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ABSTRACT

This thesis focuses on agency problems among variety of parties in companies. We first investigate the effect of CEO inside debt on trade credit policies. CEO inside debt is perceived as a mechanism for aligning the interests of management and debt holders, reducing the exploitation of debt holders by the shareholders and for promoting more conservative corporate policies. The empirical results support our hypothesis by proving that there is a negative and significant relationship between CEO inside debt and trade credit in terms of trade payables. However, we find an insignificant effect of CEO inside debt on trade receivables. We further investigate how institutional investor ownership affects the negative relationship between CEO inside debt and trade credit. We find that, with a higher level of block holder ownership, the reduction effect of CEO inside debt on the trade payables is less pronounced. We also find weak evidence that, for firms with higher information asymmetry, there is a more pronounced negative relationship between CEO inside debt holdings and provision, and the adoption of trade credit. Our findings support the risk-reduction effect of CEO inside debt and confirm the implications of CEO inside debt for financing decisions. Furthermore, using a comprehensive sample set of firms from 48 countries over the period from 2003 to 2019, we investigate the impact of greenwashing on analyst forecast accuracy. After controlling for firm and country specific factors, as well as industry fixed effects and country fixed effects, we employ a panel data regression model and find a significantly negative relationship between greenwashing and analyst forecast errors. This finding is robust to alternative measures of analyst forecast accuracy and endogeneity concerns. We further examine the impact of cash holdings on the relationship between greenwashing and analyst forecast errors. Our results show that, for firms with a higher level of cash holdings, the negative association between greenwashing and analyst forecast errors is less pronounced. We also find that countries with cultures that are characterized by higher levels of masculinity exhibit a weaker relationship between greenwashing and analyst forecast errors, while we find no evidence of any significant effects

of three other national culture factors: Power Distance, Individualism and Uncertainty Avoidance. The findings in this paper suggest an amplifying effect of greenwashing on agency problems associated with analyst forecasts. We further examine how business greenwashing practises are associated with the provision and use of trade credit. Using firm-year observations of U.S. listed firms, we find that both provision and adoption of trade credit by firms are negatively associated with corporate greenwashing activity. We also examine the channel effect for the relationship between these two and our result show that greenwashing activity influences firms' trade credit through the channel of financial constraints rather than social capital. Our results further indicate that the association between trade payables and greenwashing is less pronounced for firms with higher institutional ownership. Additionally, we discover that the strength of the link between trade receivables and greenwashing decreases when the associated information asymmetry is higher. We finally provide supportive evidence that both greenwashing and trade credit play a role to relieve firms' financial constraints and works in a substitution with each other.

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CHAPTER ONE: INTRODUCTION

1.1 Background and Motivation

The main premise from which the field of agency theory originates is the possibility that the current corporate form of economic organisation, with its separation of ownership and control, is inadequate (Fama, 1980; Fama and Jensen, 1983). According to Jensen and Meckling (1976), enterprises, particularly large ones, can be viewed as "a series of contracts among elements of production" in their current form. In this approach, the company functions more like a team whose members are motivated by self-interest but recognise that their survival ship is tied to the team's success. To better understand the organisational notion of modern economic organisation, both Alchian and Demsetz (1972) and Jensen and Meckling (1976) describe the concept of separation of security ownership and control. Alchian and Demsetz (1972) proposed that the risk-bearer (owner) should be “the party holding the residual claim and the right to sell his central contractual residual status”.

In contrast, agents need to be “a single party common to all contracts of the joint inputs and with the power to renegotiate any input's contract independently of contracts with other input owners”. According to Denis (2001), the first understanding of the agency dilemma dates back to 1776, when Adam Smith claims in *Wealth of Nations* that as professional managers “of other people’s money…it cannot be expected that they should watch over it with the same anxious vigilance…” Berle and Means (1991) then applied the same concept to companies; this difficulty deemed corporations an untenable form of organisation. The theory of agency provides crucial insight into the topic of corporate governance, which is the investigation of the institutional and market mechanisms that encourage managers with entrenched self-interests (the controllers) to act in the interests of the firm's shareholders by raising the companies residual cash flows (the owners) (Denis, 2001).

The conflict of interest that emerges between managers and shareholders is the subject of most agency problem studies. Addressing conflicts of interest between managers and shareholders is complicated, but Jensen and Meckling (1976) lay out the motives involved in these conflicts. Managerial absenteeism and the misuse of perquisites are clear instances of private interests; however, there are less evident but potentially damaging private interests at play. Managers' desires for prestige, authority, adventure and mastery over their work environment all

contribute to the emergence of conflicts. The authors highlight three costly types of conflicts for owners: managers' risk aversion, free cash flow, and managers' desire to control. The usual solution for agency problems can be classified into three means: contractual bonds, monitoring and incentives (Denis, 2001). Jensen (1993) offers a comprehensive illustration of how to mitigate agency costs from four different aspects: 1) Legal and regulatory mechanisms; 2) internal control mechanisms; 3) external control mechanisms; 4) product market competition.

Most fundamental corporate governance mechanism, according to Jensen (1993), remains external to the corporation and is instead embedded in the system of legislation that gives monitors the company. During normal circumstances, courts in several nations are cautious about second-guessing the management of a firm without extremely overwhelming evidence of bad intent. There are genuine reasons for pursuing this course of action, but it affords senior management enormous decision-making freedom. Furthermore, the political system is deeply embedded inside the regulatory and legal systems. It is probable that the regulation can aggravate agency tensions between managers and shareholders.

The board of directors, executive compensation structures, and capital and leverage structures of a firm are the primary determinants of the extent to which management satisfies shareholders' interests (Jensen, 1993). These three elements have drawn a great deal of public interest and have been extensively examined by scholars. Several problems linked to internal control monitoring are investigated and supported by empirical evidence in this thesis. External parties may identify a profit opportunity if the management of a publicly listed company does not maximise the firm's wealth following the firm's regulatory and internal control mechanisms. These parties include acquirers who seek improvement in operating efficiency or realisation of profits from increased firm values through merger and acquisition processes, analysts who follow the firms and earn from offering accurate estimations and directional recommendations and institutional investors who take part in shareholder activism to gain from the rise of firm values. Finally, by product market competition, firms exhibit inefficient operations and high capital costs and face severer financial constraints, although the outcome may come slowly.

The central exploration of this thesis lies in the conflict of interests of various parties in a company. Several facets of agency difficulties and their relative impacts on the investigations were examined in this paper. Each study's context and justification are described in this thesis.

1.2 Objective and Scope

The first topic of the thesis investigates how CEO debt-like remuneration affects trade credit. A considerable body of research on executive pay focuses on bonus and equity-based payment in the form of stocks, stock options, and instruments whose value is linked to future returns on the company's stock. Equity-based compensations incentivise risk-averse managers to undertake necessary value-added risks to firms. Early studies, such as Jensen and Meckling (1976), Myers (1977), Smith and Stulz (1985), and Smith and Watts (1992), mention intuition. Several studies provide empirical evidence that equity-based pay encourages CEOs to take greater risks. CEO incentives have been discovered to be negatively and closely associated with companies' use of derivatives for hedging purposes (Rogers, 2002), underinvestment due to manager shirk (Broussard et al., 2004), and investment in fixed assets (Coles et al., 2006), but highly and significantly connected to investment in R&D, the use of leverage, and stock return volatility (Coles et al., 2006). Tong (2010) digs further into the link between CEO risk incentives and cash on hand, proving that the idea holds validity. Lower cash reserves and higher cash value, according to the author, are associated with increasing CEO risk incentives. The finds provide evidence that equity-based compensation induces higher risk-taking strategies.

According to Gormley et al. (2012), management equity-based pay is connected to corporate business risks in both directions. The authors utilise simultaneous equations to demonstrate that as the company's left-tail risk increases, boards choose to reduce risk by reducing the share of stock and option-based compensation in CEO pay. Following a shift in CEO compensation, companies reduce their use of borrowed funds, cut R&D spending, stockpile more cash, and make more diversified acquisitions. When comparing CEOs and other top managers, Kini and Williams (2012) investigate the divergence in tournament incentives. According to the author, a larger wage disparity encourages senior managers to put in more effort in taking chances in the hopes of being promoted. Kuang and Qin (2013) show evidence that vega and delta are positively related to default risks, illustrating the risk-inducing influence of CEO risk incentives. Credit rating agents include CEO compensation when calculating a corporation's overall degree of default risk. Nguyen (2018) demonstrates that enhanced long-term incentives, such as unvested options, can increase firm innovation.

Consequently, risk-taking does not always imply value-added activities. According to Bergstresser and Philippon (2006), companies with CEO compensation related to stock and options are more likely to influence earnings through discretionary accruals. Managers often increase equity returns for performance-based remuneration. According to Dow and Raposo (2005), when employees are paid based on their performance, they are more likely to choose unrealistic long-term goals. The authors contend that the stock and option-based components of CEOs' compensation packages make their investing decisions riskier. Findings in previous studies also suggest that stock- and option-based compensation can lead to excessive risk. For instance, a higher proportion of stock and options in compensation packages and higher CEO "vega" is found to be positively associated with the cost of debt, indicated by wider yield spreads (Shaw, 2012) and more investment in research and development projects with lower abnormal returns (Shen and Zhang, 2013).

There is plenty of research focused on equity-based compensations, which are believed as a solution to shareholder-manager agency problems and promote risk-taking activities. Jensen and Meckling (1976), on the other hand, offer another agency problem, the risk-shifting problem, which includes a collision of incentives between shareholders and debtholders. Including both equity-based and debt-like compensations in CEO pay packages, as later extended by Edmans and Liu (2011), would encourage managers to look out for the interests of shareholders and debtholders. Debt-like compensation serves as a cure for the risk-shifting problem. Despite the fact that pension and deferred pay are key components of CEO compensation packages (Sundaram and Yermack, 2007; Wei and Yermack, 2011; Phan, 2014), they have garnered minimal consideration. Owing to the growing significance of such types of executive compensation in terms of its effects on company value, cost of finance, corporate governance, and investor decision-making. As of December 15, 2006, the Securities and Exchange Commission (SEC) requires all firms to disclose in their proxy statements the annual accruals of pension benefits and the present value of accrued pension benefits for each of a firm's top five executives.

Previous research has regularly focused on the relationship between various forms of debt-like compensation and various corporate financing strategies, including debt and equity. CEO inside debt is inversely related to the number of loan covenants and the projected return, as shown by Anantharaman et al. (2014). This influence is caused by supplementary executive retirement plans (SERPs), which can more strongly resemble external corporate loans than

other kinds of debt-like remuneration. As for what degree a CEO's inside debt impedes an organisation's ability to realign its capital structure with the demands of its shareholders, Brisker and Wang (2017) investigate this issue. In cases of overleverage, the study finds that CEOs with greater levels of internal debt can bring their leverage down more quickly.

CEOs with smaller amounts of internal debt, on the other hand, take debts with longer horizons. According to the findings, CEO internal debt minimises risk. Campbell investigates the impact that a shift in the amount of CEO inside debt has on the value of a company's equity and debt. They suggest that there is no uniformly optimal amount of internal debt. Dang and Phan (2016) demonstrate that CEO inside debt has a favourable influence on short-term debt, suggesting that CEO inside debt serves to lessen loan costs. Authors argue that CEO inside debt makes financing easier with external debt and lowers refinancing risk. To back up this conclusion and expand the study, Freund et al. (2018) found a positive correlation between CEO inside debt holdings and the probability of issuing debt and the share of debt in the financing structure. Earlier research has mostly focused on conventional methods of raising finance. The thesis's last portion investigates how CEO inside debt impacts a critical alternative financing source: trade credit. As anticipated by previous research, short-term financing has been found to have a major impact on both the financial status and liquidity of enterprises.

To better align managers' incentives with the firm's bondholders, debt-like compensation components, generally called inside debt, are unsecured and usually underfunded liabilities that imitate debt-like claims against the company. Several earlier studies have looked at the relationship between CEO debt-like remuneration and firm risk-taking. Paying CEOs in the form of debt might encourage risk-averse management decisions and practices. According to Cassell et al., (2012), CEO inside debt can limit organisational risk-taking. The authors establish an adverse association between CEO internal debt and R&D investment, financial leverage, and future stock return volatility. The liquidity and diversity of a firm’s investment are positively correlated with the CEO's inside debt. According to the authors, CEOs who have a significant amount of internal debt are less inclined to take risks. Tung and Wang (2012) investigated the risk-taking behaviour of banks during the 2008 financial crisis and found that CEOs with high inside debt holdings reduce risk-taking activities. The authors claim that because banks are frequently exposed to increased regulatory scrutiny, there is no straightforward correlation between CEO remuneration and risk-taking. Nevertheless, the findings show that higher CEO inside debt is related to reduced idiosyncratic risk, lower bond

returns, fewer downside risks, and improved accounting and stock returns in banks. With their research on the impact of inside debt on the conditions of syndicated loans, Anantharaman et al. (2014) found that loans extended to companies with bigger CEO inside debt balances were connected to narrower yield spreads and fewer covenant limitations. The authors also argue that compensation schemes for CEOs might have an impact similar to that of external company debt due to the incorporation of the CEO inside debt. Phan (2014) uncovers evidence that confirms the agency theory's claim of a negative association between CEO inside debt holdings and company risk-taking when examining CEO inside debt in an M&A setting. The author believes that M&A activity reflects firms' desire to take higher risks with their investments. The findings reveal that higher CEO internal debt is associated with higher bond returns and long-term performance after an announcement but lower stock returns following an M&A announcement. According to Chi et al. (2017), CEOs with significant internal debt tend to be more cautious in their tax approaches. It is believed that CEO's inside debt should be avoided since it raises cash flow unpredictability. The empirical tests support the theories.

Including inside debt in CEO remuneration helps to resolve the conflict of interest between shareholders and debtholders. Since most inside debt is unfunded and unsecured, which resembles outside corporate debt, this nature of inside debt induces managers to consider the interests of debtholders while, in reality, thinking of their interests (Jensen and Meckling, 1976; Edmans and Liu, 2011). Shareholders bear the inherent costs after debtholders claim the firm’s assets (Hirshleifer and Thakor, 1992). Therefore, they intend to reduce the agency cost of both equity and debt. Rather than promoting risk-shifting, Hirshleifer and Thakor (1992) suggest that shareholders realise the advantages of lowering the agency cost of debt and enable management to make cautious investments. According to recent research, CEO inside debt helps lower agency expenses. Liu reveals that firms with higher CEO inside debt incur fewer agency costs associated with free cash flows. According to Dhole et al. (2016), companies with larger CEO inside debt are less prone to commit to earnings management. These studies provide evidence supporting the argument that inside debt can reduce the agency costs of debt and mitigate managers’ incentives to pursue risk-taking strategies. Wang et al. (2018) demonstrate that increased CEO inside debt corresponds to less accounting conservatism. This is explained by the authors as a substitutional connection between CEO inside debt and accounting conservatism. Debtholders require accounting conservatism to insure against loss when firms suffer financial distress. CEO inside debt help to align the interests of shareholders and debtholders, reducing the demand for accounting conservatism.

The main argument raised by past studies is that the use of trade credit is significantly influenced by the accessibility of financial credit that firms can obtain (Love et al., 2007; Shenoy and Williams, 2017; Molina and Preve, 2012). Firms with superior credit financing and lower debt expenses are less inclined to depend on trade credit. CEO inside debt aligns the interests of shareholders and creditors (Jensen and Meckling, 1976; Edmans and Liu, 2011), resulting in more supplies of credit finance and lower cost of debts (Anantharaman et al., 2014; Freund et al., 2018) and lower cost of equity (Shen and Zhang, 2020). According to Freund et al., (2018), debtholders recognise the CEO within debt and are more likely to issue debt with more favourable debt conditions, resulting in better access to debt financing and reduced debt costs. Shen and Zhang (2020) discuss why CEOs use debt to decrease the cost of the stock. Shareholders realise that equity-based incentives would lead to excessive risk-taking activities by managers, which ends up being harmful to shareholders' wealth. Shareholder value the role of the CEO inside debt in addressing the concern of overinvestment in risky projects. Therefore, firms rely less on trade credit if the CEO inside debt compensation is higher.

In the second topic of this thesis, we seek to investigate the impact of greenwashing on analyst forecast accuracy. The emphasis has been on corporate social responsibility (CSR initiatives) recently. To satisfy the needs of their stakeholders, successful businesses are beginning to include ESG initiatives in their overall strategies and operations (European Commission, 2011). Numerous businesses want to build positive relationships with a broad range of stakeholders by talking about their CSR fears and sharing their CSR performance data. This will increase corporate value and reduce firm risks (Servaes and Tamayo, 2013; Lins et al., 2017; Flammer and Luo, 2017). However, "greenwashing," described as "the confluence of two firm behaviours: inadequate environmental performance and good communication about environmental performance," is rising because CSR is becoming more popular, according to Delmas and Burbano (2011). The term "greenwashing" refers to the practice through which certain businesses attempt to conceal their genuine CSR practices by only revealing the positive parts of their social and environmental performance. This would seriously affect corporations' efforts to build confidence through CSR disclosures (Du, 2015). According to TerraChoice (2010), virtually all green products sold in the United States and Canada violate at least one "greenwashing sin," such as hiding essential data or convincing clients to accept misleading promises. Greenwashing activities reflect the corporate short-termism inherent in agency problems between managers and shareholders.

Greenwashing can have an impact on a company's operations, marketing, financial performance, and corporate governance such as green distrust among customers and damage to customer confidence (Hsu, 2011; Chen and Chang, 2013a), significant harm to firms' ethics and legitimacy (Nyilasy et al., 2014), worse financial records (Walker and Wan, 2012), and a significant decline in cumulative abnormal returns around improper environmental conduct (Du, 2015). Nevertheless, there are several periodicals devoted to the issue of corporate branding and marketing. Few academic research has been conducted on the implications of greenwashing on business financial policy. To further investigate greenwashing practices in corporate finance.

