| | | | (1.920) | (1.162) |

*Notes.*This table provides the results for multi-dimension regression discontinuity design (MRDD) tests. Panel A reports the results using Yield as a dependent variable. Panel B reports the results using Yield Spread as a dependent variable. Criteria I-III are threshold variables: sales, profit, and net worth. The bias-corrected method uses a bias-corrected RD estimator with a conventional variance estimator. All tests include covariates such as *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Industry is industry fixed effects. Refer to Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

**TABLE IX**
NEAREST NEIGHBOR MATCHED SAMPLE ANALYSIS

**PANEL A**: DISTRIBUTION OF AFFECTED AND UNAFFECTED OBSERVATIONS PRE AND POST CSR RULE

| | (1) | (2) | (3) |
|---|---|---|---|
| | Unaffected | Affected | Total |
| Pre-CSR Rule | 7 | 28 | 35 |
| Post-CSR Rule | 21 | 58 | 79 |
| Total | 28 | 86 | 114 |

**PANEL B**: COVARIATE BALANCE

| | (1) | | (2) | |
|---|---|---|---|---|
| | Mean | | t-test | |
| Variable | Unaffected | Affected | t | p¿t |
| Size | 8.604 | 5.669 | 10.32 | 0 |
| Tobin's Q | 1.864 | 1.537 | 1.2 | 0.232 |
| Leverage | 0.389 | 0.478 | -2 | 0.048 |
| Years of Maturity | 6.937 | 6.657 | 0.09 | 0.931 |
| Credit Rank | 6.369 | 6.73 | -1.37 | 0.173 |

**PANEL C**: DIFFERENCES-IN-DIFFERENCES

| | (1) | (2) | (3) |
|---|---|---|---|
| VARIABLES | Yield | Yield Spread | Issued_Sale |
| CSR Rule | -2.175*** | -1.310** | 0.17 |
| | (0.577) | (0.549) | (0.338) |
| Affected | -1.129 | -0.352 | -0.488 |
| | (0.691) | (0.657) | (0.402) |
| Affected x CSR Rule | 2.404*** | 1.277** | -0.255 |
| | (0.654) | (0.623) | (0.384) |
| Constant | 13.745*** | 5.252*** | 0.024 |
| | (1.133) | (1.078) | (0.657) |
| Observations | 114 | 114 | 114 |
| R-squared | 0.475 | 0.44 | 0.301 |
| Controls | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes |

*Notes.* This table provides the results for difference-in-differences regression after matching. Panel A reports the distribution of affected and unaffected firms before and after the CSR rule. Panel B reports the covariate balance between affected and unaffected issuers after matching. Panel C reports the difference-in-differences regression results. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Industry is industry fixed effects. Refer to Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

**TABLE X**
EFFECT OF IDENTIFIED NGO AGENCIES

| VARIABLES | (1) Yield | (2) Yield Spread | (3) Issued_Sale | (4) Yield | (5) Yield Spread | (6) Issued_Sale |
|---|---|---|---|---|---|---|
| Affected | 0.629 | 0.569 | -1.052*** | | | |
| | (0.471) | (0.453) | (0.268) | | | |
| NGO Indicator | 0.969** | 0.915* | -0.940*** | | | |
| | (0.486) | (0.479) | (0.251) | | | |
| NGO Indicator X Affected | -0.941* | -0.868* | 0.935*** | | | |
| | (0.499) | (0.491) | (0.249) | | | |
| Amount Spent (in %) | | | | -0.414*** | -0.415*** | -0.01 |
| | | | | (0.078) | (0.074) | (0.008) |
| Constant | 16.585*** | 8.729*** | 0.525* | 18.887*** | 10.834*** | -0.02 |
| | (0.938) | (0.907) | (0.307) | (0.854) | (0.838) | (0.046) |
| Observations | 940 | 940 | 940 | 727 | 727 | 727 |
| R-squared | 0.385 | 0.359 | 0.367 | 0.47 | 0.449 | 0.043 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes.* This table explains the cross-section differences in yield and amount issued due to incumbent foundation or third-party CSR implementing agency in the post-CSR rule period. Columns (1)-(3) show the results for cross-section differences in bond characteristics based on whether NGOs (incumbent or third-party) information is provided by the issuer. Columns (4)-(6) show the results for cross-section differences in the bond characteristics of affected issuers based on the amount spent as a percentage of the amount expected. *Yield* is the offer yield to maturity. *Yield Spread* is the spread between the offer yield and the Treasury bill rate. Yield and Yield Spread are measured in percentages. $Issued_Sale$ is the amount issued scaled by sale. Amount Issued and Sale are in a million USD. *NGO Indicator* is a dummy variable which is equal to 1 if the firm provides detail on agencies used for CSR disbursement; otherwise equal to 0. Amount Spent is actual expenditure on CSR activities with respect to the prescribed amount. It is measured in percentage. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Industry is industry fixed effects. Refer to Appendix A for detailed definitions of the variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