Firms' greenwashing initiatives are motivated by a variety of factors. Companies employ greenwashing strategies, particularly in CSR reports, according to Mason and Mason (2012), to build favourable in-group opinions of the organisation while concurrently projecting a socially responsible public image. Short-sighted firms with poor CSR performance tend to imitate their competitors who perform well in socially responsible engagement and reap benefits from being "green". According to Mitchell and Ramey, (2011), greenwashing is motivated by unconventional customer behaviours. Even in harsh economic times when consumers are seeking value in the products and services they purchase, consumers will continue paying a premium for environmentally friendly goods and services. This consumer behaviour tendency drives enterprises to ready themselves to meet the demands given by the prevailing trend, and some of these companies want to engage in greenwashing. However, several firms are exploiting the current opportunity given by the movement of "becoming green" by employing unethical practices to fight for market share and profits. Industries can attempt to trick consumers into buying their products over the competition by exaggerating their environmental claims to take advantage of green premiums, which can increase their profits. Some research suggests that raising the transparency of a firm's ESG performance, or re-establishing its legitimacy Campbell et al. (2003), can reduce the negative impact of environmental damage (or comparable incidents) on its corporate image and fair value (Brown and Deegan, 1998; Cho and Patten, 2007).

Previous research has demonstrated that improved ESG practises can decrease a firm's risk exposure and increase its access to external funding through lower capital costs and bank loans.(Goss and Roberts, 2011; Hoepner et al., 2016; Nandy and Lodh, 2012; Sharfman and

Fernando, 2008). If you have a great track record in ESG, it may be simpler to get access to outside funding and lessen the impact of economic constraints. Strong environmental, social, and governance (ESG) regulations are associated with fewer financial constraints, according to the research of Chen et al. (2014), for two key reasons. Improved ESG performance is correlated with increased stakeholder orientation, which minimises the risk of short-sighted opportunism and lowers total contracting costs. This also leads to increased revenue and profit in the long run (Dhaliwal et al., 2011).In addition, a good record of financial performance and better CSR performance attracts the attention of institutional investors, hence further enhancing the transparency of the firm (Dhaliwal et al., 2011). Improved data availability and quality decrease obstacles to capital access by closing the knowledge gap between a business and its investors (Hail and Leuz, 2006; El Ghoul et al., 2011; Khurana & Raman, 2004). Companies can minimise their borrowing rates by providing more information to prospective lenders (Hubbard, 1997).

Meanwhile, stakeholders put a lot of faith in corporate messages, although they may not always be an accurate representation of a company's actual ESG performance. (Marquis et al., 2016; Van Halderen et al., 2016). Companies with limited financial resources are more motivated to reveal their ESG engagement, which leads to greater greenwashing (Zhang, 2022). Additionally, highly leveraged firms may face additional financial pressure in the short- and long-run, aggravating their greenwashing behaviour. According to Berrone et al. (2017), corporations gain environmental legitimacy by adhering to external environmental expectations. Stakeholders place substantial faith in corporate disclosures, even though these records may not always be a reliable indicator of a company's real ESG performance (Marquis et al., 2016; Van Halderen et al., 2016). Firms with lower resources are more prone to engage in greenwashing since they are under pressure to publicise their ESG initiatives (Zhang, 2022). Furthermore, deeply indebted businesses can face higher financial pressure immediately and over time, potentially exacerbating their greenwashing behaviour. Companies gain environmental legitimacy by meeting external environmental expectations, according to research by Berrone et al. (2017). Generally, despite the fact that greenwashing practices, if uncovered, can have considerable negative consequences for organisations, corporate short-termism drives these companies to participate in greenwashing. The influence of greenwashing upon two factors is explored in this thesis: analyst forecast accuracy and trade credit.

Analysts play a role as information intermediaries. Over the past few decades, there has been a heated debate over the role of CSR engagement by firms, and there is growing market interest. According to certain research, analysts include such nonfinancial information while providing earnings forecasts. Due to the importance of analysts in capital markets, this research is motivated to examine the reactions of financial analysts to firms' greenwashing activities.

In the financial markets, analysts serve as mediators for different forms of information (Lang and Lundholm, 1996a). Over the past few decades, there has been a lot of debate and growing interest in corporate social responsibility (CSR) activities. According to some studies, analysts may take such non-financial aspects into consideration when forecasting profits. (Eccles et al., 2011; Dhaliwal et al., 2012; Kim et al., 2012). Due to their noticeable influence on the financial markets, it is necessary to investigate how financial experts feel about greenwashing by businesses. The first subject in this thesis attempts to evaluate if and how greenwashing by corporations affects the veracity of analyst profit estimates.

Several studies show that analysts are incentivised to favour company management to get confidential information. They enhance their forecasting accuracy and are less likely to be dismissed (Ke and Yu, 2006; Richardson et al., 2004; Sethuraman et al., 2018; Soltes, 2014; Chen and Matsumoto, 2006). Ke and Yu (2006) discuss the earnings forecasting bias that analysts use to attract corporate management and the benefits that come with it. They uncover that in return for management information, analysts provide inaccurate profit estimates. Chen and Matsumoto (2006) compare analysts' predictive accuracy before and after a suggestion, presuming that management-provided information boosts (decreases) forecast accuracy. The authors discovered that experts who made more positive suggestions had more accurate projections. In addition, they find a greater increase in relative accuracy for analysts with more favourable recommendations. Sethuraman et al. (2019) also looked at manager-analyst discussions during earnings calls. Favoured and disfavoured analysts encounter varying degrees of managerial conflict of interest. Favoured analysts gain favour with management by making favourable recommendations and providing more realistic profit projections.

According to the discussion above, analysts may have improved access to managing confidential information in exchange for more accurate earnings estimates. This research proposes that analysts are incentivised to provide incorrect greenwashing information to stakeholders. A higher degree of greenwashing activity by corporations is projected to be

related to lower analyst prediction errors (representing better analyst forecast accuracy). As a result, in the first subject, it is hypothesised that greenwashing is positively associated with forecasting accuracy.

The third topic of the thesis tries to investigate how greenwashing is adopted as a risk reduction tool and affects firms' financing activities. The goal of this chapter is to determine if greenwashing enterprises supply more (or less) trade credit as suppliers or adopt more (or less) trade credit as purchasers.

Through two channels, this research aims to evaluate the influence of greenwashing on the availability and acceptance of trade credit. First, we assume greenwashing affects the trade credit through the financial constraints channel, which argues that greenwashing acts as a mechanism to increase the financial conditions of firms and is a substitute for trade credit to reduce financial constraints. Previous research shows that enhanced ESG practises could lessen company risk and enhance access to financing sources with a lower cost of capital and financial institution loans (Goss and Roberts, 2011; Hoepner et al., 2016; Nandy and Lodh, 2012; Sharfman and Fernando, 2008), resulting in increased ability to alleviate economic constraints. As a result, it is possible to argue that businesses know the importance of ESG performance and use it to influence public opinion and profit from it. Prior studies indicate that a firm could increase the level of disclosure of their ESG performance to avoid or mitigate the negative impact of their environmental damage (or similar occurrences) on corporate reputation and market value (Brown and Deegan, 1998; Cho and Patten, 2007), or to reclaim its legitimacy (Campbell et al., 2003). Stakeholders put much faith in corporate messages, although they may not always be an accurate representation of a company's actual ESG performance. (Marquis et al., 2016; Van Halderen et al., 2016).

Companies often rely substantially on trade credit as a significant source of short-term funding. Firms provide trade credit to their clients to enable them to pay later, hence giving liquidity to their consumers. Simultaneously, they use trade credit to fund their inventory and unanticipated financial demands. Many past pieces of research prove that relying on trade credit leads to a higher risk of a firm's default. The previous study indicates that suppliers and consumers use trade credit for a variety of reasons. From the demand-side point of view, trade credit serves as a substitution for financing sources which reliefs firms from financial distress and liquidity risk (Ferris, 1981; Wilner, 2000; Niskanen and Niskanen, 2006; Yang and Birge, 2018; Shang,

2020). Firms' ability to get external, formal financing, such as bank loans, corporate debt, and stock market access, is conditional on their ability to provide and access to trade credit (Petersen and Rajan, 1997; Fisman and Love, 2003; Love et al., 2007; Carbo-Valverde et al., 2016; Shenoy and Williams, 2017; Shang, 2020). Firms in greater financial hardship (Molina and Preve, 2012) and with weaker accounting quality are more prone to use trade credit (Chen et al., 2017b).

Combining the views obtained in prior studies, we argue that greenwashing plays a role in improving firm access to finance. Trade credit, on the other hand, can be used to alleviate financial limitations as an informal source of funding. Both devices should serve complementary roles in alleviating budgetary limitations. This research expects that increasing greenwashing activities is associated with reducing the adoption of trade credit by firms.

Two schools of thought exist about a company's trade credit practices and greenwashing. Greenwashing damages the confidence, and reputation enterprises send to stakeholders, reducing trade credit. Trust or reputation may be an effective way to continue unfinished contracts like trade credit agreements, according to studies. According to Karlan (2005), individuals are more ready to lend to and return loans in honest organisations. This demonstrates the need for trust in ensuring the continuation of imperfect arrangements such as trade credit. Previous studies demonstrate that greenwashing can harm companies' reputations and stakeholder trust (Hamann and Kapelus, 2004; Pomering and Johnson, 2009; Lyon and Maxwell, 2011; Chen and Chang, 2013a; Guo et al., 2017). It is reasonable to expect there is a negative association between greenwashing and trade credit since firms which commit to greenwashing activities are perceived as not trustworthy. The two channels are studied in the thesis's second subject.

1.3 Findings

Chapter two of empirical research discusses the impact of CEO inside debt on trade credit. This research finds a significant negative association between CEO inside debt and trade payable and net payable, which is in line with the hypothesis of this study. Companies with more CEO internal debt rely less on trade payables. Nevertheless, trade receivables and CEO internal debt are not significantly related. How institutional investor ownership affects the negative relationship between CEO inside debt and trade credit is investigated further. It is found that

with a higher level of blockholder ownership, the reduction effect of CEO inside debt is less pronounced on the trade payable, indicating institutional investors acting as an external monitoring mechanism. With a higher external monitoring force, there is less demand for conservative policy. However, no substantial moderating influence of blockholder ownership on trade receivables is seen. Additionally, how analyst projections mitigate the consequences of CEO inside debt on trade credit is investigated. This study provides modest evidence that the negative link between CEO inside debt and trade credit becomes more severe in terms of trade payable as analyst prediction error increases. This implies that with a higher level of information asymmetry, the demand for more conservative policy is higher. The endogeneity by adopting instrumental variable approaches is also addressed, and robust results for trade payable are obtained.

In Chapter three, how firms' greenwashing activities impact the accuracy of analyst earnings forecasts is explored. The data on greenwashing of the firms are collected for the period 2002 to 2019 from the Thomson Reuters Asset4 ESG database. This study obtains empirical results that indicate negative associations between analyst forecast error and the level of greenwashing. The data show that analyst prediction mistakes diminish when analysts appease company managers by including favourable greenwashing material in their reports in exchange for improved access to confidential managerial information, hence decreasing forecast errors. This research provides evidence that greenwashing is positively linked with analyst prediction optimism, hence giving more support for the claim. This research also finds that the negative association between forecast errors and greenwashing is less pronounced in firms with higher cash holdings. This research further examines how country cultures moderate the relationship between the two. In nations with a greater degree of masculinity, the negative association between prediction mistakes and greenwashing is less prominent. The test results are robust when we address endogeneity concerns using instrumental variables, the PSM approach and the entropy balancing approach.

Chapter four focuses on the impact of greenwashing on trade credit. In this study, the findings support that there is a negative and significant association between trade credit and greenwashing. It can be inferred from the channel testing that the results support the financial constraints channel. The research examines the moderating effects of institutional investor ownership and analyst forecast dispersion. It finds that with a higher level of institutional investor ownership, the association between greenwashing and trade payables is less

pronounced. As information asymmetry increases, the negative correlation between trade payables and greenwashing weakens.

1.4 Contribution

This work contributes to the existing body of knowledge in several areas. The first topic contributes to the current literature on CEO inside debt by providing further evidence of the risk reduction role of the CEO inside debt. This is suspected to be the first investigation of the connection between debt-like CEO compensation and trade credit policies. This study contributes to the literature on CEO inside debt. It supports the evidence from past research that CEO inside debt plays an important role in shaping corporate financing policies and risk-taking behaviours. This study also contributes to the current literature on trade credit policies. Past literature focuses on how inside debt affects managers' decisions on debt structure and debt-equity financing trade-offs (Anantharaman et al., 2014; Campbell et al., 2016; Dang and Phan, 2016; Brisker and Wang, 2017; Beavers, 2018). Less emphasis has been placed on the alternate source of finance, trade credit. As the usage of trade credit between suppliers and consumers increases, this research offers empirical evidence of how the remuneration structure of chief executive officers might influence the short-term financing choices of businesses. Very little literature focuses on the corporate governance factors that can influence trade credit policies. Numerous studies provide opposing perspectives on economic variables and information asymmetry. This study contributes to the literature by providing an alternative angle of view. The implication for corporate decision-makers or governor might be that debt-like compensation helps to relieve financial constraints, and it should be taken into consideration when making decisions on short-term and long-term financing activities.

The second study contributes to the literature that investigates the effects of greenwashing activities by companies. There is an abundance of research evaluating the effects of CSR performance on organisations' financial performance (Edmans, 2011; Lin et al., 2015; Dimson et al., 2015), firm risk (Godfrey et al., 2009; Lee and Faff, 2009; Lins et al., 2017; Albuquerque et al., 2015) and better access to finance (Goss and Roberts, 2011; El Ghoul et al., 2011a; Dhaliwal et al., 2011). Others concentrate on the influence of CSR disclosure quality on the accuracy of analyst profit forecasts (Dhaliwal et al., 2012). However, with the expansion of the adoption of CSR engagement as a business strategy, the possibility that firms are using CSR disclosures to greenwash also increases. In the field of finance, the impact of greenwashing

remains largely unknown. This multinational research employs empirical analysis predicated on huge sample size. As analyst projections are an essential source of information for capital markets to encourage the selection of an investment portfolio, investors could be concerned about how corporations can affect the information environment of analysts through greenwashing engagements. This investigation provides evidence that greenwashing, although used by firms to convey misleading information, is associated with greater analyst forecast accuracy. We demonstrate that greenwashing exaggerates the agency problems associated with analysts.

In the third topic, to our best knowledge, this is the first study on the impact of greenwashing activities on firms' trade credit policies. The existing literature focuses on how greenwashing affects market outcomes and the information environment of a firm, while little attention has been paid to the alternative financing activity, this being trade credit. With an increasing number of businesses now relying on trade credit to make transactions, our research sheds light on the factors that drive this phenomenon, including financing motives. In particular, previous studies have mainly focused on the harmful effects of greenwashing on the market reaction, customer perception and a firm's reputation (i.e. Du, 2015; Akturan, 2018; Brouwer, 2016). There is limited literature exploring how greenwashing is associated with factors which affect firm financing decisions.

Our paper differs from previous papers, such as Cheung and Pok (2019) and Xu et al.(2020), as we focus on greenwashing activities, instead of corporate social responsibility performance. We argue that firms adopt greenwashing to relieve financial distress, and consequently depend less on trade credit. In addition, we adopt measures of greenwashing, computed by the difference between symbolic CSR ratings subtracting the substantive CSR ratings, and the ratio of symbolic CSR ratings over the substantive CSR ratings, while previous studies focus mainly on the overall CSR ratings of the firms. At the same time, we provide additional evidence to support the financial constraints theory of trade credit.

1.5 Structure

This thesis is divided into five chapters. Chapter one is an introduction which outlines the background and motivations of the studies contended in this thesis. The three subjects discussed in this thesis are presented in Chapters two to four. The three studies are related to

different aspects of agency problems in corporate governance. The fifth chapter concludes the thesis and presents its contributions, consequences, limits, and recommendations for further study.

CHAPTER TWO: CEO INSIDE DEBT AND TRADE CREDIT

2.1 Introduction

There is extended literature that focuses on equity-based compensation. The equity-based compensation that is provided to executives often consists of stocks, stock options, and a range of other financial instruments. The underlying assets of these instruments are frequently tied to a business's anticipated future equity value. The topic of executive equity-based compensation has been the subject of a significant amount of research and investigation. Equity-based compensation can be employed to mitigate the shareholder-manager agency problem and promote risk-taking activities. However, it is suggested by Jensen and Meckling (1976) that there is another type of agency issue, this being the conflict of interests between shareholders and debtholders, known as a risk-shifting problem. Edmans and Liu (2011) propose that the inclusion of debt-like compensations in executive pay packages would lead managers to take care of the interests of debtholders, leading to more conservative risk-taking activities. Debt-like compensation serves as a tool for addressing the risk-shifting problem. Although debt-like compensation, such as pensions and deferred compensation, constitutes a large percentage of executive compensation packages, the increasingly common practice of rewarding top executives with debt in the form of pay has received very little attention. Literature shows that there is growing adoption of inside debt in CEO compensation packages by U.S. firms (Sundaram & Yermack, 2007; Wei & Yermack, 2011). For example, Wei and Yermack (2011) document that 84 percent of CEOs in their sample hold inside debt, with average holdings of approximately US$10 million.

Equity-based compensations are generally perceived as being incentives used to encourage risk-averse managers to employ value-added risk strategies. This intuition appears in some earlier research studies, such as those by Jensen and Meckling (1976), Myers (1977), Smith and Stulz (1985) and Smith and Watts (1992). A number of papers extend the earlier research and provide empirical evidence that equity-based compensations induce a greater quantity of risk-taking decisions being made by executives. CEO incentives are found to be negatively and closely tied to the use of derivatives for hedging purposes by firms (Rogers, 2002). Broussard et al. (2004) argue that, through an investigation on the connections between CEO incentives and investment decisions, they find that CEO incentives align the interests of managers and shareholders, and help to reduce underinvestment caused by reticent management. Coles et al.