## TABLE XI
FIRM OWNERSHIP STRUCTURE AND CSR RULE

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| VARIABLES | Yield | Yield Spread | Issued_Sale | Yield | Yield Spread | Issued_Sale | Yield | Yield Spread | Issued_Sale |
| Conc_Hold | -0.276*** | -0.262*** | 0.028*** | | | | | | |
| | (0.058) | (0.056) | (0.010) | | | | | | |
| Govt Owned | | | | -1.151*** | -1.150*** | 0.057*** | | | |
| | | | | (0.079) | (0.075) | (0.014) | | | |
| BG | | | | | | | 0.891*** | 0.916*** | -0.052*** |
| | | | | | | | (0.073) | (0.070) | (0.013) |
| Conc_Hold X Affected X CSR Rule | 0.144 | 0.177** | -0.026* | | | | | | |
| | (0.090) | (0.086) | (0.015) | | | | | | |
| Govt Owned X Affected X CSR Rule | | | | 0.326*** | 0.297*** | -0.015 | | | |
| | | | | (0.110) | (0.105) | (0.020) | | | |
| BG X Affected X CSR Rule | | | | | | | -0.201* | -0.260*** | 0.02 |
| | | | | | | | (0.104) | (0.099) | (0.018) |
| CSR Rule | -2.115*** | -1.312*** | 0.127 | -2.168*** | -1.354*** | 0.132* | -2.051*** | -1.240*** | 0.127 |
| | (0.434) | (0.416) | (0.079) | (0.414) | (0.394) | (0.078) | (0.419) | (0.399) | (0.078) |
| Affected | -0.519 | -0.205 | -0.795*** | -0.573 | -0.253 | -0.796*** | -0.374 | -0.055 | -0.805*** |
| | (0.398) | (0.382) | (0.073) | (0.380) | (0.362) | (0.073) | (0.384) | (0.367) | (0.073) |
| Affected X CSR Rule | 1.466*** | 0.805* | -0.118 | 1.531*** | 0.881** | -0.136* | 1.672*** | 1.066*** | -0.151* |
| | (0.441) | (0.423) | (0.080) | (0.416) | (0.396) | (0.079) | (0.428) | (0.409) | (0.080) |
| Observations | 2,317 | 2,317 | 2,317 | 2,317 | 2,317 | 2,317 | 2,317 | 2,317 | 2,317 |
| R-squared | 0.356 | 0.345 | 0.306 | 0.413 | 0.41 | 0.31 | 0.4 | 0.396 | 0.309 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes.*This table provides the difference-in-differences results for different ownership structures. Columns (1) – (3) show results for ownership concentration to promoters. Columns (4)– (6) show results if government holds significant ownership in a firm. Columns (7)-(9) show results for business group ownership. *Conc_Hold* is a dummy variable that takes a value of 1 if promoters holding is greater than median; otherwise, it takes a value of 0. *Govt Owned* is a dummy variable that takes a value of 1 if government ownership in a firm is greater than median; otherwise, it takes a value of 0. *BG* is a dummy variable that takes a value of 1 if a firm belongs to a business group; otherwise, it takes a value of 0. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. *Industry* is industry fixed effects. Refer to Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

**TABLE XII**
CORPORATE GOVERNANCE AND CSR RULE

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| VARIABLES | Yield | Yield Spread | Issued_Sale | Yield | Yield Spread | Issued_Sale |
| BIG4 | 0.299*** | 0.264*** | -0.028** | | | |
| | (0.061) | (0.059) | (0.011) | | | |
| BI | | | | 0.199*** | 0.264*** | -0.009 |
| | | | | (0.059) | (0.057) | (0.011) |
| CSR Rule | -1.514*** | -0.828** | 0.454*** | -1.207*** | -0.353 | 0.175** |
| | (0.405) | (0.389) | (0.077) | (0.410) | (0.394) | (0.078) |
| Affected | 0.638* | 0.867** | -0.615*** | 1.205*** | 1.374*** | -0.567*** |
| | (0.357) | (0.343) | (0.069) | (0.323) | (0.311) | (0.062) |
| Big4 X CSR Rule | 1.565*** | 1.602*** | -1.040*** | | | |
| | (0.537) | (0.515) | (0.098) | | | |
| BI X CSR Rule | | | | 0.935** | 0.473 | 0.340*** |
| | | | | (0.397) | (0.382) | (0.074) |
| Affected X CSR Rule | 0.893** | 0.342 | -0.463*** | 0.486 | -0.112 | -0.172** |
| | (0.409) | (0.392) | (0.078) | (0.413) | (0.397) | (0.078) |
| Big4 X CSR Rule X Affected | -1.402*** | -1.368*** | 1.038*** | | | |
| | (0.539) | (0.517) | (0.098) | | | |
| BI X CSR Rule X Affected | | | | -0.766* | -0.474 | -0.353*** |
| | | | | (0.400) | (0.384) | (0.074) |
| Constant | 13.835*** | 5.549*** | 0.882*** | 13.221*** | 4.921*** | 0.883*** |
| | (0.390) | (0.375) | (0.074) | (0.350) | (0.336) | (0.066) |
| Observations | 2,392 | 2,392 | 2,392 | 2,392 | 2,392 | 2,392 |
| R-squared | 0.321 | 0.312 | 0.308 | 0.31 | 0.298 | 0.281 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes.*This table provides the results for difference-in-differences for board independence and Big 4 auditors. The pre- and post-sample are two years before and two years after the commencement date. Columns (1) –(3) show results for $BIG4$. Columns (4) – (6) show results for board independence. $BI$ is a dummy variable that takes a value of 1 if a firm has an independent board; otherwise, it takes a value of 0. $BIG4$ is a dummy variable that takes a value of 1 if a firm is audited by a Big 4 auditor or their affiliates; otherwise, it takes a value of 0. Industry is industry fixed effects. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Refer to Appendix A for detailed definitions. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

## TABLE XIII
MANDATORY CSR GOVERNANCE AND DEBT MARKET

| VARIABLES | (1) Yield Spread | (2) Yield Spread | (3) Yield | (4) Yield | (5) Issued_Sale | (6) Issued_Sale |
|---|---|---|---|---|---|---|
| Mandatory CSR Governance | -0.150*** | 0.034 | -0.103* | 0.023 | 0.010*** | 0.012*** |
| | (0.048) | (0.065) | (0.053) | (0.066) | (0.002) | (0.003) |
| Constant | 1.780*** | 10.881*** | 9.588*** | 18.339*** | -0.012* | 0.105* |
| | (0.184) | (1.457) | (0.204) | (1.489) | (0.006) | (0.059) |
| Observations | 242 | 217 | 242 | 217 | 242 | 217 |
| R-squared | 0.063 | 0.384 | 0.057 | 0.477 | 0.211 | 0.252 |
| Industry | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | No | Yes | No | Yes | No | Yes |

*Notes.*This table provides the regression results of mandatory CSR governance on cost of debt for firms affected by CSR rule. *Mandatory CSR Governance* is measured as number of members in CSR committee. Columns (1) –(2) show results for yield spread. Columns (3) – (4) show results for yield. Columns (1) –(2) show results for . Industry is industry fixed effects. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Refer to Appendix A for detailed definitions. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

## TABLE XIV
MANDATORY CSR AND SECONDARY DEBT MARKET

| VARIABLES | (1) CY3 | (2) CY5 | (3) CYS3 | (4) CYS5 |
|---|---|---|---|---|
| CSR Rule | 2.509*** | 4.200*** | 0.059** | 0.063 |
| | (0.093) | (0.526) | (0.023) | (0.039) |
| Constant | 31.892*** | 56.285*** | 10.368*** | 17.362*** |
| | (7.114) | (8.099) | (2.182) | (3.600) |
| Observations | 1,517 | 1,517 | 1,517 | 1,517 |
| R-squared | 0.192 | 0.342 | 0.565 | 0.566 |
| Industry | Yes | Yes | Yes | Yes |
| Year | Yes | Yes | Yes | Yes |
| Error Clustering | Yes | Yes | Yes | Yes |

*Notes.*This table provides the regression results of mandatory CSR rule on yield and yield spread of affected firms' bonds. *CSR Rule* is a dummy variable that takes a value of 1 if a bond is issued post 29th August 2013; otherwise, it takes a value of 0. Columns (1) –(2) show results for cumulative yield (CY) of 3-days and 5-days. Columns (3) – (4) show results for cumulative yield spread (CYS) of 3-days and 5-days. Industry is industry fixed effects. Year is year fixed effects for de-trending. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Refer to Appendix A for detailed definitions. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

## APPENDIX A
VARIABLE DEFINITION AND DESCRIPTION

| VARIABLE | DEFINITION |
|---|---|
| Yield | The bond's yield to maturity as reported by SDC Platinum. Measured in percentage. |
| Yield spread | Yield to maturity minus matched Indian Treasury Interest Rate. |
| Issued_Sale | Ratio of the amount issued to sale. The amount issued and sale are in millions of USD. |
| Maturity | Difference between years of maturity minus years of issuing the bond. |
| CSR Rule | Dummy variable equal to 1 if the bond is issued after 29th Aug 2013 and otherwise equal to 0. |
| CSR Rule (Comm.) | Dummy variable equal to 1 if the bond is issued after 1st April 2014 and otherwise equal to 0. |
| R1 | The percentage difference between the firm's net profit and 0.83 million USD. |
| R2 | The percentage difference between the firm's net worth and 83 million USD. |
| R3 | The percentage difference between the firm's sale and 167 million USD. |
| M | The minimum positive value of R1, R2, and R3 if at least one of them is positive or if the maximum values of R1, R2, and R3 are all negative. |
| Affected_R1 | Dummy variable equal to 1 if R1>0 and otherwise equal to 0. |
| Affected_R2 | Dummy variable equal to 1 if R2>0 and otherwise equal to 0. |
| Affected_R3 | Dummy variable equal to 1 if R3>0 and otherwise equal to 0. |
| Affected | Dummy variable equal to 1 if M>0 and otherwise equal to 0. |
| Size | Logarithm of total assets. Total assets is measured in million USD. |
| Leverage | Ratio of long-term debt to total assets. |
| ROA | The ratio of net income to total assets. |
| Tobin's Q | Mkt Value of Equity / (Mkt Value of Equity + Book Value of LT Debt). |
| BI | Dummy variable equal to 1 if the fraction of independent directors is higher than the sample median. |
| BIG4 | Dummy variable equal to 1 if the auditor of the firm is aligned with Deloitte, E&Y, PWC, or KPMG. |
| BG | Dummy variable equal to 1 if the firm is aligned with a business group and otherwise equal to 0. |
| Conc_Hldg | Dummy variable equal to 1 if the promoter holding is greater than the median holding in the sample and otherwise equal to 0. |
| Net Profit | Net profit of a firm. Measured in million USD. |
| Net Worth | Total assets minus total liabilities. Measured in million USD. |
| Credit Rank | Rank for securities rating grade assigned based on ratings given by different rating agencies. |
| NGO Indicator | Dummy variable is equal to 1 if the firm provides detail on agencies used for CSR disbursement; otherwise equal to 0. |
| Amount Spent | Amount spent on CSR activities with respect to the prescribed amount. It is measured in percentage. |
| Volatility | Stock return volatility using one-year daily return data. It is measured in percentage. |