(2006) find a strong positive relationship between the sensitivity of CEO compensation to stock volatility (vega) and investment in research and development, the use of leverage and stock return volatility. The authors also prove that there is a significant and negative relationship between vega and investment in fixed assets. The findings provide evidence that equity-based compensation induces the employment of risk-taking strategies. Based on the findings of Bergstresser and Philippon (2006), businesses in which the compensation of the chief executive officer is more closely linked to the value of the company's stock and options are more likely to rely on discretionary accruals for the purposes of manipulating results. The reason behind this is that managers tend to boost equity returns in order to achieve better self-gains through performance-based compensations. Tong (2010) provides further evidence on this theory by investigating the relationship between CEO risk incentives and cash holdings. The author finds that a higher CEO risk incentives are associated with less cash holdings and a higher value of cash.

Gormley et al. (2012) discover a two-way relationship between management equity-based compensations and firm business risks. The authors employ simultaneous equations, revealing that when a firm's left-tail risk increases, boards tend to reduce the level of risk by reducing the portion of stock- and options-based compensation in an executive's pay. Following the change to executive pay structures, firms exhibit a reduced use of leverage, less research and development expenses, an increase in cash hoardings and more diversified acquisitions. Kini and Williams (2012) assess the tournament incentives gap based on options provided to CEOs and other senior managers. The author finds that a higher pay gap induces a higher level of risk-taking by senior managers in order to bet on a higher chance of promotion. Kuang and Qin (2013) further prove the risk-inducing effect of CEO risk incentives by providing evidence that vega and delta are positively related to default risks. Credit rating agents incorporate CEO compensation information into their risk assessments. Nguyen (2018) shows that an increase in the long-term incentives associated with unvested options promotes corporate innovation.

Dow and Raposo (2005) argue that performance related compensations increase the adoption of overly ambitious strategies that are challenging to implement. The authors propose that changes to executive compensation elements embedded in stock- and option-based components within their package lead to radical investment decisions that may go beyond the expectations of shareholders. Findings in previous studies also suggest that stock- and options-based compensation may lead to excessive risk. A higher proportion of stock and options in

compensation packages and higher CEO "vega" is found to be positively associated with the cost of debt, indicated by wider yield spreads (Shaw, 2012). Shen and Zhang (2013) also reveal that higher vega is related to higher research and development expenses. However, the abnormal returns following an increase in research and development investment are lower for firms with a higher level of vega, compared to lower vega firms, suggesting that equity-based compensation leads to overinvestment.

The risk-promoting effect of equity-based compensation is also revealed in financial firms. Gande and Kalpathy (2017) evidence that financial firms with higher "vega" are more likely to issue emergency loans and that such loans would have longer outstanding periods. The authors point out that higher "vega" is tied to an increase in the risk-taking activities of financial firms, inducing higher solvency risk. By investigating bank risk-taking activities in terms of acquisitions, Hagendorff and Vallascas (2011) show that pay-risk sensitivity embedded from stock and options in CEO compensation is positively associated with bank risk-taking.

The above research studies focus on equity-based compensations, believed to be a solution to the shareholder-manager agency problem and to promote risk-taking activities. However, there is also a need to mitigate excessive risk-taking behaviour of managers (Jensen and Meckling; 1976; Edmans and Liu, 2011). Sundaram and Yermack (2007) find that pensions and deferred compensations account for 25% of the size of the equity-based compensations among the S&P 1500 CEOs and is 40% larger in size than base salaries in 2007. The proportion increases to 43% in 2008. The authors also point out that the pension proportion increases with CEO age. Many other papers also document that inside debt accounts for a significant portion of total compensation, and is even larger in value than equity compensation (Wei and Yermack, 2011; Phan, 2014). Since December 15, 2006, the Securities and Exchange Commission (SEC) has mandated that all companies disclose in their proxy statements the yearly basis accruals of pension benefits, as well as the present value of accrued pension benefits for each of a company's top five executives. This is due to the growing significance of such forms of executive compensation in terms of their effect on firm value, the cost of funding, corporate governance, and investor decision making.

Previous studies mainly focus on the effect of debt-like compensation on financing policies, such as corporate debt and equity. Anantharaman et al. (2014) document that there is negative association between CEO inside debt and promised yield, and the number of covenants in loans.

The effect is driven by supplemental executive retirement plans (SERPs), as opposed to other types of debt-like compensation, since SERPs can more closely resemble outside corporate loans. Brisker and Wang (2017) investigate the effect of CEO inside debt on the speed at which firms adjust their capital structure towards the desired level of shareholders. The authors find that a higher level of CEO inside debt is related to a faster adjustment to the desired level when there is overleverage, and a slower adjustment to the desired level when there is underleverage. The findings support the risk-reducing effect of CEO inside debt. Campbell et al. (2016) examine the effect of the change in CEO inside debt on the value of equity and debt of the firms. They suggest there is no universal optimal inside debt ratio. By showing a favourable effect of inside debt on short-term debt, Dang and Phan (2016) show that CEO inside debt contributes to lowering the cost of debt. According to the authors, having CEO inside debt makes it easier for firms to finance external debt and lowers the risk associated with refinancing activities. A recent study by Freund et al. (2018) provides more evidence in favour of this notion and expands upon the existing literature by showing a positive link between CEO inside debt holdings and the propensity to issue debt by firms, and the fraction of debt in corporate capital structures. Previous papers mainly focus on formal forms of financing activities. In this paper, our focus is on the effect of CEO inside debt on an important alternative financing source, this being trade credit. As suggested by the existing literature, this form of short-term financing has a strong influence on firms' default risk and liquidity risk.

To better align manager incentives with those of the firm's bondholders, debt-like compensation components, generally referred to as inside debt, are unsecured and frequently underfunded commitments that imitate debt-like claims against the business. Several pieces of prior literature address the relationship between CEO debt-like compensation and corporate risk-taking. CEO debt-like compensation can induce the creation of conservative corporate policies by managers and can motivate risk-reducing activities. Research by Cassell et al. (2012) shows that CEO inside debt may curb risk-taking in businesses. The authors discover a significant inverse relationship between CEO internal debt and R&D spending, leverage ratio, and the volatility of future stock returns. There is a positive relationship between CEO inside debt and asset liquidity and diversification. The authors conclude that CEO inside debt promotes risk aversion activities. In accordance with the findings of Tung and Wang (2012), who conducted research on the risk-taking behaviours of banks during the 2008 financial crisis period, bank CEOs who have substantial inside debt holdings take fewer risks. The authors argue that the relationship between executive compensation and risk-taking in banks is not

straightforward, since banks are generally subject to more regulatory controls. Even so, the findings show that higher levels of CEO inside debt are related to lower idiosyncratic risk, lower bond returns, lower downside risks and higher accounting and stock returns in banks. Anantharaman et al. (2014) carried out an experiment to determine how the presence of inside debt influences the conditions of syndicated loans. The authors found that loans provided to companies with significant CEO inside debt holdings were linked to smaller yield spreads and fewer covenant limitations. The authors also point out that the impact of CEO inside debt is mainly generated by pay schemes that can more closely resemble outside corporate debt. According to the agency theory, CEO inside debt holdings are expected to have a negative relationship with firm risk-taking propensity, and Phan (2014) provides evidence to support this hypothesis via an examination of CEO inside debt in the context of M&As (mergers and acquisitions). The author argues that M&A activities also reflect corporate investment risk-taking. Based on the findings, a greater level of CEO inside debt is related to better M&A announcement bond returns, as well as long-term performance; on the other hand, it is associated with poorer M&A announcement stock returns. As per the study by Chi et al. (2017), firms with CEOs who hold significant amounts of inside debt are less likely to employ aggressive tax strategies. Given that corporate tax sheltering leads to higher cash flow volatilities, the authors argue that CEO inside debt should curb tax sheltering. The findings support their conjectures.

The inclusion of inside debt in executive compensation helps to resolve shareholder-debtholder conflicts of interest. As the majority of inside debt is unfunded and unsecured, it can resemble outside corporate debt. Given the nature of inside debt, managers are motivated to consider the interests of debtholders, but in reality, this also means considering their own interests (Jensen and Meckling, 1976; Edmans and Liu, 2011). After creditors have made claims on a company, the shareholders are left to foot the bill (Hirshleifer and Thakor, 1992). Thus, they then aim to reduce the agency cost of equity and debt. Instead of promoting risk-shifting, shareholders should acknowledge the advantages of decreasing the agency cost of debt and allow management to make conservative decisions, according to the argument presented by Hirshleifer and Thakor (1992). Recent studies find that CEO inside debt helps to mitigate agency costs. Liu et al. (2014) reveal that firms with higher CEO inside debt incur fewer agency costs that are associated with free cash flows. Having a larger level of CEO inside debt holdings is correlated with a lower likelihood of profit manipulation, as shown by Dhole et al. (2016). These studies, when taken as a whole, provide evidence in favour of the concept that inside

debt may diminish the agency costs of debt and attenuate managers' incentives to undertake risk-taking activities. Wang et al. (2018) prove that higher levels of CEO inside debt lead to lower accounting conservatism. The authors explain this as being a substitutional relationship between CEO inside debt and accounting conservatism. Debtholders require accounting conservatism to insure against loss when firms suffer financial distress. By bringing together the interests of shareholders and debtholders, CEO inside debt assists in reducing the desire for accounting conservatism.

Companies often rely substantially on trade credit as a significant source of short-term funding. Firms offer trade credit to allow their customers to pay later and, hence, provide liquidity to their customers. At the same time, they also adopt trade credit to finance their inventory and any unexpected financial needs. Many previous research studies prove that relying on trade credit leads to a higher risk of defaulting for firms. Previous research studies suggest that there are several reasons why suppliers and customers adopt trade credit. From the demand-side point of view, trade credit serves as a substitution financing source which relieves firms from financial distress and liquidity risk (Ferris, 1981; Wilner, 2000; Niskanen and Niskanen, 2006; Yang and Birge, 2018; Shang, 2020). Smith (1987) provides another rationale, this being that suppliers are willing to provide trade credit to clients who are having trouble obtaining bank loans. The author suggests that trade credit serves as a screening device for buyers' default risk. By assessing the trade credit rates and terms, suppliers can obtain information about a buyer's default risk. To extend this point of view, Yang and Birge (2018) suggest that retailers use trade credit for the purposes of inventory management and supply-chain coordination, leading them to achieve increased supply-chain efficiency. The authors propose a risk-sharing role of trade credit. Suppliers provide trade credit to build long-term relationships with customers, with the intention of maintaining stable sales to customers and to reduce the cost of information gathering (Chod et al., 2019; Fontaine and Zhao, 2021).

Previous studies reveal that a wide range of firm characteristics influence the provision and adoption of trade credit by firms. Firms' provision of, and access to, trade credit is conditional on their capacity to obtain external, formal finance, such as bank loans, corporate debt and equity markets (Petersen and Rajan, 1997; Fisman and Love, 2003; Love et al., 2007; Carbo-Valverde et al., 2016; Shenoy and Williams, 2017; Shang, 2020). Firms with higher levels of financial distress (Molina and Preve, 2012) and poorer accounting quality are more likely to

rely on trade credit (Chen et al., 2017). The provision and use of trade credit also depend on the relationship between the supplier and customer. Fabbri and Klapper (2016) prove that suppliers use trade credit as a device for enhancing their positions in the product competition. Suppliers with weak bargaining power are more likely to issue credit sales for their customers, are more likely to extend their credit terms and to issue fewer penalties for overdue credit sales. This point of view is further tested and supported by Chod et al. (2019) and Fontaine and Zhao (2021). Recent studies also show that social capital and trust enhance the use of trade credit, since this form of informal financing is highly dependent on trust and reputation between suppliers and customers. At the same time, social trust also provides a better information environment which facilitates the information transmission between suppliers and customers, thus, encouraging suppliers to permit more credit sales (Wu et al., 2014; Hasan and Habib, 2019; Li et al., 2021).

The main argument raised by previous studies is that the use of trade credit is significantly influenced by the level of accessibility by firms to financial credit (Love et al., 2007; Shenoy and Williams, 2017; Molina and Preve, 2012). The reliance on trade credit decreases as a company's access to other credit financing options increases and the cost of debt decreases. Debt-like pay taken on by a CEO benefits both shareholders and lenders (Meckling and Jensen, 1976; Edmans and Liu, 2011), resulting in a greater supply of credit finance, a lower cost of debt (Anantharaman et al., 2014; Freund et al., 2018) and a lower cost of equity (Shen and Zhang, 2020). Freund et al. (2018) state that the debtholders recognize CEO inside debt and are more willing to offer debt with more favorable debt terms, leading to improved access to debt financing and a lower cost of debt. Shen and Zhang (2020) explain why CEO inside debt reduces the cost of equity. Shareholders realize that equity-based incentives would lead to excessive risk-taking activities by managers, which can be harmful to shareholder wealth. Shareholders value the role of CEO inside debt in addressing concerns relating to overinvestment in risky projects. We consequently conjecture that firms rely less on trade credit if the CEO inside debt compensation level is higher.

According to Anantharaman et al. (2014), executive compensation often consists of two parts, the tax-qualified plans that are assigned to all employees, also known as rank-and-file (RAF) plans, and supplemental executive retirement plans (SERPs), which are exclusively granted to top executives. RAF plans are funded and secured; hence, they are not subject to default risk, similar to that of outsider debtholders. It is argued that RAF plays a smaller role in aligning the

interests of managers and debtholders. However, SERPs are unsecured and unfunded debt-like compensation that resembles corporate debts, which in turn play the main role in protecting debtholders' interests. Deferred compensation also refers to other deferred compensation (ODC), which is also unsecured and unfunded. However, it gives top executives more flexibility in terms of withdrawal and in terms of the underlying assets of investments. Top executives can withdraw the balance before retirement. They can also choose to use the balance to invest in firms' stocks. The nature of ODC makes it less effective at aligning the interests of managers and debtholders. Following Wei and Yermark (2011), Phan (2014), and Dang and Phan (2016), we include both executive pensions and deferred compensation in our measure of CEO inside debt, which are also the most common ways to measure debt-like compensation in past literature. We argue that even for RAF plans and ODC, which are less alike to resemble corporate debt, they are still debt-like compensations that need to be included in the total inside debt.

There are a variety of agency problems addressed in the prior studies. Shareholder-manager agency problems are explained in detail in the introduction section when equity-based compensation is discussed. These problems can be summarized as follows: 1) Managers are likely to be "lazy" if they are not motivated by risk-taking incentives since their interests are not tied to firm performance (i.e., Rogers, 2002; Broussard et al., 2004; Coles et al., 2006; Tong, 2010); 2) too much risk-taking incentives might also lead to investments into projects with excessive risk since managers bet for higher self-interests without considering long-term interests of shareholders' wealth (i.e., Dow and Raposo, 2005; Shaw, 2012; Shen and Zhang, 2013). The conflict of interests between debtholders and managers arises due to the following reasons: excessive risk-taking by managers, which leads to high default risk (i.e., Dow and Raposo, 2005; Shaw, 2012); alignment of interests of managers and shareholders by equity-based compensation, which amplifies the exploit on debtholders by shareholders (Jensen and Meckling, 1976; Edmans and Liu, 2011).

We investigate the effect of CEO inside debt on trade credit policies using two measures of trade credit: the trade receivables and the trade payables[1]. The receivables indicate a willingness by firms to offer trade credit to customers, which is computed as trade accounts

[1] This is a research project with Dr. Qingjing (Maggie) Zhang at Southampton Business School, University of Southampton, and the working paper is entitled "Managerial risk-reducing incentives and trade credit".

receivable divided by the total assets. The payables represent a firm's willingness to rely on trade credit provided by its suppliers, which is calculated as accounts payable divided by the total assets. Following Wei and Yermack (2011), Cassell et al. (2012) Phan (2014) and Freund et al., (2018), five different computations are adopted to measure the level of CEO inside debt holdings, including the CEO leverage ratio, the CEO relative leverage ratio, the CEO relative incentive ratio, and two the dummies, the CEO relative leverage dummy and CEO relative incentive dummy. We obtain our inside debt data from the ExecuComp database, which is merged with trade credit data and control variables data from the Compustat database and CRSP database. Analyst forecast data are obtained from I/B/E/S database. In the end, we are left with 10,003 firm-year observations.

We find a significant negative association between CEO inside debt and trade payables. Firms with a higher level of CEO inside debt are less dependent on trade payables. However, we do not find a significant relationship between trade receivables and CEO inside debt. We further investigate how institutional investor ownership affects the association between CEO inside debt holdings, and the provision and adoption of trade credit. First, institutional investors play an effective monitoring role in reducing opportunistic behaviours by managers, such as hoarding bad news (An and Zhang, 2013; Callen and Fang, 2013), overinvesting in risky projects (An and Zhang, 2013; Esteban et al., 2014), and earnings management (Zhu et al., 2022). We expect that, with a stronger external monitoring force, there is less demand for curbing excessive risk-taking, leading to a less pronounced relationship between CEO inside debt holdings and corporate trade credit in companies with higher levels of institutional ownership. Second, certain studies reveal that institutional investors inhibit excessive incentive compensation being paid to CEOs (Hartzell and Starks, 2003; Khan et al., 2005; Zhu et al., 2022). Institutional investors also help to mitigate overinvestment and asset substitution problems. Therefore, we conjecture that the effect of CEO inside debt is weaker in firms with higher levels of institutional investor ownership. Our results show that, with higher levels of institutional investor ownership, measured as blockholder ownership, the reduction effect of CEO inside debt is less pronounced on trade payables. This implies that institutional investors can act as an effective external monitoring mechanism used to curb excessive risk-taking behaviours. We also examine how analyst forecasts moderate the effects of CEO inside debt on trade credit. We find weak evidence that the inverse relationship between CEO inside debt and trade credit strengthens with an increasing level of analyst forecast error, in terms of trade payables. This implies that, with a higher level of information asymmetry, the demand for a

more conservative policy is higher. We also address the endogeneity concern by adopting Two-Stage-Least-Square (2SLS) approaches and use CEO age as the instrumental variable, and we obtain robust results for trade payables.