# Debt Markets Retort to Mandatory Corporate Social Responsibility

## Online Appendix

# APPENDIX B

## TABLE B1: CSR SPENDING AND INFORMATION ON NGOs

### PANEL A: AMOUNT EXPECTED AND AMOUNT SPENT THROUGH DIRECT AND IMPLEMENTING AGENCIES

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Company Name | Amount Expected | Amount Spent | Amount to Direct Agency | Amount to Indirect Agency |
| Reliance Industries Ltd. | 8.96 | 8.006 | 7.737 | 0.269 |
| NTPC Ltd. | 4.52 | 7.757 | 3.878 | 3.878 |
| Reliance Industries Ltd. | 5.866 | 5.194 | 4.67 | 0.524 |
| Power Finance Corp. Ltd. | 6.159 | 4.185 | 0 | 4.185 |
| Oil & Natural Gas Corp. Ltd. | 3.975 | 3.922 | 3.786 | 0.136 |
| HDFC Bank Ltd. | 3.335 | 3.335 | 0 | 3.335 |
| Oil & Natural Gas Corp. Ltd. | 4.263 | 2.844 | 0.001 | 2.843 |
| ICICI Bank Ltd. | 3.314 | 2.832 | 1.416 | 1.416 |
| Tata Steel Ltd. | 0 | 2.472 | 2.472 | 0 |
| TVS Motor Co. Ltd. | 11.779 | 1.714 | 0.006 | 1.708 |

### PANEL B: CSR ACTIVITIES, NAMES OF DIRECT AND IMPLEMENTING AGENCIES

| Company Name | CSR Activities | Direct Agency Names | In-Direct Agency Names |
|---|---|---|---|
| Reliance Industries Ltd. | Schedule (I) | Reliance Foundation | - |
| NTPC Ltd. | Schedule (I) | NTPC foundation | - |
| Reliance Industries Ltd. | Schedule (II) | Reliance Foundation | - |
| Power Finance Corp. Ltd. | Schedule (I) | - | Energy & Resources Institute; The Gramin Vikas Trust; Hindustan Prefab Ltd.; Ircon Infrastructure Services Ltd. |
| Oil & Natural Gas Corp. Ltd. | Schedule (X) | ONGC Foundation | - |
| HDFC Bank Ltd. | Schedule (X) | - | Indo Global Social Service Society; Krushi Vikas va Gramin Prashikshan Sanstha, Mysore; Resettlement & Development Agency; Society to Heal Aid Restore Educate; Watershed Organisation Trust |
| Oil & Natural Gas Corp. Ltd. | Schedule (I) | ONGC Foundation | Help Age India; Sulabh International Social Service Organization |
| ICICI Bank Ltd. | Schedule (X) | | Business Correspondent Network |
| Tata Steel Ltd. | Schedule (I) | TCS, TSFIF, TSRDS | |
| TVS Motor Co.Ltd. | Schedule (I) | - | Sri Sathya Sai Central Trust; Srinivasan Services Trust |

*Notes.*This table provides information on the highest CSR paid firms and their NGOs for the year 2015. Panel A reports the names of the 10 highest CSR spending firms, the expected amount of CSR spent, and the actual amounts spent. Panel A reports how much of spending was done through direct agencies (in-house foundations) of the firm and how much was indirect (i.e., through third party NGOs). Panel B reports the specific CSR activities of the firm and the name of the direct and indirect agencies through which the amounts were spent. All reported expenditures are measured in million USD.