Our study contributes to the existing literature in several ways. First, to our best knowledge, this is the first study on the relationship between CEO debt-like compensation and firms' trade credit policies. Previous studies focus on how CEO inside debt affects a manager's decisions on debt structure and debt-equity financing trade-offs (Anantharaman et al., 2014; Campbell et al., 2016; Dang and Phan, 2016; Brisker and Wang, 2017; Beavers, 2018). Less attention has been paid to the alternative financing source, this being trade credit. Trade credit also functions as an important financing source in operating activities and inventory purchases, and accounts for a significant proportion of firms' balance sheets (i.e. Petersen and Rajan, 1997; Niskanen and Niskanen, 2006; Fisman and Love, 2003; Yang and Birge, 2018). As the use of trade credit between suppliers and customers increases, our study provides empirical evidence on how CEO compensation structure can affect firms' short-term financing decisions.

Second, this study contributes to the literature on CEO inside debt and provides evidence that CEO inside debt plays an important role in shaping corporate financing policies and risk-taking behaviours, as it has an impact on CEO decision making. The existing literature proposes that CEO inside debt aligns the interests of management with those of debt holders by helping to mitigate the exploitation of debtholders' interests by shareholders (i.e., Jensen and Meckling, 1976; Edmans and Liu, 2011; Cassell et al., 2012; Shen and Zhang, 2020). Therefore, a higher level of CEO inside debt helps to promote more conservative operating strategies and activities. Our empirical results provide further evidence to support this view. Third, very few studies pay attention to the determinants of trade credit policies from the aspect of corporate governance. Many studies argue from the economic and business operating points of view. For example, Smith (1987) reveals the information transmission purpose of suppliers offering trade credit. Some existing literature focuses on market competition and the bargaining power of the supplier verses the customer (i.e., Fabbri and Klapper, 2016; Chod et al., 2019; Fontaine and Zhao, 2021). Others investigate the risk-sharing function of trade credit (Yang and Birge, 2018). We contribute to the literature by providing an alternative angle. We prove that firms perceive a higher level of trade credit as being risker, and that firms with more conservative operating strategies choose to adopt less trade credit, in terms of their trade payables. Firms with higher

levels of external monitoring and less information asymmetry have a lower demand for conservative policies and can therefore depend to a greater extent on trade credit.

Third, we contribute to the literature by providing empirical evidence that external monitoring forces moderate the effects of CEO inside debt on corporate trade credit policies. With stronger external monitoring power, proxied by institutional investor ownership and analyst forecast accuracy, we demonstrate a weaker effect of CEO inside debt on trade credit. Since the functioning roles of both an external monitoring force and CEO inside debt are to mitigate agency costs, we contribute to the literature on the agency problem by presenting concrete evidence of the substitutional roles of external monitoring forces and CEO inside debt.

The remainder of this paper is structured as follows. Section Two lays out the related literature and the generation of hypotheses. The data collection, the variable computation and the empirical methodology are described in Section Three. Section Four presents the empirical results from our baseline models, the evidence of the moderating effects of institutional investors and analysts forecast on the relationship between CEO inside debt and trade payables, robustness checks and other additional tests. Section Five makes a conclusion.

2.2 Literature Review and Hypothesis Development

2.2.1 Inside debt

Early studies of the agency costs of equity and debt suggest that executive equity-based compensations align the interests of equity holders and managers, hence, reducing the agency costs faced by equity holders. Jensen and Meckling (1976) state that both the equity holders and debtholders of a firm are faced with agency problems and bear agency costs. The authors define “inside debt ” as a debt-like compensation held by managers with similar characteristics to debt held by outside debtholders. Jensen and Meckling (1976) also point out that the most common types of inside debt are pensions and deferred compensations, suggesting that inside debts are obligations owed by firms to managers in terms of fixed claims on a firm’s assets.

The theories of agency cost proposed by Jensen and Meckling (1976) are also extended and supported by Myers (1977), Smith and Stulz (1985) and Smith and Watts (1992). A number of papers extend the earlier studies and provided empirical evidence that equity-based

compensations induce an increase in risk-taking decisions being made by executives. For example, CEO risk incentives are negatively related to the use of derivatives for hedging purposes by firms (Rogers, 2002), underinvestment due to an excessive risk-aversion of managers (Broussard et al., 2004), reduced precautionary cash holdings piles (Tong, 2010) and less investment in fixed assets (Coles et al., 2006). A greater amount of equity-based incentives also leads to more investment in research and development, the use of leverage and higher stock return volatility (Coles et al., 2006), more aggressive accounting policies in terms of earnings management (Bergstresser and Philippon, 2006), higher business risk (Gormley et al., 2012), larger default risk (Kuang and Qin, 2013) and more corporate innovations (Nguyen, 2018).

However, equity-based compensation without monitoring can induce overinvestment in risky projects, finally resulting in excessive risk and an increase in the cost of funding. Dow and Raposo (2005) argue that performance related compensations increase the adoption of overly ambitious strategies that are difficult to implement. The authors propose that the way that executive compensation change which embedded from stock- and option-based components in their package leads to over radical investment decisions that may go beyond what shareholders expect. Findings in previous studies also suggest that stock- and option-based compensation provided by a firm may lead to excessive risk. A higher proportion of stock and options in compensation packages and higher CEO vega is found to be positively associated with the cost of debt, indicated by wider yield spreads (Shaw, 2012). Shen and Zhang (2013) also reveal that a higher level of vega is related to increased research and development expenses. However, the abnormal returns following an increase in research and development investment are lower for higher vega firms, compared to lower vega firms, suggesting that equity-based compensation leads to overinvestment.

The risk promoting effects of equity-based compensation are also revealed in financial firms. Gande and Kalpathy (2017) provide evidence that financial firms with higher "vega" are more likely to issue emergency loans, as well as longer repayment periods. The authors point out that a higher level of "vega" is linked to an increase in the risk-taking activities of financial firms, thus, inducing higher solvency risk. By investigating banks' risk-taking activities in terms of acquisitions, Hagendorff and Vallascas (2011) show that pay-risk sensitivity from stock and embedded options in CEO compensation are positively associated with bank risk-taking.

Suggested by Edmans and Liu (2011), with inside debt, a type of compensation which resembles unfunded and unsecured debt, managers experience similar risks and consequences to outside debtholders. The inclusion of CEO inside debt helps to mitigate the asset substitution problem and provides a solution for shareholder-debtholder conflicts.

It is proposed by John and John (1993) that the agency link between shareholders and managers, as well as the agency relationship between debtholders and managers, should inspire the design of executive compensations. In a levered firm, the design of management compensations serves as a device for aligning the interests of managers and both equity holders and debtholders, hence, reducing the agency costs borne by equity and debt. The authors prove that debtholders recognize the risk-shifting behavior of shareholders and price into the return from debt. This hypothesis is supported by Jensen and Meckling (1976), who believe that a reduction in the incentive for management to reallocate wealth from debtors to equity holders would occur if the ratio of CEO leverage to company leverage were to increase.

Several studies suggest that inside debt shapes the risk-taking behaviours of management. By using a sample of CEOs from S&P 500 firms, Bebchuk and Jackson (2005) find that CEO pension compensations are employed heavily and the value of pension compensations are substantial. Sundaram and Yermack (2007) investigate the effect of CEO pension arrangements. The authors use hand collected data from 237 large capitalization firms and find that CEO compensation reflects a balance between equity and debt. As CEOs get older, the compensation structure gradually changes from equity-based incentives to debt-like incentives. The authors also find that an increase in debt incentives is associated with more conservative management by CEOs. They also reveal that pension compensation affects CEO turnover and patterns of CEO cash compensation. Wei and Yermack (2011) study the effects of the size of debt-like compensations on firm risk by using a sample of CEOs from U.S. firms. They find that a larger proportion of pension and deferred compensation is associated with higher bond prices, lower equity prices and a reduction in the volatilities of the bond and equity prices. The authors state that their findings indicate that a larger proportion of inside debt leads to a tendency for the value to shift from equity to debt, and leads to a reduction of overall firm risk.

Edmans and Liu (2011) propose a theoretical model to prove that inside debt is a more efficient compensation for reducing the agency costs of debt, compared to solvency-contingent bonuses

and salaries. The authors point out that firms rarely provide managers with purely equity-based compensation or equally weighted debt-equity based compensation. The payoffs of debt-like compensation depend on the incidence of bankruptcy, as well as the value of the firm faced with bankruptcy. The authors argue that equity-based compensation is known to be more useful for promoting effort. However, when there is a likelihood of bankruptcy, firms can increase the weight of debt-like compensation to increase the liquidation value and to reduce the agency costs of debt. Cassell et al. (2012) use a sample of companies, included in the S&P 1500 index, in order to explore the link that exists between CEO inside debt holdings and the risk of investment, and financial policies. The authors indicate that a greater share of CEO inside debt holdings is related to the reduced volatility of future stock returns, reduced R&D spending, a reduction in financial leverage, and an improved level of diversification and asset liquidity. The authors argue that their findings provide empirical evidence that CEO inside debt works as a device for aligning the interests of debtholders and managers, and that CEOs entitled to a higher proportion of inside debt prefer less risky investments and more conservative financial policies.

Anantharaman et al. (2014) expand the past research studies by examining three different forms of CEO debt-like compensations. These include rank-and-file (RAF) plans, supplementary executive retirement plans (SERPs), and other deferred remuneration (ODC). These three types of compensation differ in their seniority. RAF plans are funded and secured to some level, and ODC may be invested in equities and withdrawn flexibly prior to retirement. While SERPs are often unfunded and unsecured. The authors find that a higher level of debt-like compensation is associated with a lower promised yield and fewer loan covenants. However, this result is mainly driven by SERPs and not the two other types of debt-like compensation, and the fact that SERPs can also more closely resemble risky corporate debt. Therefore, the authors argue that lenders' views are affected, not only by the total amount of CEO debt-like compensation, but also by the seniority of the debt-like compensation. Colonnello et al. (2017) obtain similar results by proving that credit spreads decrease as inside debt increases only for unsecured debt. The authors also suggest that inside debt indirectly influences the relationship between equity ownership and credit spreads. When the level of CEO inside debt is modest, ownership of equity has a significant and negative effect on credit spreads, whereas when it is substantial, it has a positive impact.

Campbell et al. (2016) extend the prior studies of Edmans and Liu (2011) and Wei and Yermack (2011). Following the adoption of the new disclosure rules relating to CEO inside debt in 2006, they develop a model to estimate the ideal CEO relative incentive ratios, and find that businesses frequently adjust their CEO debt-to-equity incentive ratios towards the projected optimal CEO relative incentive ratios. The adjustments occur regardless of whether it is an increase or decrease to the debt-to-equity incentive ratio. The debt value increases when a firm increases their debt-to-equity incentive ratio, but does not decrease when the ratio falls. The authors justify their results by highlighting that they are consistent with those of Edmans and Liu (2011), who proposed that the ideal CEO leverage (debt-to-equity) ratio need not be equal to one. Campbell et al. (2016) also demonstrate that their findings indicate that shareholders bear the agency costs of both equity and debt.

Phan (2014) studies CEO inside debt and its effect on mergers and acquisitions (M&A). The author explains that, since M&A activities increase the default risk of the acquiring firms, it thus represents the discretionary risk-taking behaviours of the CEOs. The author examines the impact of CEO inside debt holdings on the corporate M&A activity of the acquiring companies in terms of the impact on shareholders, debtholders, and company value. The author finds that M&A tendencies are inversely linked to the relative debt-to-equity ratios of CEOs. With greater inside debt holdings, short-term abnormal returns on corporate bonds increase after an M&A announcement, whereas abnormal returns on equities decrease. There is a favourable linkage between higher levels of CEO inside debt and long-term operational success. These findings support the previous research studies and further prove that inside debt serves as a device for aligning the interests of managers and external debtholders and for curbing managers' risk-taking behaviours. Interestingly, the author reveals that, in the long run, firms tend to adjust the CEO compensation structure that resembles the firm's capital structure. The author explains that the reason for this finding is that short-term inside debt benefits debtholders at the expense of shareholders. However, in the long run, firms tend to prevent wealth from being transferred from shareholders to debtholders by adjusting the CEO compensation structure. In this paper, the author also finds that a greater level of inside debt is linked to lower financial leverage, a higher degree of diversification, a smaller proportion of cash payments being made to target firms, and a smaller increase in firm risks following a merger.

Liu et al. (2014) investigate how CEO inside debt holdings affect the amount of cash held by firms, as well as the value of the cash of firms. According to the findings of the authors, greater

CEO inside debt holdings are connected with higher levels of cash holdings and a fall in the marginal value of cash to shareholders. On the other hand, the effect of these impacts is magnified for businesses that operate with a greater degree of financial leverage and for firms with fewer financial distresses. The authors suggest that the findings are in agreement with the previous studies, indicating that inside debt motivates managerial incentives towards debtholders at the expense of shareholder wealth. Dang and Phan (2016) place an emphasis on the connection that exists between CEO inside debt and the maturity of the debt. They found that, for companies that do not face any financial distress, having more CEO inside debt motivates managers to take on cheaper debt with a shorter term. The authors state that inside debt reduces the cost of refinancing and facilitates firms' access to external debt financing.

Brisker and Wang (2017) investigate the effects of inside debt on financial leverage and the speed at which firms adjust their capital structure. The authors conclude that CEOs are prompted to take a more cautious approach to financial policy as a result of their company's inside debt levels. A higher level of internal debt is linked to lower leverage and a faster adjustment being made towards the level of leverage required by shareholders for over-levered companies. Increases in inside debt tend to impede the rate at which under-levered companies catch up to the degree of leverage required by their shareholders. Freund et al. (2018) find that inside debt helps to shape external financing decisions. The authors demonstrate that the presence of inside debt holdings raises the likelihood that a company will issue debt financing. Companies with greater amounts of inside debt tend to have a higher proportion of debt as a percentage of their overall external funding. The authors argue that inside debt facilitates more favorable debt contracting and reduces the cost of debt. The use of equity-based compensation, which aligns the interests of shareholders and managers, may lead to wealth extraction by shareholders. Debtholders bear this agency cost of debt and the requirement for insurance and compensation by providing unfavorable debt terms and higher interest rates. When debt-like compensation is included in a pay package, debtholders recognize it and offer more favorable debt terms and a lower cost of debt since they expect managers to consider their interests.

2.2.2 Trade credit

Trade credit is an important form of short-term financing. Prior studies reveal that firms rely heavily on trade credit, not only to support inventory purchases, but also to meet their unexpected financial needs (Haley and Higgins, 1973; Yang and Birge, 2018). Previous studies

show that a firm's decision to use and provide trade credit can be affected by its access to external debt financing and equity financing (Petersen and Rajan, 1997; Fisman and Love, 2003; Love et al., 2007; Shenoy and Williams, 2017; Abdulla et al., 2017; Shang, 2020). When a firm finds it more difficult to obtain external financing, firms tend to rely more on trade credit.

By using a sample of small firms, Petersen and Rajan (1997) perform empirical tests on the determinants of the use and provision of trade credit by firms. They imply that businesses who have difficulty obtaining funds from conventional sources, such as banks, turn to trade credit instead. Firms that have a competitive advantage in their ability to gather data on their clients, an improved ability to liquidate assets, or an implicit equity investment in their clients are more likely to provide trade credit to those buyers. Companies that are more able to easily access external financing are, likewise, more inclined to provide trade credit.

Fisman and Love (2003) use samples from 43 countries and prove that, in countries with weaker financial institutions, firms which have a higher dependence on trade credit exhibit faster growth. The authors suggest that in less developed financial markets, trade credit plays a role as a substitute of conventional external financing and firms benefit from the use of trade credit. By using a sample of 890 firms from six emerging markets, Love et al. (2007) study the effects of a financial crisis on the use and provision of trade credit. During a financial crisis, the firms which are more vulnerable to a financial crisis are less likely to offer trade credit to their customers. Authors claim that their research supports the "redistribution perspective" of trade credit, by showing that trade credit helps to redistribute credit from stronger firms to weaker firms.

Garcia-Appendini and Montoriol-Garriga (2013) investigate how the reduced provision of bank credit during a financial crisis affects the use and supply of trade credit by the firms. The authors find that firms with a higher level of liquidity before the financial crisis of 2007/08 started were likely to offer more trade receivables to their customers. During this financial crisis, stricter constraints led to an increase in the use of trade credit as a substitutional source of funding by businesses that had insufficient liquidity. The authors argue that suppliers provide liquidity insurance to their customers when access to bank loans are limited. Shenoy and Williams (2017) investigate how bank liquidity affects the supplier-customer relationship through the provision of trade credit. The authors adopt staggered changes to interstate bank branching laws as an exogenous shock to firms' access to bank loans. They find that firms with

better access to bank loans offer more trade credit to customers. The authors also find that, with more relaxed bank branching restrictions, supplier-customer relationships are more likely to extend.

Abdulla et al. (2017) examine how different trade credit types are adopted by public firms and private firms. The authors argue that, since public firms have better access to cheaper and less risky external sources of financing, they depend less on trade credit. The authors also suggest that both private and public firms adjust their trade credit towards optimal trade credit levels. Public firms adjust their level of trade credit faster than private firms. Shang (2020) examines how firms' stock liquidity affects the use and provision of trade credit. The author finds that, with higher stock liquidation, firms are more willing to offer trade credit to customers and to rely less on the use of trade credit. This relationship is more pronounced for firms with financial constraints, those dependent on external financing, and those restricted by short-term debt.

The literature studying the determinants of firms decisions on trade credit is abundant. Smith (1987) proposes a model which defines those suppliers that provide two-part credit to customers, since they can identify the prospective defaulting of customers more quickly than when only short-term bank credit is adopted. At the same time, suppliers also provide trade credit as a product quality guarantee for their customers and aim to build a long-term relationship with their customers. Long et al. (1993) focus on suppliers' decisions on the provision of trade credit. The authors argue that a major motive that encourages suppliers to offer trade credit are product quality guarantees. When there is an information asymmetry regarding product quality between suppliers and customers, trade credit works as a tool for distinguishing between high-quality products and low-quality products. Consistent with Long et al. (1993), Deloof and Jegers (1996) find similar results that support the product quality guarantee hypothesis by using samples of Belgian industrial firms and Belgian wholesale distribution firms. Ng et al. (1999) perform empirical tests by using a sample of interfirm credit terms and credit policies across industries and the authors document a rich variation. They examine the determinants of the credit policies and find results which support the theories of product quality guarantee and information asymmetry regarding customers' creditworthiness.

Wu et al. (2014) investigate how social trust influences the adoption of trade credit in China. The authors find that in regions with higher levels of social trust, the suppliers are willing to provide more favorable trade credit to their customers. They argue that private firms in China

depend more on trade credit compared with state-owned firms which can access bank credit more easily. Social trust can help to overcome the problems faced by private firms in their financing activities. While limited bank credit is available to them, they use more trade credit as an alternative source of finance. Fabbri and Klapper (2016) use Chinese firms as their sample and examine the relationship between supplier bargaining power and their provision of trade credit. According to the findings of the authors, suppliers that have less influential power in negotiations are more likely to provide trade credit with conditions that are beneficial to customers, such as longer credit terms, a larger proportion of products sold by credit and a higher possibility of the extension of credit sales. Customers are more likely to make payment once the repayment of the credit is overdue. When suppliers with weak bargaining power face financial constraints, they are less likely to provide trade credit. Kong et al. (2020) study how CEO hometown connections with suppliers help in shaping the trade credit policies in China. They argue that CEO hometown connections plays an important role in influencing the access to trade credit from suppliers. The authors argue that, since a closer hometown connection reduces the information asymmetry and establishes stronger social trust, suppliers are then more certain about customers' creditworthiness and are more willing to provide more favorable trade credit. They also find that firms with CEOs from places with a stronger merchant guild culture or those that hold important positions in the chamber of commerce are able to more easily to obtain trade credit.

2.2.3 Inside debt and trade credit

Studies on executive equity-based compensation have suggested that this type of risk incentive helps to encourage risk-averse managers to invest in value-added risky projects (i.e., Jensen and Meckling, 1976; Myers, 1977; Rogers, 2002; Broussard et al., 2004; Coles et al., 2006). However, certain studies also provide theoretical and empirical evidence that equity-based risk incentives lead to overinvestment in risky projects, resulting in high firm risks (i.e., Bergstresser and Philippon, 2006; Gormley et al., 2012; Kuang and Qin, 2013; Dow and Raposo, 2005) and induce a higher cost of debt (i.e., Shaw, 2012; Shen and Zhang, 2013). Edmans and Liu (2011) suggest that CEO inside debt is a debt-like compensation that aligns the interests of shareholders and debtholders, since it resembles the nature of unfunded and unsecured external corporate debt. Managers are concerned with their own interests in relation to debt-like compensation components in their pay package and this helps to protect debtholders from wealth extraction by shareholders. In this way, debtholders are willing to

provide debt with favorable terms and lower costs (Freund et al., 2018). At the same time, CEO inside debt also helps to curb excessive risk-taking activities being undertaken by managers, leading to a lower cost of equity and an improved performance (Shen and Zhang, 2020).

Trade credit serves as important informal financing source for funding a firm's operating and inventory purchases. It is a short-term alternative method of financing, particularly for those firms that find it more difficult to obtain other external funds (Ferris, 1981; Wilner, 2000; Niskanen and Niskanen, 2006; Yang and Birge, 2018; Shang, 2020). Previous studies reveal that the offer and use of trade credit depends on the ability of a firm to obtain external financing, including bank loans, corporate debts and the equity market (Petersen and Rajan, 1997; Fisman and Love, 2003; Love et al., 2007; Carbo-Valverde et al., 2016; Shenoy and Williams, 2017; Shang, 2020). From the demand-side point of view, firms with a higher level of financial distress would depend more on trade credit (Molina and Preve, 2012). From the supply-side point of view, Wang et al. (2018) suggest that the increase in the offer of trade credit results in a higher default risk of suppliers. Suppliers tend to reduce their offers of trade credit when they are faced with financial distress. Given that previous studies also reveal that CEO inside debt induces the risk-reducing behaviour of the firms, thus, leading to a lower cost of debt and equity. We propose that with a higher proportion of CEO inside debt, suppliers strengthen their financial status and improve their capacity to offer more trade credit. On the other hand, customers rely less on trade credit since they can access external financing with more favorable terms and lower costs. Based on above arguments, we derive the first hypotheses as being:

H1a: CEO inside debt holdings is positively associated with the provision of trade credit by the firms.
H1b: CEO inside debt holdings is negatively associated with the adoption of trade credit by the firms.

Institutional investors serve as an external monitoring device to mitigate agency problems. For example, institutional investors play an effective monitoring role for reducing the opportunistic behaviours of manager, such as hoarding bad news (An and Zhang, 2013; Callen and Fang, 2013), overinvesting in risky projects (An and Zhang, 2013; Esteban et al., 2014), and earnings management (Zhu et al., 2022). We anticipate a weaker impact of CEO inside debt holdings on corporate trade credit with larger institutional ownership, due to a lower level of pressure to

rein in excessive risk-taking in firms that are subject to a stronger external monitoring force. Second, some studies reveal that institutional investors inhibit the incentive for excessive levels of compensation to be paid to CEOs (Hartzell and Starks, 2003; Khan et al., 2005; Zhu et al., 2022). Institutional investors also help to mitigate the overinvestment problem and asset substitution.

Hartzell and Starks (2003) study how institutional ownership concentration affects the pay-to-performance sensitivity and the level of executive compensation. According to the authors' research, institutional ownership is linked to greater pay-to-performance sensitivity, but less compensation overall, suggesting that institutional investors play an important role in monitoring executive compensation and try to reduce the agency problem between managers and shareholders. Equity-based incentives, they argue, more effectively bring together the interests of managers and shareholders, hence, firms with a higher institutional investor concentration should present a higher tendency to use equity-based compensation. Institutional investors benefit from firms with a higher firm value and a lower cost of agency problems between shareholders and managers due to their impact on firms' compensation structure through the channel of pay-to-performance sensitivity.

Janakiraman et al. (2010) extend the study by Hartzell and Starks (2003) by examining how managerial ownership affects the relationship between the two. The authors find that the institutional ownership monitoring effect works more effectively when managerial power is lower. However, there are several ways in which institutional investors might affect the connection between CEO internal debt and trade credit. First, prior studies find that a higher level of incentive compensation is associated with a higher manager risk-taking incentive and higher firm risk (Coles et al., 2006). Equity-based compensation motivates managers to employ riskier policies, in order to increase firm value. Institutional investors have a tendency to promote managers to take risks, thus, increasing the value of assets under management. As the literature relating to inside debt suggests, inside debt helps to align the interests of creditors and managers due to the demand by creditors. Creditors adopt this device to mitigate the problem of exploitation by shareholders and to reduce the risk-taking behaviour of the firm. Due to the interests of institutional investors, there would be a reduced demand for the risk reduction mechanism provided by inside debt. Institutional investors prefer more aggressive risk policies and higher equity-based compensation than conservative policies and debt-like compensations. In other words, the effect of inside debt as a risk reduction device would be

reduced in firms with a higher institutional ownership concentration. Thus, we develop the following hypothesis:

H2: The negative association between CEO inside debt holdings and trade credit is less pronounced in firms with a higher level of institutional ownership.

Previous studies reveal that analysts work as an external monitoring device to reduce the agency problems caused by information asymmetry. With a higher level of analyst attention, firms are forced to disclose more detailed information and to improve the quality of the disclosures (Dhaliwal et al., 2012; Chen et al., 2015, 2017). When the number of analysts following a company drops, Chen et al. (2015) find that the CEO earns more in excess pay, management is more inclined to take advantage of earnings management, and investment in value-destroying acquisitions increases. Chung and Jo (1996) examine the effects of analysts' monitoring function and information intermediary function on the market value of firms. They provide concrete proof that analysts' oversight helps to reduce the agency costs induced by ownership and control being held by separate parties. Analysts also help to increase the breadth of investor cognizance due to their information intermediary function. Chen et al. (2017) also reveal that, through information intermediary and monitoring channels, the analyst forecast quality, measured by analyst forecast accuracy and dispersion, is positively (negatively) associated with a firm's investment when the firm under-invests (over-invests). The authors provide evidence of analysts' monitoring and information intermediary functions in relation to firm value and corporate governance. We argue that, through monitoring channels, if the firm exhibits stronger external monitoring, the agency costs associated with equity holders would be reduced but the agency costs associated with debtholders would increase, and CEOs with higher levels of inside debt are likely to be more conservative and to reduce trade debt further.

Shiah-Hou (2016) studies how analyst coverage affects CEO compensation structures and finds a significant positive relationship between analyst coverage and CEO total compensation. He argues that analysts influence firms' CEO compensation structures through their effect on the information environment. An analyst's actions convey information relating to an optimal compensation structure and, hence, this mitigates the costs of agency problems. Analyst followings can improve the firm's information environment and lead CEOs to make better decisions to improve firm performance and to increase firm value. Better firm performance leads to compensation contracts including more incentive compensation, hence, increasing a

firm's pay-to-performance sensitivity. We argue that analyst coverage and analyst forecast equity should promote CEOs to have a higher volume of risk-taking incentives and to include more equity-based compensation, rather than debt-like compensation. Therefore, with less information asymmetry, indicated by lower analyst forecast errors, there is less demand for conservative policies.

Using the analyst forecast error as the proxy to measure the effect of analyst forecast quality and the information asymmetry, we develop the following hypothesis:

H3: The negative association between CEO inside debt holdings and trade credit is more pronounced in firms with higher quality analyst forecasting.

2.3 Data and Methodology

2.3.1 CEO inside debt

When calculating the CEO inside debt, the present value of all accumulated pensions and deferred compensation is added together as is done at the fiscal year end. The CEO compensation data is obtained from the ExecuComp database. We use five computations as our measure of CEO inside debt: CEO leverage ratio; CEO relative leverage ratio; CEO relative leverage ratio>1; CEO relative incentive ratio; and, CEO relative incentive ratio>1. Following the prior research (Wei and Yermack, 2011; Cassell et al., 2012; Phan, 2014; Freund et al., 2018), we construct the CEO leverage ratio (debt-to-equity ratio) as the ratio of debt-like compensations held by a CEO to the equity-based compensation held by a CEO; the CEO relative leverage ratio is constructed as the ratio of a CEO's debt-to-equity ratio divided by the firm's debt-to-equity ratio. The CEO relative incentive ratio is constructed as the ratio of the marginal change in the value of CEO inside debt holdings to the marginal change in CEO inside equity holdings given the firm value, all scaled by the respective firm's ratio. We also include two dummy variables: the dummy variable that takes the value of 1 if the relative leverage is greater than 1, and otherwise 0; and the dummy variable that takes the value of 1 if the relative incentive is greater than 1, and otherwise 0.

Following Wei and Yermack (2011), Cassell et al. (2012), Phan (2014), and Freund et al., (2018), we include five measures of CEO inside debt: CEO leverage, computed as the ratio of

a CEO's inside debt scaled by CEO inside equity; CEO relative leverage; the dummy if CEO relative leverage is larger than 1, and otherwise 0; CEO relative incentive; and the dummy if CEO relative incentive is larger than 1, and otherwise 0. We calculate the CEO relative leverage as:

$$RelativeLeverage = (D_{CEO}/E_{CEO}) \div (D_{firm}/E_{firm}) \quad (1)$$

where D_{CEO} and E_{CEO} are CEO debt-like compensations and equity-based compensations, and D_{Firm} and E_{Firm} are the total corporate debt and equity claims against the company, including those held by the CEO.

We define the relative CEO incentive as:

$$RelativeIncentive = (\Delta D_{CEO}/\Delta E_{CEO}) \div (\Delta D_{firm}/\Delta E_{firm}) \quad (2)$$

A CEO's equity holdings consist of stocks and stock options, therefore, ΔE_{CEO} is computed as:

$$\Delta E_{CEO} = S + \sum_i N_i(\Delta N_i) \quad (3)$$

where *S* and *N* are the number of stocks and stock options held by a CEO. ΔN is the delta of stock options calculated in accordance with the Black-Scholes (1973) model. Since the CEO stock options are granted in tranches with different exercise prices and time to maturity, the total option delta is the sum of the option delta of all tranches.

To compute the total firm delta, ΔE_{Firm}, following Wei and Yermack (2011), we use the data of the total number of stock options held by an employee and the average exercise price of these options obtained in Compustat, and we assume that the average time-to-maturity is four years. We also assume that:

$$\Delta D_{CEO}/\Delta D_{Firm} \approx D_{CEO}/D_{Firm} \quad (4)$$

We therefore calculate the CEO relative incentive as:

$$RelativeIncentive = (D_{CEO}/D_{Firm}) \div (\Delta E_{CEO}/\Delta E_{Firm}) \quad (5)$$

Following Wei and Yermack (2011), Cassell et al. (2012), Phan (2014) and Freund et al. (2018), the estimation of the value of the stock options is based on the Black-Scholes (1973) model. The value of stock options can be obtained by:

$$Value\_Option = \left[Se^{-dT} N(Z) - Xe^{-rT} N(Z - \sigma T^{(1/2)}) \right] \quad (6)$$

where

$$Z = \left[In(\frac{S}{X}) + T(r - d + \frac{\sigma^2}{2}) \right] \Big/ \sigma T^{(1/2)} \quad (7)$$

where *N* refers to the cumulative probability function of a normal distribution; *S* is the price of the underlying stock; *X* is the exercise price of an option; σ is the expected stock-return volatility over the life of the option; *r* is the natural logarithm of a risk-free interest rate; *T* is the time-to-maturity of the option in years; and *d* is the natural logarithm of expected dividend yield over the life of the options. The ExecuComp database only reports the option granted and exercised. The following data for exercised options can be found in the ExecuComp database: stock price, exercise price of option, expected stock return volatility, risk-free rate, time-to-maturity and dividend yield.

However, we also need to compute the value for unexercised options. There is a two-step procedure that must be followed in order to receive the exercise price of the unexercised exercisable options. To begin, we determine the ratio between the realisable value of in-the-money exercisable options and the realisable value of unexercised exercisable options. Second, I take this ratio out of the price of the stock. The resultant value is an estimate of the average exercise price of unexercised exercisable options held by a CEO. We can obtain the average exercise price of unexercisable options by using similar two-step process. It is estimated that the maturity of unexercised exercisable options would be four years shorter than the average maturity of newly granted options. In the absence of any awards granted this year, the term is set at six years. The option term of unexercised unexercisable options is set at one year less

than the average maturity of newly granted options. In the event that no options are granted this year, the term is set as nine years.

Following Shang (2020), we use two measures of firm trade credit policies. The first measure is Receivables (*TR*), measuring the willingness by a firm to offer trade credit to customers, which is calculated as trade accounts receivable divided by the total assets. The second measure is Payables (*TP*), measuring the firm's willingness to rely on trade credit provided by its suppliers, which is calculated as accounts payable divided by the total assets.

2.3.2 Baseline regression models

We adopt panel regression models to examine the association between CEO inside debt and the firm's trade credit policies. We estimate the following models to examine the first hypothesis:

$$TradeCredit_{it+1} = \beta_0 + \beta_1 InsideDebt_{it} + \beta_2 Size_{it} + \beta_3 Age_{it} + \beta_4 Growth_{it} + \beta_5 PPE_{it} + \beta_6 ROA_{it} + \beta_7 MTB_{it} + \beta_8 EBIT_{it} + \beta_9 Cash_{it} + \beta_{10} CashFlow_{it} + \beta_{11} Leverage_{it} + \beta_{12} Capex_{it} + \beta_{13} CEOAge_{it} + \beta_{13} CEOTenure_{it} + \beta_{14} Industry_i + \beta_{15} Year_t + \varepsilon_{it} \quad (8)$$

where $TradeCredit_{it+1}$ represents the measures of trade credit; TR_{it+1} is the trade receivable days measured as a firm's accounts receivables scaled by the total assets; TP_{it+1} is the trade payable days measured as firm's accounts payables scaled by the total assets. $InsideDebt_{it}$ refers to the measures of inside debt: *CEOLeverage,* is a ratio of a CEO's debt to equity. *RelativeLeverage Ratio,* a CEO's leverage ratio, is the measure of CEO inside debt, computed as a ratio of a CEO's debt to equity to the firm's debt to equity ratio. *RelativeIncentive Ratio,* a CEO's incentive ratio, is another measure of CEO inside debt, computed as the ratio of the marginal change in the value of CEO inside debt holdings to the marginal change in CEO inside equity holdings, given the firm value, all scaled by the respective firm's ratio. We also include two indicator variables as measures of CEO inside debt. *RelativeLeverage Ratio>1* is the dummy variable that takes the value of 1 if the relative leverage is greater than 1, and otherwise 0. *RelativeIncentive Ratio>1 is* the dummy variable that takes the value of 1 if the relative

incentive is greater than 1, and otherwise 0. We include firm-level control variables to control for firm specific characteristics. We also include industry and year fixed effects.

2.3.3 Control variables

Edmans and Liu (2011) and Campbell et al. (2016) argue that the use of CEO inside debt is related to the risk-shifting incentive. By investing in projects that are considered to be high-risk, however not necessarily high-reward at the cost of debtholders, Jensen and Meckling's (1976) risk-shifting theory predicts that managers of financially struggling companies would try to maximise the limited liability option for shareholders. Equity-based compensation induces managers to only consider shareholders' interests, leaving less repayment to be made to debtholders. The CEO of a firm with higher leverage has an increased risk-shifting incentive. We include book leverage (*Leverage*), computed as the book value of the long-term debt divided by the book value of the total assets, as a control for the risk-shifting incentive effects. The authors also argue that high growth projects tend to give more consideration to solvency relative to insolvency. Therefore, a growth firm is expected to exhibit a lower relative incentive ratio. Based on this, we include the market-to-book ratio (*MTB*) and sales growth (*Sales Growth*) to control for firms' growth opportunities. We calculate the market-to-book ratio as market capitalization scaled by the book value of total assets. We compute sales growth as the difference between revenue in the current fiscal year and the previous fiscal year, divided by revenue from the previous year. Due to the alignment of interests between CEO and creditors through debt-like compensation, a CEO has a greater incentive to maintain asset value when bankruptcy occurs. Therefore, the authors suggest that one should control for the value of CEO effort in protecting asset value in liquidation. We adopt the ratio of net property, plant, and equipment (*PPE*) to book assets to control for these effects. Following Edmans and Liu (2011), Campbell et al. (2016), Phan (2014), we also control for firm size (*Size*), measured by the logarithm of net assets, because CEO percentage ownership falls as firm size increases. Campbell et al. (2016) argue that a CEO who extracts a greater volume of private benefits from a firm has a stronger incentive to maintain the solvency of the firm, thus, reducing the demand for inside debt.