## TABLE B2: MANDATORY CSR AND DEBT MARKET

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Affected | Unaffected | Affected | Unaffected | Affected | Unaffected |
| VARIABLES | Yield | Yield | Yield Spread | Yield Spread | Amount Issued | Amount Issued |
| CSR Rule | -0.546*** | -2.658** | -0.388*** | -1.466 | -0.008** | 0.556 |
| | (0.044) | (0.982) | (0.042) | (0.956) | (0.004) | (0.602) |
| Size | -0.377*** | -0.530 | -0.387*** | -0.270 | -0.012*** | 0.177 |
| | (0.028) | (0.523) | (0.027) | (0.509) | (0.002) | (0.321) |
| TobinQ | -0.066*** | 0.204 | -0.019 | 0.133 | -0.007*** | 0.299 |
| | (0.018) | (0.507) | (0.017) | (0.494) | (0.001) | (0.309) |
| Leverage | -0.698*** | 1.616 | -0.629*** | 0.726 | -0.056*** | -1.310 |
| | (0.138) | (1.787) | (0.132) | (1.740) | (0.011) | (1.146) |
| Maturity | 0.004** | -0.015 | 0.005*** | -0.003 | 0.001*** | 0.383*** |
| | (0.002) | (0.029) | (0.002) | (0.029) | (0.000) | (0.134) |
| CreditRank | -0.624*** | -0.631* | -0.617*** | -0.312 | 0.013*** | 0.459** |
| | (0.044) | (0.341) | (0.042) | (0.332) | (0.004) | (0.217) |
| Constant | 18.285*** | 18.106*** | 10.083*** | 6.294 | 0.103*** | -4.918* |
| | (0.372) | (4.329) | (0.356) | (4.216) | (0.031) | (2.826) |
| Observations | 2,282 | 35 | 2,282 | 35 | 2,281 | 34 |
| R-squared | 0.354 | 0.280 | 0.348 | 0.119 | 0.038 | 0.365 |
| Industry | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes.* This table reports the regression results of yield and yield spread on mandatory CSR for affected firms and unaffected firms. Column (1) and Column (2) show results for yield. Column (3) and Column (4) show results for yield spread. Column (5) and Column (6) show results for amount issued. *CSR Rule* is a dummy variable that takes a value of 1 if a bond is issued post 29th August 2013; otherwise, it takes a value of 0. $Yield$ is the offer yield to maturity measured in percentage. $YieldSpread$ is the spread between the offer yield and the Treasury bill rate measured in percentage. *Yield* and *Yield Spread* are measured in percentages. $Affected$ firms are those which are affected by mandatory CSR rule. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Industry is industry fixed effects. Refer Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

## TABLE B3: DEBT MARKET, STOCK VOLATILITY AND MANDATORY CSR

| VARIABLES | (1) Yield | (2) Yield Spread | (3) Amount Issued |
|---|---|---|---|
| CSR Rule | -2.265*** | -1.456*** | 0.127 |
| | (0.435) | (0.416) | (0.078) |
| Affected | -0.530 | -0.208 | -0.795*** |
| | (0.399) | (0.382) | (0.073) |
| Affected X CSR Rule | 1.734*** | 1.085*** | -0.132* |
| | (0.437) | (0.418) | (0.079) |
| Size | -0.366*** | -0.383*** | -0.012*** |
| | (0.027) | (0.026) | (0.005) |
| Tobin's Q | -0.032 | 0.017 | 0.002 |
| | (0.020) | (0.019) | (0.003) |
| Leverage | -0.573*** | -0.500*** | -0.003 |
| | (0.133) | (0.128) | (0.023) |
| Years of Maturity | 0.004** | 0.005*** | 0.001** |
| | (0.002) | (0.002) | (0.000) |
| Credit Rank | -0.597*** | -0.570*** | 0.038*** |
| | (0.041) | (0.040) | (0.007) |
| Volatility | 0.203*** | 0.221*** | 0.038*** |
| | (0.055) | (0.053) | (0.009) |
| Constant | 17.932*** | 9.259*** | 0.577*** |
| | (0.543) | (0.520) | (0.097) |
| Observations | 2,317 | 2,317 | 2,317 |
| R-squared | 0.352 | 0.343 | 0.308 |
| Industry | Yes | Yes | Yes |

*Notes.* This table reports the regression results of yield, yield spread, and of amount issued on mandatory CSR controlling for stock volatility. *CSR Rule* is a dummy variable that takes a value of 1 if a bond is issued post 29th August 2013; otherwise, it takes a value of 0. $Yield$ is the offer yield to maturity measured in percentage. $YieldSpread$ is the spread between the offer yield and the Treasury bill rate measured in percentage. *Yield* and *Yield Spread* are measured in percentages. $Affected$ firms are those which are affected by mandatory CSR rule. $Volatility$ is the stock return volatility using one-year daily return data. It is measured in percentage. $Industry$ is industry fixed effects. Column (1) shows the results for $Yield$. Column (2) shows the results for *Yield Spread*. Column (3) shows the results for *Amount Issued*. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Industry is industry fixed effects. Refer to Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