Older managers have a shorter remaining time frame until they retire, therefore, they have fewer private benefits that they can extract from a firm (Sundaram and Yermack, 2007; Brisker

and Wang, 2017). Firms with older managers, thus, have a greater incentive to adopt inside debt to increase the manager's incentive to keep the firm solvent. On the other hand, CEOs with a longer future tenure have greater human capital and a greater incentive to keep a firm solvent, and, thus, require less inside debt. Sundaram and Yermack (2007) suggest that equity-based compensation provides firms with a way of paying without using cash, whereas pension compensation will, at some point, require cash. Firms with lower liquidity, measured by cash and cash flows, may have a reduced tendency to adopt debt-like compensation. Furthermore, firms faced with financial constraints and with lower liquidity are more likely to use trade payables as a financing source. In order to capture these effects, we include two liquidity measures, *Cash* and *CashFlows*. Following Anantharaman et al. (2014), we also control for other factors that may influence the intensity of shareholder-debtholder conflicts: profitability (measured by using *ROA* and *EBIT*), capital expenditure (*CAPEX*) and firm age (*FirmAge*). We compute firm age as the natural logarithm of the difference between the current fiscal year and the year in which the firm first appears in the Compustat database. We compute *ROA*, *EBIT* and *CAPEX* as the net income, the earnings before interests and taxes and the capital expenditures, scaled by total assets. To take into account the variations that come from heterogeneity in the nature of the product market structure, we additionally control for industry fixed effects based on the Fama-French 48-industry categorization (El Ghoul and Zheng, 2016). We also include year fixed effects in our models.

2.3.4 Sample and Data

We obtain the data of debt-like compensation for U.S. firms from the ExecuComp database for the period from 2006 to 2018. The accounting and stock price information is obtained from the Compustat and CRSP databases. After excluding firms with negative pensions and deferred compensations, we obtain 20,320 firm-year CEO inside debt observations. We then also exclude firm-year observations with missing control variables and we are left with 16,115 firm year observations in our dataset. We keep only firms with positive inside debt and eliminate firms with incomplete information for control variables. We finally obtain a sample containing 10,003 firm-year observations. Our sample contains 2,143 U.S. listed firms.

Table 2-1 reports the descriptive statistics. Panel A reports the full sample and panel B reports the trade credit subsample. The inside debt leverage ratio (CEO inside debt/equity) shows that

inside debt takes up a significant portion of the CEO's compensation as, for the full sample, the average leverage ratio is 0.334. For those CEOs who receive debt-like compensation, the average leverage ratio is 0.534. This finding is in line with Phan (2014), who also find a significant average CEO debt/equity ratio of 0.51 for the sample period ranging from 2006-2009. In addition, we also find that a significant number of companies issue CEOs with inside debt leverage, which is higher than the firms' leverage (represented by *Relative Leverage Ratio >1*) with the average *Relative Leverage Ratio >1* of 0.427 for the trade credit subsample. This is comparative to Phan (2014) who obtains 0.42 for their sample. For the five measures of CEO inside debt, our sample shows descriptive statistics that are similar to those obtained by Phan (2014), even though we use different sample periods.

[Insert Table 2-1 around here]

Table 2-2 presents the correlation of the coefficient matrix between our dependent variables (*TR* and *TP*), the independent variables (relative leverage and relative incentive) and other control variables. We notice that the coefficients between trade receivables and the two measures of CEO inside debt (relative leverage and relative incentive) are both significant at the 5% significance level and are positive: 0.049 and 0.050. This preliminary result indicates that there is a positive relationship between CEO inside debt and trade receivables. This result is in line with our prediction. We also notice a significant and negative correlation of the coefficients between trade payables and CEO inside debt measures, which also supports our prediction that CEO inside debt is negatively associated with trade payables. We notice that there is no significant correlation between our independent variables and control variables, implying that there should be no multicollinearity concerns in our models. We can then proceed to our regression estimation. To ensure that there is no such concern within our variables, we also perform variance inflation factor (VIF) tests, the results of which conclude that the average VIF is around 2, indicating no multicollinearity concerns.

[Insert Table 2-2 around here]

2.4 Empirical Results and Discussion

2.4.1 Inside debt and trade credit

The existing literature suggests that equity-based compensation helps to align the interests of managers and shareholders (i.e., Jensen and Meckling, 1976; Myers, 1977; Smith and Stulz, 1985; Smith and Watts, 1992). Debt-like compensation works with a similar mechanism, as it resembles the nature of external unfunded and unsecured corporate debt, thus, aligning the interests of managers and debtholders (Sundaram and Yermack, 2007; Phan, 2014; Brisker and Wang, 2017). This motivates managers to be more conservative and to reduce the risk-taking activities that increases a firm's default risk. Trade credit, suggested by a number of studies, can work as a source of financing when a firm is having difficulty in raising funds by other sources of financing (such as bank loans and corporate loans) (Yang and Birge, 2018; Garcia-Appendini and Montoriol-Garriga, 2013; Love et al., 2007). As with other methods of financing, increasing the amount of trade credit adopted (trade payables) will increase a firm's leverage ratio, resulting in a higher default risk. Therefore, we suggest that an increase in CEO inside debt is associated with a decrease in the use of trade credit in terms of trade payables. On the other hand, an increased provision of trade receivables to a firm's customers exposes a firm to the credit default risk of the customers, thus, increasing the firm's liquidity risk and default risk. Therefore, we expect that higher levels of inside debt are likely to reduce the provision of trade credit (trade receivables). Based upon this, we firstly regress the measures of trade credit, *TR* and *TP*, on the five measures of inside debt.

Table 2-3 and Table 2-4 report the results of regressing inside debt measures on the accounts receivables and payables, respectively. Table 2-3 shows that there is no significant relationship between trade receivables provided by the firm and CEO inside debt measures (columns (1) to (5)). The positive sign of the coefficients on the CEO inside debt measures suggests that there is a positive relationship between trade receivables and inside debt, which is in line with our prediction in Hypothesis 1.

Column 2 of Table 2-3 illustrates that, keeping other variables unchanged at their sample means, a one standard deviation point increase in CEO relative leverage causes a 0.407 percentage point (-0.357 * 11.404) decrease in the account payable ratio. Column 3 shows that firms with a *CEO relative leverage* ratio larger than 1, on average, have an accounts payable ratio that is 1.20 percentage points lower than firms with *CEO relative leverage* ratio smaller than 1, when other variables remain unchanged at their sample means. Column 4 reports that a one standard deviation point increase in the relative incentive ratio is, on average, associated with a 0.377 decrease in the trade payables, ceteris paribus. Column 5 reports that compared with firms with

relative incentive ratios smaller than 1, those with relative incentive ratios higher than 1 have a trade payables ratio that is 0.86 percentage points lower, ceteris paribus. Most of the control variables show significance and signs that are consistent with the previous studies. Our baseline regression of trade receivables (*TR*) shows that firm size (*Size*), firm tangibility (*PPE*), market-to-book ratio (*MTB*) and cash holdings (*Cash*) are significant and negatively related to trade receivables. The results are consistent with Shang (2020), except for free cash flow. However, it is interesting to find that there is a moderate significant negative relationship between free cash flows and trade receivables. We find a moderate significant positive relationship between trade receivables (*TR*) and firm age (*Age*), whereas Shang (2020) finds mixed results for the relationship between the two. We show that higher sales growth (*Growth*) and capital expenditure (*CAPEX*) are associated with higher trade receivables, which is also consistent with Shang (2020).

[Insert Table 2-3 around here]

Table 2-4 reports the regression results of trade payables adopted by the firm and CEO inside debt. Column 1 shows the coefficient estimates of *CEO Leverage* (CEO debt/CEO equity) and control variables. Column 2 reports the coefficient estimates of *Relative Leverage Ratio* (CEO leverage/firm leverage) and column 3 reports the coefficient estimates of *Relative Leverage >1*. Similarly, column 4 and column 5 report the coefficients for CEO relative incentive and *Relative Incentive >1*. The results show that, among all measures of inside debt, the coefficients for four measures (*Relative Leverage Ratio, Relative Leverage >1, Relative Incentive Ratio and Relative Incentive >1*) are statistically significant and negative. This is in line with our prediction that a higher level of inside debt is associated with less trade payables being used by the firm, proving that inside debt induces CEOs to be more conservative.

We find in Table 2-4 that trade payables (*TP*) is positively and significantly related to the firm size (*Size*) and capital expenditure (*CAPEX*). The results are consistent with Shang (2020). However, we find a significant positive association between return to assets (*ROA*) and trade payables. This finding is inconsistent with that which is revealed by Chen et al. (2017) and Shang (2020). A higher market-to-book ratio is associated with lower trade payables, which is in line with Chen et al. (2017). We also find a negative relationship between trade payables and free cash flow (*Cash Flows*), consistent with Shang (2020). We notice that firms with higher tangibility (*PPE*) and higher leverage (*Leverage*) are associated with lower trade

payables. Whereas Shang (2020) finds mixed results for firm tangibility and a positive relationship between leverage and trade payables. It is worth noting that CEO age (*CEO Age*) is negatively associated with *TP*, indicating that older CEOs are more conservative. However, CEO tenure (*CEO Tenure*) is positively related to *TP*, indicating that CEOs with a longer tenure are more confident and more likely to take risks.

[Insert Table 2-4 around here]

2.4.2 The effect of institutional investors

Previous studies on the relationship between institutional ownership concentration and CEO compensation structures provide theoretical and empirical evidence on the monitoring function of institutional investors for reducing the agency problems between shareholders and managers (Hartzell and Starks, 2003; Khan et al., 2005; Janakiraman et al., 2010b). Institutional ownership is positively associated with pay-to-performance sensitivity and negatively correlated with compensation levels, as found by Hartzell and Starks (2003). This indicates that institutional investors play a key role in monitoring executive compensation and attempting to mitigate the agency conflicts between shareholders and executives. Janakiraman et al. (2010) find that the institutional ownership monitoring effect is more effective when managerial power is lower. Khan et al. (2005) suggest that institutional ownership plays a monitoring role by reducing the level of CEO compensation and lowering the level and percentage of incentive compensation that is granted. The existing literature on inside debt suggests that inside debt helps to align the interests of creditors and managers due to the demand by creditors. Creditors adopt this device to mitigate the problem of exploitation by shareholders and to reduce the risk-taking activities of a firm. Due to the monitoring mechanism served by institutional investors, this being a substitution for inside debt, there would be a reduced demand for the risk reduction mechanism provided by inside debt. We measure institutional investor concentration by using blockholder ownership. Blockholders are institutional investors whose ownership exceeds 5% of firm's capital.

Tables 2-5 and 2-6 report the regression results when we add in the interaction term between inside debt measures and blockholder ownership. Table 2-5 shows the coefficient estimates for the regression of trade receivables on the five inside debt measures. The coefficients of five inside debt measures and the coefficients of the interaction terms are not statistically significant, revealling that there is no effect of inside debt on trade receivables provided by the firms to

their customers, and that there is no effect of institutional investor concentration on the relationship between the two.

[Insert Table 2-5 around here]

Table 2-6 reports the coefficient estimates of the regression of trade payables on the five inside debt measures. The results show that, except for CEO leverage, the coefficients of the four other measures (*relative CEO leverage, relative CEO leverage >1, CEO relative incentive and CEO relative incentive >1*) are shown to be significant and negative, consistent with our first hypothesis. The coefficients of the interaction terms for these four measures are also statistically significant and show positive signs, consistent with our hypothesis that institutional investor concentration acts as a monitoring device and is a substitution for CEO inside debt in reducing the firm risk. We notice that the coefficients of the interaction terms (1.677, 38.347, 1.822 and 32.879 for *relative CEO leverage ratio, relative CEO leverage >1 dummy, relative incentive ratio and relative incentive ratio>1 dummy*) are all greater than the coefficients of the CEO inside debt measures (-0.733, -20.728, -0.812 and -15.660 for *relative CEO leverage ratio, relative CEO leverage >1 dummy, relative incentive ratio and relative incentive ratio>1 dummy*) in columns 2 to 4. These results confirm that, even though CEO inside debt helps to align the interests of debt holders and managers (i.e., Edmans and Liu, 2011; Cassell et al., 2012; Anantharaman et al., 2014; Phan, 2014; Freund et al., 2018b, 2021), hence, reducing firm risks, institutional investors act as a stronger outside monitoring force for reducing firm risks when the two effects exist at the same time (i.e., Hartzell and Starks, 2003; Khan et al., 2005; An and Zhang, 2013; Callen and Fang, 2013; Zhu et al., 2022). The results show that institutional investors and CEO inside debt have a substitutional effect, which is in line with our Hypothesis 2.

[Insert Table 2-6 around here]

2.4.3 The effect of analyst forecast quality

A number of studies on analysts reveal that analysts act as an external monitoring device for enhancing firms' corporate governance and for reducing agency problems (Dhaliwal et al., 2012b; Chen et al., 2015, 2017b). Chen et al. (2017) reveal that through information intermediary and monitoring channels, analyst forecast quality, measured by analyst forecast accuracy and dispersion, affects firms' investment decisions. The authors provide evidence of the effects of analysts' monitoring and information intermediary functions on firm value and

corporate governance. We argue that through monitoring channels, if a firm exhibits weaker external monitoring, the agency costs associated with debtholders would increase due to the function of inside debt aligning the interests of debtholder and managers. CEOs with higher levels of inside debt are likely to be more conservative and to reduce the level of trade debt further. We use two proxies to measure the effect of analyst forecast quality: the analyst forecast error and dispersion.

Tables 2-7 and 2-8 report the regression results when we incorporate the interaction term between CEO inside debt measures and analyst forecast errors. Table 2-7 shows that there is no significant relationship between trade receivables and inside debt, however, the coefficients of the interaction terms in columns 1, 3 and 5 are statistically significant and negative at the 1% significance level. These results indicate that, in general, there is a moderating effect of analyst forecast accuracy on the relationship between CEO inside debt and trade receivables. The results imply that, with a higher level of information asymmetry (higher analyst forecast dispersion), the enhancing effect of CEO inside debt on trade receivables is less pronounced. The intuition behind this is that an unfavourable information environment hinders trust between suppliers and customers, leading to a reduction in the offers made of trade receivables.

Table 2-8 reports the coefficients of the regression of trade payables on inside debt measures and the interaction terms. The four inside debt measures, apart from CEO leverage, remain statistically significant and negative. The coefficients of the interaction terms show negative signs, indicating that, with lower analyst forecast quality, CEOs become more conservative as they align their interests with those of debtholders. However, only the coefficients of the interaction terms in columns 1, 3 and 5 (CEO leverage, Relative Leverage>1 and Relative Incentive>1) show significance at the 10% significance level. In general, the results indicate that there is no effect of analyst forecast quality on the relationship between inside debt and trade payables.

[Insert Tables 2-7 and 2-8 around here]

2.4.4 The channel of financial constraints

We investigate the channels through which CEO inside debt can affect the provision and adoption of trade credit. We argue that CEO inside debt leads to more conservative policies

within firms and reduces the overall firm risk. Previous studies provide empirical evidence that CEO inside debt is associated with reduced risks and a lower cost of capital. With a higher level of CEO inside debt, financial constraints are alleviated. Therefore, these firms can provide more trade credit to their customers and are less dependent on trade credit being provided by their suppliers. By computing two measures of financial constraint, coverage ratio and SA index, we investigate the channel effect of financial constraints using subsample tests. A lower coverage ratio and a higher SA Index indicate greater financial constraints. We divide the sample into the high financial constraint group and low financial constraint group by using the industrial median of coverage ratio and SA index. We then perform regressions of trade credit on CEO inside debt for each subsample.

Tables 2-9 and 2-10 presents the regression results. Table 2-9 presents the regression results when the sample has been split into high and low financial constraints, according to the industry-year median SA index. In panel A of Table 2-9, the results indicate that there is no significant difference between the two subsamples when trade receivables (TR) is a dependent variable, since no coefficient is significant. This result is consistent with the baseline model, showing that the positive relationship between trade receivables (TR) and CEO inside debt is insignificant. In panel B of the table, we notice that for four out of five measures of CEO inside debt, the coefficients are significantly negative for the higher financial constraints group. The magnitude of the coefficients are larger than those of the counterparty, indicating economic significance for the high financial constraints subsample. For CEO leverage ratio and CEO incentive ratio, the coefficients of the low financial constraints group are insignificant. The result shows that the negative association between CEO inside debt and trade payables are significantly different for the high and low financial constraints groups. CEO inside debt affects the adoption of trade credit through the channel of financial constraints.

In Table 2-10, we repeat the test by using high and low financial constraints subsamples, which are split according to the industry-year median coverage ratio. Again, in panel A, we find insignificant results for all five measures of CEO inside debt in the trade receivable regressions. In panel B, we show results that are consistent with those in Table 2-9. Four out of five coefficients are more negative and significant for the high financial constraints subsample. The test results confirm our prediction that CEO inside debt affects trade payables via the channel of financial constraints.