## TABLE B4: VOLUNTARY CSR AND DEBT MARKET

| VARIABLES | (1) Yield | (2) Yield Spread | (3) Amount Issued |
|---|---|---|---|
| CSR Rule | -2.137*** | -1.348** | 1.013*** |
| | (0.652) | (0.625) | (0.137) |
| Affected | -0.645 | -0.305 | 0.018 |
| | (0.626) | (0.600) | (0.133) |
| Affected x CSR Rule | 1.607** | 0.994 | -1.011*** |
| | (0.655) | (0.628) | (0.138) |
| Size | -0.293*** | -0.328*** | 0.010* |
| | (0.035) | (0.033) | (0.006) |
| TobinQ | -0.132*** | -0.057*** | -0.002 |
| | (0.023) | (0.022) | (0.004) |
| Leverage | -0.403** | -0.269 | 0.102*** |
| | (0.178) | (0.171) | (0.031) |
| Maturity | 0.003 | 0.006*** | 0.000 |
| | (0.002) | (0.002) | (0.000) |
| CreditRank | -0.521*** | -0.483*** | 0.042*** |
| | (0.049) | (0.047) | (0.009) |
| Constant | 17.290*** | 8.652*** | -0.433*** |
| | (0.750) | (0.719) | (0.155) |
| Observations | 1,460 | 1,460 | 1,460 |
| R-squared | 0.295 | 0.279 | 0.341 |
| Industry | Yes | Yes | Yes |

*Notes.* This table reports the regression results of mandatory CSR on debt market for firms engage in voluntary CSR pre-rule. *CSR Rule* is a dummy variable that takes a value of 1 if a bond is issued post 29th August 2013; otherwise, it takes a value of 0. $Yield$ is the offer yield to maturity measured in percentage. $YieldSpread$ is the spread between the offer yield and the Treasury bill rate measured in percentage. *Yield* and *Yield Spread* are measured in percentages. $Affected$ firms are those which are affected by mandatory CSR rule. $Volatility$ is the stock volatility in percentage. $Industry$ is industry fixed effects. Column (1) shows the results for $Yield$. Column (2) shows the results for *Yield Spread*. Column (3) shows the results for *Amount Issued*. Industry is industry fixed effects. Refer to Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

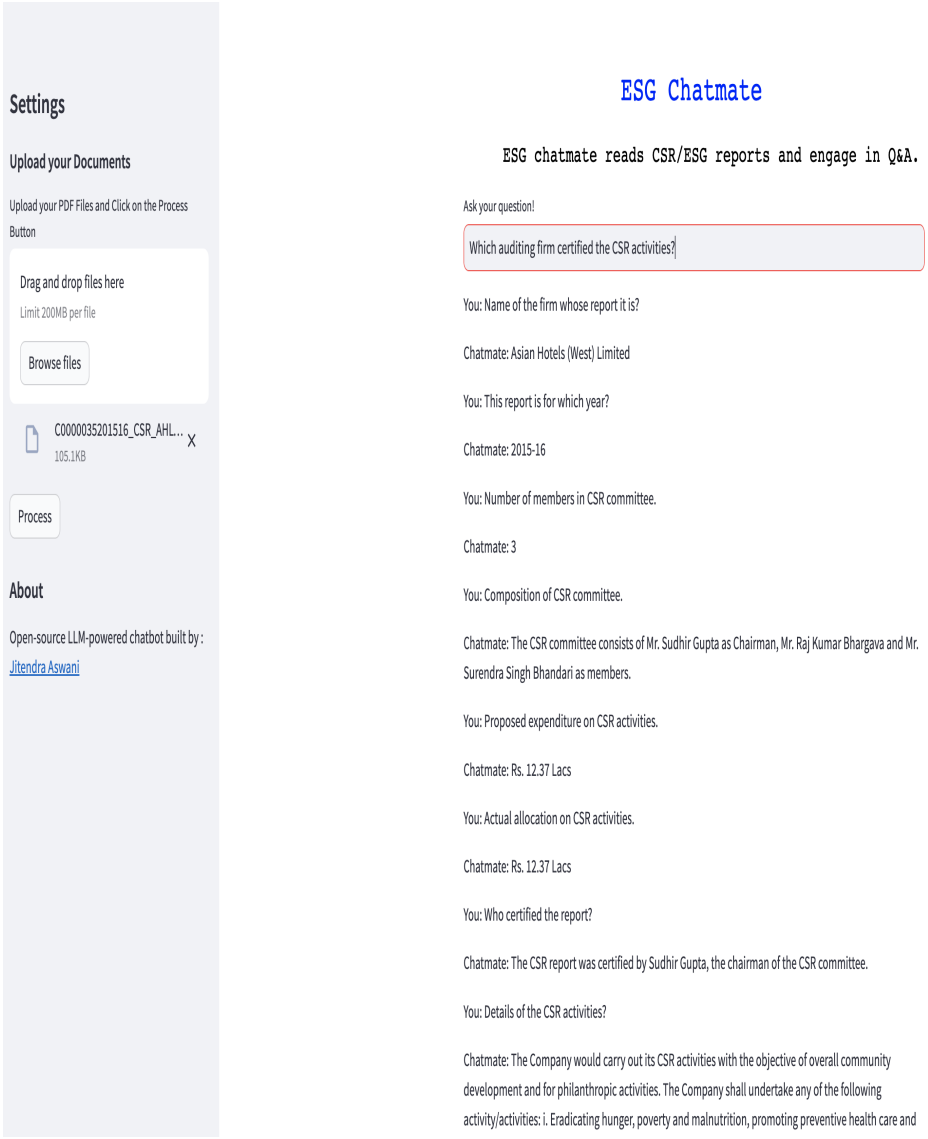
## TABLE B5: CSR RULE COMMENCEMENT DATE AND BOND ISSUANCE

| VARIABLES | (1) Yield | (2) Yield Spread | (3) Amount Issued |
|---|---|---|---|
| CSR Rule (Comm.) | -2.150*** | -2.009*** | 0.118*** |
| | (0.753) | (0.732) | (0.043) |
| Affected | -0.58 | -0.507 | 0.04 |
| | (0.704) | (0.685) | (0.040) |
| CSR Rule (Comm.) x Affected | 1.458* | 1.402* | -0.116*** |
| | (0.755) | (0.734) | (0.043) |
| Constant | 18.623*** | 10.661*** | 0.039 |
| | (0.833) | (0.810) | (0.048) |
| Observations | 1,427 | 1,427 | 1,427 |
| R-squared | 0.4 | 0.405 | 0.103 |
| Controls | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes |

*Notes.* This table provides the results for the difference-in-differences regression when the commencement date (1st April 2014) is used as the CSR Rule adoption date. The pre- and post-sample periods are two years before and two years after the commencement date. Column (1) shows the results for *Yield*. Column (2) shows the results for *Yield Spread*. Column (3) shows the results for *Amount Issued*. Controls are *Size, Leverage, Tobin's Q, Maturity* and *Credit Rank*. Industry is industry fixed effects. Refer to Appendix A for detailed definitions of variables. All control variables are winsorized at 1%. *, **, and *** show significance at 10%, 5%, and 1%.

# Appendix C

## Table C1: ESG app: Proof-of-Work of Open-source Large Language Model (LLM)



# Table C2: Snapshot of Large Language Model (LLM) Acquired Data

| | Firm Name | Year | Number of CSR Committee Members | Member Names | Total Amount Spent | Total Amount Unspent | Sectors | Details of CSR Activities | Implementation and Monitoring of CSR policy | Compliance to Allocate Prescribed CSR Amount | Reason for Not Spending Prescribed Amount |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ponni Sugars (Erode) Limited | 2017-18 | 3 members | The CSR committee members are Mr N Gopala Ratnam, Chairman, Mr N R Krishnan, Independent Director and Mr N Ramanathan, Managing Director. | 13 lakhs | nt unspent is not appli | Livelihood, Rural development, Education, Environment | al area2. Strengthening rural infra: | Yes, the implementation and monitoring of CSR Policy is in compliance with CSR objectives and policy of the company. | No, the company has not failed to spend the two per cent, of the average net profit of the last three financial years, as CSR or any part thereof. | Not applicable |
| 2 | KOOCL's CSR report | 2017-18 | 5 members in the CSR committee | CSR committee members are Sri Madhav Lal, Chairman, Dr. Deepika Sharma, Member , Sri N. Vidyananda, Member , Sri SK Gorai, Member | 15.98 Lakhs | Nil | The firm invested CSR expenditure in the following sectors:<br>1. Swachh Vidyalaya Abhiyan/ Drinking water<br>2. Promotion of Swachh Bharath Abhiyan<br>3. Animal Welfare<br>4. Medical Assistance to poor & economically weaker section of the society<br>5. Promotion of Education<br>6. Support for Swachh Bharath Abhiyan by construction of toilets | of Toilets in 6 Schools at Mangalur | Yes, the implementation and monitoring of CSR Policy is in compliance with CSR objectives and policy of the company. | No, the company has not failed to spend the two per cent of the average net profit of the last three financial years, as CSR or any part thereof. | Not Applicable |
| 3 | is the CSR report of QUESS COR | This report is for the year 2016-17. | 3 | The CSR committee members are: Ms. Revathy Ashok, Chairperson, Mr. Ajit Isaac, and Mr. Pravir Kumar Vohra. | 1.52 crores | `0.18 crores | The company invested CSR expenditure in the following sectors: Education, Health, Disaster Management | nme2. Improvement of School Envi | The implementation and monitoring of the CSR Policy is in compliance with the CSR objectives and policy of the Company. | Yes, the company has failed to spend 0.18 crores as CSR in the financial year 2016-17 due to delay in completion of the project | Due to delay in completion of the project |
| 4 | Blue Dart Express Limited | 2015-2016 | 3 | The CSR Committee of the Board comprises of the following:<br>Â‹ Sharad Upasani, Chairman of the Committee<br>Â‹ Malcolm Monteiro, Member of the Committee | 4,05,00,000 | 00 has been spent sorphans; setting up old age hom | The company has spent `<br>4,05,00,000 in the financial year<br>2015-16 on various CSR activities. | | Yes, the implementation and monitoring of CSR Policy is in compliance with CSR objectives and policy of the company. | Yes, the company has failed to spend the two per cent, of the average net profit of the last three financial years, as CSR or any part thereof. | unspent amount is `1,01,03,701 |
| 5 | Sun TV Network Ltd | 2016-2017 | 3 | Mrs. Kavery Kalanithi - Member<br>Mr. Nicholas Martin Paul - Member | nt for the finan | 7.88 Crore | The CSR expenditure was invested in the following sectors:<br>- Education<br>- Arts and Culture | 7.25 Direct Total 15.67 15.67and N | Yes | Yes, the company has failed to spend the two per cent, of the average net profit of the last three financial years, as CSR or any part thereof. | The company has expended major portion of 2% of its average net profits made during the immediately three preceding financial years as per section 135(5) of Companies Act, 2013 in pursuance of its corporate social responsibility policy since the company is yet to identify sutiable projects. |