[Insert Table 2-9 and 2-10 around here]

To double confirm the financial constraints channel, we further test the moderating effect of short-term loans. Previous research studies reflect that firms faced with greater financial constraints adopt more trade payables from their suppliers as an alternative source of financing and have less capability to offer trade receivables to their customers (Love et al., 2007; Garcia-Appendini and Montoriol-Garriga, 2013; Abdulla et al., 2017). Firms with a higher adoption level of short-term debt are proved to face greater liquidity constraints, which increases their refinancing risk and limits their ability to invest (Duchin et al., 2010; Harford et al., 2014; Fu and Tang, 2016). We argue that, with a higher level of short-term debt usage, firms face higher financial and liquidity constraints and will be less able to provide trade credit to their customers. Additionally, the positive effect of CEO inside debt on trade receivables will be limited in firms with a higher level of short-term debt adoption. The reduction effect of CEO inside debt on trade payables would be more pronounced in firms with higher short-term debt, since CEO inside debt is more effective in firms with a higher level of financial constraints. We intend to investigate how short-term debt affects the relationship between CEO inside debt and trade credit. In this paper, we follow Shang (2020) and adopt three measures of short-term debt: the proportion of debt due within 1 year (*ST1*), 3 years (*ST3*), and 5 years (*ST5*). We add interaction terms of ST*CEO inside debt to our baseline models to test for the moderating effect of the short-term debt.

Table 2-11 and Table 2-12 report how the proportion of debt due within 1 year (*ST1*) affects the relationship between CEO inside debt and the provision of trade credit (*TR*), and between CEO inside debt the adoption of trade credit (*TP*). In Table 2-11, we notice that among the five the interaction terms, four are negative and significant at the 1% significance level (*Relative leverage ratio*ST1, Relative Leverage>1*ST1, Relative Incentive Ratio*ST1 and Relative Incentive >1*ST1*). The test results confirm our prediction, that the positive effect of inside debt on *TR* is less pronounced in firms with higher levels of short-term debt, since liquidity and financial constraints limit a firm's capability to offer trade credit. In Table 2-12, we also notice negative and significant coefficients of the four interaction terms (*Relative leverage ratio*ST1, Relative leverage>1*ST1, Relative incentive ratio*ST1 and Relative leverage >1*ST1*). The results are in line with our prediction, in that the reduction effect of CEO inside debt on trade payables is more pronounced in firms with a higher level of short-term debt, since the relief is more effective for firms with greater financial constraints.

[Insert Table 2-11 and Table 2-12 around here]

We further test the effect of short-term debt by using *ST3* and *ST5* as alternative measures, and the results are shown in Tables 2-13 to 2-16. We find consistent results for both *ST3* and *ST5* for *TR* and *TP*.

[Insert Table 2-13 to Table 2-16 around here]

2.5 Robustness Checks

2.5.1 Endogeneity concerns

The existing literature shows that CEO inside debt is a device which aligns the interests of debt holders and managers, hence, motivating managers to be more conservative in terms of their risk-taking activities. Firms with higher levels of CEO inside debt ratio are associated with a lower usage of trade credit. However, on the other hand, it may be possible that the firms issue debt-like compensation to managers for the purpose of reducing firm risks. As such, the issue of reverse causality may be raised. Although we include several control variables to capture firm financial risk, liquidity risk and default risk, the variables may be inadequate and insufficient. To solve these endogeneity problems, we further perform the Two-Stage least squares (2SLS) regression analysis. 2SLS has been recently adopted to address reverse causality concerns (i.e., Sundaram and Yermack, 2007; Phan, 2014; Dang and Phan, 2016; Shang, 2020). Since we use CEO inside debt measures as our independent variables and investigate how the changes in levels of CEO inside debt affect firms' usage of trade credit, we need to find instrumental variables (IV) which are correlated with CEO inside debt, but which are independent from trade credit. Following the prior studies (Sundaram and Yermack, 2007; Cassell et al., 2012; Anantharaman et al., 2014; Phan, 2014; Dang and Phan, 2016), we use CEO age, new CEO, firm size, firm age, market-to-book ratio, the dummy which indicates negative operating cash flows and industry-year median CEO inside debt as instruments for CEO inside debt. CEO pension should increase as CEO age, firm size, firm age and market-to-book ratio increase, resulting in higher levels of CEO inside debt holdings. CEO inside debt is lower for a new CEO and for a firm which generates negative operating cash flows. For the first stage, we regress CEO inside debt on a list of instrumental variables, while controlling for other variables, to prove that our instrumental variables are valid. We notice that the F-statistics

in the first stage results demonstrate the overall significance of the instrumental variables, indicating that our instrumental variables are relevant to CEO inside debt.

Table 2-17 represents the first and second stage test results of the 2SLS approach. Panel A reports the test results when the five measures of CEO inside debt are regressed on a set of instrumental variables. The results show that CEO age, New CEO, Negative CFO and industry-year median of CEO inside debt are related to the level of CEO inside debt, which is in line with our prediction and shows that a set of instrumental variables are valid IV for CEO inside debt. Panels B to D show the results of the second stage when the three trade credit measures are regressed on the predicted CEO inside debt measures. We notice that for trade payables, the test results continue to show a significant and negative association between CEO inside debt and trade payables. This indicates that our test results for trade payables are robust when the reverse causality is addressed by using the 2SLS approach. However, we do not find significant results for trade receivables. For all tests performed in this part, we include control variables and control for year and industry fixed effects. We adopt the robust standard errors that are clustered at the firm level.

[Insert Table 2-17 around here]

2.5.2 Propensity score matching and entropy balancing

Our main regression results might be driven by firm level characteristics. To be more precise, the association between CEO inside debt and trade credit could be influenced by specific firm characteristics. In this case, the coefficients of CEO inside debt revealed in the main regression models might not reflect the impact of CEO inside debt alone. In order to address the issue of confounding variables and to reduce the mutual selection bias caused by observed firm specific characteristics, we employ the approaches of propensity score matching (PSM) (Rosenbaum and Rubin, 1979) and entropy balancing (Hainmueller, 2012). We split the samples into treatment and control groups, assigned as being high and low CEO inside debt levels, by using the industry-year median of CEO relative leverage ratio and CEO relative incentive ratio. The high relative leverage ratio (High relative incentive ratio) subsample is allocated as the treatment group and the low relative leverage ratio (low relative incentive ratio) subsample is allocated as the control group. The propensity score is the probability of assignment to the treatment group (high CEO inside debt), based on observed covariates. PSM matches treated group (high inside debt) firms with control group (low inside debt) firms based on several firm

level characteristics, thus enabling the creation of a control sample of firms that have low levels of CEO inside debt, but are with similar firm level characteristics comparing to the sample of firms with high levels of CEO inside debt. For the PSM approach, the matching sample is constructed by using a nearest-neighbor one-to-one match with replacement, and has a caliper width of 0.05. The nearest-neighbor approach with replacement picks a single control firm according to the closest propensity score.

Table 2-18 reports the regression results using a PSM approach and entropy balancing approach. Columns (1) to (4) present the results when *TR* and *TP* are regressed on *High relative leverage ratio* and *High relative incentive ratio* by using the PSM approach. The coefficients for *TR* regressions are not significant and are significantly negative for *TP* regressions. The results confirm the significant negative association between trade payables and CEO inside debt. Columns (5) to (8) present the regression results when the tests are repeated using entropy balancing. To ensure that treatment and control samples have a similar distribution of firm-level features, entropy balancing is used to identify weights for the control sample. Previous studies have shown that entropy balancing may greatly enhance model specification by lowering coefficient bias in comparison to propensity-score matched models (Hainmueller, 2012; Mcmullin and Schonberger, 2020). The test results are consistent with our hypotheses and the results of our baseline models. The results obtained after controlling for observable confounding firm characteristics through the PSM approach and entropy balancing approach illustrate that the coefficients of independent variables and control variables remain robust.

[Insert Table 2-18 around here]

2.6 Conclusion

In this paper, we investigate the effect of CEO inside debt measures on firms' issuance and usage of trade credit. Following the previous studies on CEO inside debt (Sundaram and Yermack, 2007; Cassell et al., 2012; Phan, 2014; Dang and Phan, 2016), we use CEO leverage, relative CEO leverage ratio, a relative CEO leverage ratio>1 dummy, relative incentive ratio and a relative incentive ratio>1 dummy as our measures of CEO inside debt. Following Shang (2020), we adopt the accounts receivables ratio as our measure of firms' issuance of trade credit and the accounts payables ratio as our measure of firms' usage of trade credit. Prior studies provide evidence that CEO equity-based compensation helps to align the interests of equity

holders and managers, thus, motivating managers to make operating decisions which benefit equity holders. Jensen and Meckling (1976) suggest that both equity holders and debtholders in a firm are faced with the agency problem. A number of studies provide empirical evidence that CEO debt-like compensation (CEO inside debt) helps to align the interests of debtholders and managers, inducing them to make decisions which benefit debtholders and encourage them to be more conservative in terms of firm risk. On the other hand, the literature on firm trade credit provides evidence to show that firms, especially firms faced with financial constraints, adopt trade credit as a source of financing. Therefore, firms with a higher level of trade credit face a higher liquidity risk and default risk. We are motivated by the risk reduction channel of CEO inside debt and aim to investigate how CEO inside debt affects firms' issuance and usage of trade credit. Furthermore, as institutional investors and outside analysts are two conventional monitoring forces of agency costs to the firms, we further investigate how the effect of CEO inside debt on trade credit varies when there exists institutional investors and outside analysts.

We find in our empirical studies that firms' usage of trade credit (AP ratio) is negatively related to CEO inside debt measures, providing evidence that CEO inside debt induces managers to be more conservative. However, we find that CEO inside debt has no significant effect on the issuance of trade credit (AR ratio). We then add the interaction term of CEO inside debt and institutional investors to our panel regression model. We find significant positive coefficients for the interaction terms, implying a substitutional role of institutional investors for CEO inside debt. This proves that when there exists a strong effect of institutional investors on the trade credit, the effect of CEO inside debt is reduced. We then include the interaction term of CEO inside debt and analyst forecast error in our panel regression model, and find that, in general, there is no significant effect of analyst forecast quality on the relationship between CEO inside debt and trade credit.

This paper contributes to the current literature of CEO inside debt by providing further evidence of the risk reduction role of CEO inside debt. To our best knowledge, this is the first examination of the relationship between CEO debt-like compensation and firms' trade credit policies. This study contributes to the literature on CEO inside debt and supports the evidence obtained by past research studies that CEO inside debt plays an important role in shaping corporate financing policies and risk-taking behaviours.

This paper also contributes to the current literature on trade credit policies. Past literature focuses on how inside debt affects a manager's decisions in relation to debt structure and debt-equity financing trade-offs. Less attention has been paid to the alternative financing source of trade credit. As the use of trade credit between suppliers and customers increases, our study provides vital empirical evidence on how the CEO compensation structure can affect firms' short-term financing decisions. Very few studies pay attention to the corporate governance determinants of trade credit policies. Many studies argue from the viewpoint of economic factors and information asymmetry. We contribute to the literature by providing an alternative angle.

Table 2- 1: Descriptive Statistics

Variables	Count	Mean	Medium	Standard Deviation	Quartile	
					25%	75%
Panel A: Full sample						
CEO Leverage	20320	0.334	0.040	0.847	0	0.298
Relative Leverage Ratio	20320	2.065	0.111	8.541	0	0.978
Relative Leverage >1	20320	0.247	0	0.431	0	0
Relative Incentive Ratio	20320	1.639	0.090	6.786	0	0.760
Relative Incentive >1	20320	0.211	0	0.408	0	0
Panel B: Trade credit subsample						
TR	10003	0.130	0.109	0.111	0.053	0.171
TP	10003	0.084	0.059	0.090	0.031	0.101
CEO Leverage	10003	0.534	0.196	1.029	0.056	0.524
Relative Leverage Ratio	10003	3.729	0.728	11.404	0.194	2.225
Relative Leverage >1	10003	0.427	0.000	0.495	0.000	1.000
Relative Incentive Ratio	10003	2.968	0.559	9.100	0.159	1.706
Relative Incentive >1	10003	0.365	0.000	0.482	0.000	1.000
Size	10003	8.461	8.339	1.504	7.363	9.463
Firm Age	10003	3.315	3.497	0.708	2.890	3.970
Sales Growth	10003	0.021	0.046	0.218	-0.020	0.106
PPE	10003	0.297	0.215	0.246	0.101	0.457
ROA	10003	0.133	0.126	0.081	0.088	0.171
MTB	10003	1.741	1.465	0.933	1.171	1.991
EBIT	10003	0.093	0.088	0.086	0.055	0.129
Cash	10003	0.101	0.066	0.107	0.026	0.142
Cash Flows	10003	0.084	0.085	0.084	0.054	0.122
Leverage	10003	0.283	0.265	0.183	0.158	0.375
CAPEX	10003	0.048	0.035	0.048	0.018	0.062
CEO Age	10003	56.527	57.000	6.071	52.000	60.000
CEO Tenure	10003	7.231	6.000	6.192	3.000	10.000
Blockholder	8949	0.246	0.230	0.129	0.149	0.322
Analyst forecast error	6711	11.884	87.828	3.934	33.875	36.793
Analyst forecast dispersion	6761	1.244	9.538	0.594	2.931	3.709

This table presents descriptive statistics for measures of trade credit measures, CEO inside debt measures as well as control variables. The sample period ranges from 2006 to 2018. The first measure of trade credit is treade receivables (TR), calculated as trade accounts receivable divided by the book value of total assets. The second measure of trade credit, trade payables (TP), is calculated as accounts payable divided by the book value of total assets. See Appendix A for other variable definitions.

Table 2- 2: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) TR	1														
(2) TP	**0.483**	1													
(3) CEO Leverage	**0.049**	**-0.020**	1												
(4) Relative Incentive	**0.050**	**-0.019**	**0.987**	1											
(5) Size	**-0.101**	**0.057**	**-0.151**	**-0.162**	1										
(6) Firm Age	**-0.041**	**-0.020**	**-0.039**	**-0.048**	**0.205**	1									
(7) Sale Growth	**0.067**	**0.025**	-0.019	-0.017	0.010	**-0.067**	1								
(8) PPE	**-0.432**	**-0.216**	**-0.090**	**-0.086**	**0.058**	**0.130**	**-0.079**	1							
(9) MTB	-0.005	**-0.045**	**0.130**	**0.131**	**-0.095**	**-0.067**	**0.119**	**-0.153**	1						
(10) EBIT	**0.061**	-0.001	**0.080**	**0.078**	**-0.044**	**-0.045**	**0.271**	**-0.160**	**0.558**	1					
(11) Cash	**0.045**	**0.054**	**0.217**	**0.218**	**-0.111**	**-0.107**	**-0.032**	**-0.348**	**0.249**	**0.119**	1				
(12) Leverage	**-0.135**	**-0.174**	**-0.285**	**-0.287**	**0.092**	**-0.047**	**-0.038**	**0.187**	**0.044**	**-0.061**	**-0.218**	1			
(13) CAPEX	**-0.257**	**-0.120**	**-0.048**	**-0.044**	-0.016	**0.036**	0.001	**0.693**	-0.001	**-0.067**	**-0.212**	**0.055**	1		
(14) CEO Age	**-0.023**	-0.015	**0.055**	**0.058**	**0.078**	**0.098**	0.010	0.014	-0.000	0.012	0.004	**-0.030**	0.017	1	
(15) CEO Tenure	**0.031**	**0.022**	**0.035**	**0.037**	**-0.070**	0.005	**0.044**	**-0.042**	**0.043**	0.005	**0.041**	**-0.031**	0.011	**0.441**	1

A correlation in bold indicates the statistical significance at 5% level or above. All correlation coefficients are estimated at firm level. The definitions of all variables are given in Appendix A

Table 2- 3: The impact of CEO inside debt measures on trade receivables

	(1) TR t-stat.	(2) TR t-stat.	(3) TR t-stat.	(4) TR t-stat.	(5) TR t-stat.
CEO leverage	2.390				
	(1.603)				
Relative Leverage Ratio		0.135			
		(0.675)			
Relative Leverage>1			0.436		
			(0.103)		
Relative Incentive Ratio				0.205	
				(0.830)	
Relative Incentive Ratio >1					3.290
					(0.771)
Size	-7.469***	-7.351***	-7.459***	-7.310***	-7.407***
	(-2.932)	(-2.859)	(-2.931)	(-2.836)	(-2.909)
Firm Age	7.669*	7.794*	7.699*	7.829*	7.590*
	(1.884)	(1.908)	(1.887)	(1.914)	(1.862)
Sale Growth	8.171*	7.855	7.643	7.882	7.831
	(1.713)	(1.641)	(1.593)	(1.645)	(1.635)
PPE	-199.929***	-198.906***	-198.838***	-198.960***	-199.236***
	(-14.092)	(-14.023)	(-14.028)	(-14.023)	(-14.030)
ROA	36.982	40.400	41.233	40.182	40.131
	(0.605)	(0.656)	(0.665)	(0.654)	(0.651)
MTB	-6.628**	-6.880**	-6.711**	-6.922**	-6.932**
	(-2.328)	(-2.396)	(-2.316)	(-2.407)	(-2.395)
EBIT	61.426	58.420	57.896	58.498	58.081
	(1.216)	(1.145)	(1.126)	(1.150)	(1.143)
Cash	-114.045***	-116.012***	-114.103***	-116.420***	-114.167***
	(-4.744)	(-4.799)	(-4.745)	(-4.822)	(-4.752)
Cash Flows	-27.020	-31.192*	-32.004*	-30.905*	-31.641*
	(-1.512)	(-1.740)	(-1.788)	(-1.721)	(-1.769)
Leverage	-29.274	-26.658	-28.640	-26.110	-26.052
	(-1.429)	(-1.243)	(-1.351)	(-1.215)	(-1.220)
CAPEX	177.322***	173.114***	172.155***	173.366***	174.371***
	(3.697)	(3.606)	(3.555)	(3.610)	(3.607)
CEO Age	-0.201	-0.164	-0.152	-0.168	-0.182
	(-0.451)	(-0.372)	(-0.340)	(-0.382)	(-0.407)
CEO Tenure	-0.016	-0.043	-0.044	-0.042	-0.033
	-7.469***	-7.351***	-7.459***	-7.310***	-7.407***
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
Constant	209.741***	206.643***	207.035***	206.425***	207.909***
	(5.422)	(5.381)	(5.362)	(5.372)	(5.406)
R^2	0.280	0.280	0.280	0.280	0.280
Obs.	10,003	10,003	10,003	10,003	10,003