# Table C3: Reasons for Not Spending Prescribed CSR Amount

**I. Struggling to Identify the Suitable CSR activities**

1. The company did not spend 2% CSR because it was not able to identify a suitable project to undertake. (IFB Agro Industries Limited, 2015)

2. Non-identification of appropriate projects / activities in line with the CSR policy of the Company. (Kajaria Ceramics, 2016)

3. The project was still under the evaluation strategy, the company could not spent the allocable amount. (Gati Limited, 2015)

**II. Struggling to Identify the Suitable Implementing agencies**

1. The tie-up with the NGOs is yet to gather momentum and therefore the full contribution was not completed. (Aptech Limited, 2015)

2. The company has not been able to spent 2% of the average net profit of last three financial year (Rs. 50.08 Lacs) due to the non- availability of the suitable nodal agencies to implement the projects identified by the company. (PTL Enterprises Limited, 2015)

3. The company is evaluating more CSR agencies and NGOs for implementing the company's CSR policy over a period of time in addition to its existing CSR partners as named in the Board's Report. The unspent amount will be spent in the near future as per the CSR Policy of the Company. (Ujaas Energy Limited, 2015)

**III. Initiating the Pilot Projects**

1. The Company's CSR initiatives usually involve setting the foundation of various programs at a small scale to learn from on-ground realities, getting feedback from community and then putting an enhanced sustainable model to ensure maximum benefit to the community. For this reason, during the year, the Company's spend on the CSR activities has been less than the limits prescribed under Companies Act, 2013. (Poly Medicure, 2016)

2. The company has made contributions to the projects on a pilot basis and the CSR Committee is closely monitoring the progress, before actually making further contributions for larger projects. (Neuland Laboratories Limited, 2015)

3. Your Company's CSR projects are multi-year projects. Your Company believes in creating sustainable programs that empowers communities. This year, our focus was to meet the project goals and create standards for reporting and monitoring. Due diligence process has been followed during the entire project cycle. We are evaluating communities to expand our projects. (Tata Consultancy Services Limited, 2016)

**IV. Others:**

**Law and Order**

1. CSR works which are being executed by Kishanganga Project (JK) suffered badly due to law-and-order problems in and around Bandipora (J&K). (NHPC Limited)

**Business Expansion or Dearth of Capital**

1. The company is in expansion mode and required funds for its working capital as well as expansion hence, the Board has decided not to make any expenditure for CSR activity for the financial year 2015-16. The Company understands its social responsibility and will in future make expenditure for CSR activities as and when it found appropriate. (Vidhi dyestuffs Manufacturing Limited, 2015)

# Appendix D

# COMPONENTS OF TRANSFORMER ARCHITECTURE

These components form the basis of the Transformer architecture, enabling it to effectively handle a variety of sequence-to-sequence tasks without relying on recurrent neural networks (RNNs) or convolutional neural networks (CNNs).

1. Scaled Dot-Product Attention:

$$\text{Attention}(Q, K, V) = \text{softmax}\left(\frac{QK^T}{\sqrt{d_k}}\right)V$$

Here, $Q$, $K$, and $V$ are matrices representing queries, keys, and values, respectively. The attention weights are computed by taking the dot product of the query with all keys, dividing each by $\sqrt{d_k}$ (the dimension of the keys), and applying a softmax function.

2. Multi-Head Attention:

$$\text{MultiHead}(Q, K, V) = \text{Concat}(\text{head}_1, ..., \text{head}_h)W^O$$

where each $\text{head}_i = \text{Attention}(QW_i^Q, KW_i^K, VW_i^V)$. In multi-head attention, the model projects the queries, keys, and values $h$ times with different, learned linear projections. Each of these projected versions of queries, keys, and values are then fed into the attention function in parallel, yielding $d_v$-dimensional output values. These are concatenated and once again projected, resulting in the final values.

3. Position-wise Feed-Forward Networks:

$$\text{FFN}(x) = \max(0, xW_1 + b_1)W_2 + b_2$$

In addition to attention sub-layers, each of the layers in the Transformer contains a fully connected feed-forward network, which is applied to each position separately and identically.

4. Layer Normalization and Residual Connections: The Transformer uses layer normalization and residual connections to stabilize the learning process. The output of each sub-layer is $\text{LayerNorm}(x+\text{Sublayer}(x))$, where $\text{Sublayer}(x)$ is the function implemented by the sub-layer itself.

5. Positional Encoding: Since the model doesn't use recurrence or convolution, positional encodings are added to give the model information about the relative or absolute position of the tokens in the sequence.

$$PE_{(pos,2i)} = \sin\left(\frac{pos}{10000^{2i/d_{\text{model}}}}\right)$$
$$PE_{(pos,2i+1)} = \cos\left(\frac{pos}{10000^{2i/d_{\text{model}}}}\right)$$

where $pos$ is the position and $i$ is the dimension.