This table presents regression results of trade receivables on CEO inside debt measures. The sample period ranges from 2006 to 2018. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A

Table 2- 4: The impact of CEO inside debt measures on trade payables

	(1) TP	(2) TP	(3) TP	(4) TP	(5) TP
CEO leverage	0.237				
	(0.190)				
Relative Leverage Ratio		-0.357***			
		(-3.003)			
Relative Leverage >1			-11.959***		
			(-3.201)		
Relative Incentive Ratio				-0.414***	
				(-2.842)	
Relative Incentive >1					-8.596**
					(-2.364)
Size	6.120***	5.835***	6.094***	5.820***	5.985***
	(3.117)	(3.001)	(3.128)	(2.991)	(3.081)
Firm Age	1.074	0.892	1.762	0.868	1.429
	(0.325)	(0.270)	(0.536)	(0.263)	(0.434)
Sale Growth	0.549	-0.152	-0.400	-0.053	-0.083
	(0.070)	(-0.020)	(-0.051)	(-0.007)	(-0.011)
PPE	-43.838***	-43.352***	-41.746***	-43.331***	-42.495***
	(-4.177)	(-4.133)	(-3.989)	(-4.130)	(-4.052)
MTB	-5.458***	-4.915**	-4.427**	-4.960**	-4.788**
	(-2.638)	(-2.393)	(-2.089)	(-2.411)	(-2.276)
EBIT	-35.487	-37.286	-36.466	-37.100	-36.383
	(-1.579)	(-1.596)	(-1.494)	(-1.590)	(-1.533)
Cash	12.445	17.456	12.120	17.089	12.576
	(0.520)	(0.721)	(0.509)	(0.705)	(0.527)
Leverage	-57.372***	-63.658***	-68.406***	-63.267***	-65.163***
	(-4.845)	(-5.026)	(-5.276)	(-4.987)	(-5.032)
CAPEX	135.417***	131.052***	121.705***	131.447***	127.814***
	(4.563)	(4.457)	(4.111)	(4.466)	(4.320)
CEO Age	-0.662*	-0.612	-0.533	-0.614	-0.566
	(-1.700)	(-1.602)	(-1.375)	(-1.605)	(-1.452)
CEO Tenure	0.454	0.440	0.385	0.441	0.415
	(1.088)	(1.058)	(0.927)	(1.060)	(0.995)
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
Constant	81.832**	82.045***	75.977**	82.366***	78.731**
	(2.566)	(2.596)	(2.398)	(2.607)	(2.485)
R^2	0.215	0.217	0.218	0.216	0.217
Obs.	10,003	10,003	10,003	10,003	10,003

This table presents regression results of trade payables on CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A

Table 2- 5: Effect of blockholder ownership on the relationship between trade receivables and CEO inside debt measures

	(1) TR t-stat.	(2) TR t-stat.	(3) TR t-stat.	(4) TR t-stat.	(5) TR t-stat.
CEO leverage	4.748				
	(1.578)				
CEO leverage* Blockholder ownership	-11.028				
	(-1.180)				
Relative Leverage Ratio		-0.102			
		(-0.271)			
Relative Leverage Ratio* Blockholder ownership		1.157			
		(1.254)			
Relative Leverage>1			-10.428		
			(-1.281)		
Relative Leverage>1* Blockholder ownership			44.140		
			(1.546)		
Relative Incentive Ratio				-0.065	
				(-0.140)	
Relative Incentive Ratio* Blockholder ownership				1.381	
				(1.164)	
Relative Incentive Ratio >1					-6.475
					(-0.807)
Relative Incentive Ratio >1* Blockholder ownership					39.814
					(1.396)
Blockholder ownership	8.504	-1.474	-14.067	-1.127	-10.095
	(0.415)	(-0.076)	(-0.561)	(-0.059)	(-0.426)
Constant	217.331***	216.924***	219.785***	216.797***	220.215***
	(5.021)	(5.060)	(5.093)	(5.055)	(5.127)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
R^2	0.284	0.284	0.284	0.284	0.284
Obs.	8,949	8,949	8,949	8,949	8,949

This table presents regression results of moderating effect of blockholder ownership on relationship between trade receivables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Table 2- 6: Effect of blockholder ownership on the relationship between trade payables and CEO inside debt measures

	(1) TP t-stat.	(2) TP t-stat.	(3) TP t-stat.	(4) TP t-stat.	(5) TP t-stat.
CEO leverage	0.242				
	(0.100)				
CEO leverage* Blockholder ownership	2.154				
	(0.332)				
Relative Leverage Ratio		-0.733***			
		(-3.432)			
Relative Leverage Ratio* Blockholder ownership		1.677***			
		(2.821)			
Relative Leverage>1			-20.728***		
			(-3.072)		
Relative Leverage>1* Blockholder ownership			38.347*		
			(1.929)		
Relative Incentive Ratio				-0.812***	
				(-3.101)	
Relative Incentive Ratio* Blockholder ownership				1.822**	
				(2.430)	
Relative Incentive Ratio >1					-15.660**
					(-2.461)
Relative Incentive Ratio >1* Blockholder ownership					32.879*
					(1.675)
Blockholder ownership	-12.778	-17.935	-26.643	-16.962	-22.856
	(-0.837)	(-1.253)	(-1.582)	(-1.184)	(-1.424)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
Constant	0.105**	0.104**	0.101**	0.104**	0.103**
	(3.010)	(3.024)	(2.919)	(3.029)	(2.987)
R^2	0.223	0.225	0.227	0.225	0.225
Obs.	8,949	8,949	8,949	8,949	8,949

This table presents regression results of moderating effect of blockholder ownership on relationship between trade payables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Table 2- 7: Effect of analyst forecast error on the relationship between trade receivables and CEO inside debt measures

	(1) TR t-stat.	(2) TR t-stat.	(3) TR t-stat.	(4) TR t-stat.	(5) TR t-stat.
CEO leverage	0.609				
	(0.254)				
CEO leverage* Analyst forecast error	-0.144***				
	(-4.683)				
Relative Leverage Ratio		0.145			
		(0.480)			
Relative Leverage Ratio* Analyst forecast error		-0.081			
		(-0.353)			
Relative Leverage>1			-6.246		
			(-1.092)		
Relative Leverage>1* Analyst forecast error			-1.392***		
			(-2.681)		
Relative Incentive Ratio				0.221	
				(0.580)	
Relative Incentive Ratio* Analyst forecast error				-0.138	
				(-0.522)	
Relative Incentive Ratio >1					-3.033
					(-0.534)
Relative Incentive Ratio >1* Analyst forecast error					-1.403***
					(-2.683)
Analyst forecast error	1.039***	0.116	1.398***	0.193	1.409***
	(4.708)	(0.373)	(2.693)	(0.539)	(2.695)
Constant	234.214***	235.125***	228.323***	235.168***	231.143***
	(5.088)	(5.203)	(4.936)	(5.205)	(5.001)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
R^2	0.265	0.265	0.265	0.265	0.265
Obs.	6,711	6,711	6,711	6,711	6,711

This table presents regression results of moderating effect of analyst forecast error on relationship between trade receivables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Table 2- 8: Effect of analyst forecast error on the relationship between trade payables and CEO inside debt measures

	(1) TP t-stat.	(2) TP t-stat.	(3) TP t-stat.	(4) TP t-stat.	(5) TP t-stat.
CEO leverage	-2.116				
	(-1.198)				
CEO leverage* Analyst forecast error	-0.058**				
	(-2.494)				
Relative Leverage Ratio		-0.392**			
		(-2.351)			
Relative Leverage Ratio* Analyst forecast error		-0.097			
		(-1.238)			
Relative Leverage>1			-14.525***		
			(-2.955)		
Relative Leverage>1* Analyst forecast error			-0.450*		
			(-1.898)		
Relative Incentive Ratio				-0.483**	
				(-2.321)	
Relative Incentive Ratio* Analyst forecast error				-0.118	
				(-1.371)	
Relative Incentive Ratio >1					-9.937**
					(-2.105)
Relative Incentive Ratio >1* Analyst forecast error					-0.467*
					(-1.931)
Analyst forecast error	0.420**	0.134	0.452*	0.162	0.469*
	(2.508)	(1.259)	(1.909)	(1.390)	(1.941)
Constant	68.257*	69.273**	59.431*	69.461**	63.870*
	(1.948)	(2.021)	(1.702)	(2.027)	(1.822)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
R^2	0.214	0.216	0.219	0.216	0.216
Obs.	6,761	6,761	6,761	6,761	6,761

This table presents regression results of moderating effect of analyst forecast error on relationship between trade payables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Table 2- 9: Subsample test for channels (SA index)

Panel A	Dependent variable: Trade Receivables									
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
	SA	**SA**	**SA**	**SA**	**SA**	**SA**	**SA**	**SA**	**SA**	**SA**
	High	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**
CEO leverage	1.832	2.218								
	(0.918)	(1.108)								
Relative Leverage Ratio			0.060	0.475						
			(0.310)	(1.162)						
Relative Leverage>1					1.145	-0.721				
					(0.182)	(-0.137)				
Relative Incentive Ratio							0.103	0.653		
							(0.426)	(1.284)		
Relative Incentive Ratio >1									4.783	1.816
									(0.764)	(0.342)
Constant	227.260***	188.483***	225.163***	185.790***	225.452***	185.387***	225.120***	185.561***	226.373***	186.422***
	(4.633)	(3.376)	(4.649)	(3.372)	(4.612)	(3.312)	(4.646)	(3.370)	(4.644)	(3.344)
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.262	0.347	0.261	0.347	0.261	0.346	0.261	0.348	0.262	0.346
Obs.	5004	4999	5004	4999	5004	4999	5004	4999	5004	4999

Panel B	**Dependent variable: Trade Payables**									
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
	SA	**SA**	**SA**	**SA**	**SA**	**SA**	**SA**	**SA**	**SA**	**SA**
	High	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**
CEO leverage	-0.635	0.458								
	(-0.349)	(0.278)								
Relative Leverage Ratio			-0.478***	-0.043						
			(-3.497)	(-0.199)						
Relative Leverage>1					-13.285**	-10.321**				
					(-2.570)	(-2.173)				
Relative Incentive Ratio							-0.562***	-0.028		
							(-3.318)	(-0.104)		
Relative Incentive Ratio >1									-10.433**	-6.596
									(-2.064)	(-1.421)
Constant	41.984	64.624	41.810	64.071	38.024	58.172	42.342	64.080	39.854	61.809
	(1.278)	(1.192)	(1.306)	(1.196)	(1.174)	(1.072)	(1.322)	(1.197)	(1.230)	(1.144)
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R2	0.200	0.262	0.204	0.262	0.204	0.265	0.204	0.262	0.202	0.263
Obs.	5004	4999	5004	4999	5004	4999	5004	4999	5004	4999

This table presents regression results of subsample tests for financial constraints. The sample is divided into high and low financial constraints by industrial median SA index. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Table 2- 10: Subsample test for channels (Coverage ratio)

Panel A	Dependent variable: Trade Receivables									
	(1) Coverage Low	**(2) Coverage High**	**(3) Coverage Low**	**(4) Coverage High**	**(5) Coverage Low**	**(6) Coverage High**	**(7) Coverage Low**	**(8) Coverage High**	**(9) Coverage Low**	**(10) Coverage High**
CEO leverage	2.869	2.176								
	(1.123)	(1.433)								
Relative Leverage Ratio			-0.106	0.161						
			(-0.494)	(0.690)						
Relative Leverage>1					-0.373	0.925				
					(-0.067)	(0.199)				
Relative Incentive Ratio							-0.112	0.308		
							(-0.425)	(1.021)		
Relative Incentive Ratio >1									1.826	3.636
									(0.335)	(0.770)
Constant	221.694***	215.718***	219.922***	211.959***	219.411***	212.599***	219.983***	211.775***	219.944***	213.314***
	(4.826)	(4.235)	(4.790)	(4.203)	(4.776)	(4.168)	(4.781)	(4.198)	(4.803)	(4.205)
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.300	0.323	0.300	0.322	0.300	0.322	0.300	0.322	0.300	0.322
Obs.	5106	4897	5106	4897	5106	4897	5106	4897	5106	4897

Panel B	Dependent variable: Trade Payables									
	(1) Coverage Low	**(2) Coverage High**	**(3) Coverage Low**	**(4) Coverage High**	**(5) Coverage Low**	**(6) Coverage High**	**(7) Coverage Low**	**(8) Coverage High**	**(9) Coverage Low**	**(10) Coverage High**
CEO leverage	-0.579	0.743								
	(-0.245)	(0.641)								
Relative Leverage Ratio			-0.401***	-0.229						
			(-2.906)	(-1.186)						
Relative Leverage>1					-12.659**	-10.792***				
					(-2.458)	(-2.888)				
Relative Incentive Ratio							-0.475***	-0.241		
							(-2.832)	(-0.923)		
Relative Incentive Ratio >1									-9.480*	-6.877*
									(-1.890)	(-1.878)
Constant	79.669**	101.619***	81.589***	100.552***	76.039**	94.326***	82.033***	100.617***	77.959**	98.046***
	(2.459)	(3.041)	(2.585)	(3.072)	(2.359)	(2.851)	(2.598)	(3.075)	(2.423)	(2.976)
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.219	0.233	0.222	0.233	0.223	0.236	0.222	0.233	0.221	0.234
Obs.	5106	4897	5106	4897	5106	4897	5106	4897	5106	4897

This table presents regression results of subsample tests for financial constraints. The sample is divided into high and low financial constraints by industrial median coverage ratio. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Table 2- 11: Effect of short-term debt (ST1) on relationship between CEO inside debt and trade receivables

	(1) TR t-stat.	(2) TR t-stat.	(3) TR t-stat.	(4) TR t-stat.	(5) TR t-stat.
CEO leverage	1.760				
	(1.316)				
CEO leverage* ST1	3.876				
	(0.544)				
Relative Leverage Ratio		0.471			
		(1.545)			
Relative Leverage Ratio* ST1		-1.451***			
		(-3.900)			
Relative Leverage>1			7.451*		
			(1.721)		
Relative Leverage>1* ST1			-64.634***		
			(-3.023)		
Relative Incentive Ratio				0.629*	
				(1.691)	
Relative Incentive Ratio* ST1				-1.877***	
				(-4.062)	
Relative Incentive Ratio >1					10.299**
					(2.343)
Relative Incentive Ratio >1* ST1					-64.300***
					(-3.035)
ST1	57.683***	73.192***	96.413***	73.535***	92.756***
	(4.298)	(5.151)	(4.967)	(5.165)	(5.103)
Constant	217.331***	216.924***	219.785***	216.797***	220.215***
	(5.021)	(5.060)	(5.093)	(5.055)	(5.127)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
R^2	0.291	0.294	0.294	0.294	0.294
Obs.	9,868	9,868	9,868	9,868	9,868

This table presents regression results of moderating effect of short-term loan on relationship between trade receivables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A

Table 2- 12: Effect of short-term debt (ST1) on relationship between CEO inside debt and trade payables

	(1) TP t-stat.	(2) TP t-stat.	(3) TP t-stat.	(4) TP t-stat.	(5) TP t-stat.
CEO leverage	1.586				
	(1.013)				
CEO leverage* ST1	-2.996				
	(-0.758)				
Relative Leverage Ratio		-0.090			
		(-0.499)			
Relative Leverage Ratio* ST1		-0.531**			
		(-2.384)			
Relative Leverage>1			-5.826		
			(-1.275)		
Relative Leverage>1* ST1			-20.603**		
			(-2.098)		
Relative Incentive Ratio				-0.085	
				(-0.388)	
Relative Incentive Ratio* ST1				-0.662**	
				(-2.417)	
Relative Incentive Ratio >1					-2.063
					(-0.450)
Relative Incentive Ratio >1* ST1					-21.970**
					(-2.279)
ST1	15.372**	18.528**	24.390**	18.479**	23.958**
	(2.025)	(2.394)	(2.438)	(2.385)	(2.526)
Constant	78.002**	76.981**	69.663**	77.325**	72.834**
	(2.399)	(2.377)	(2.140)	(2.390)	(2.238)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
R^2	0.215	0.218	0.220	0.218	0.218
Obs.	9,868	9,868	9,868	9,868	9,868

This table presents regression results of moderating effect of short-term loan on relationship between trade payables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A

Table 2- 13: Effect of short-term debt (ST3) on relationship between CEO inside debt and trade receivables

	(1) TR t-stat.	(2) TR t-stat.	(3) TR t-stat.	(4) TR t-stat.	(5) TR t-stat.
CEO leverage	3.134**				
	(2.106)				
CEO leverage* ST3	-1.926				
	(-0.368)				
Relative Leverage Ratio		0.855***			
		(2.640)			
Relative Leverage Ratio* ST3		-1.494***			
		(-4.632)			
Relative Leverage>1			14.210***		
			(2.839)		
Relative Leverage>1* ST3			-46.907***		
			(-3.238)		
Relative Incentive Ratio				1.118***	
				(2.821)	
Relative Incentive Ratio* ST3				-1.920***	
				(-4.805)	
Relative Incentive Ratio >1					16.760***
					(3.289)
Relative Incentive Ratio >1* ST3					-46.584***
					(-3.276)
ST3	48.202***	55.237***	69.565***	55.465***	66.950***
	(4.410)	(5.018)	(4.648)	(5.038)	(4.731)
Constant	189.779***	185.821***	182.531***	185.677***	184.721***
	(4.756)	(4.696)	(4.537)	(4.689)	(4.613)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
R^2	0.294	0.296	0.297	0.296	0.297
Obs.	9,868	9,868	9,868	9,868	9,868

This table presents regression results of moderating effect of short-term loan on relationship between trade receivables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A

Table 2- 14: Effect of short-term debt (ST3) on relationship between CEO inside debt and trade payables

	(1) TP t-stat.	(2) TP t-stat.	(3) TP t-stat.	(4) TP t-stat.	(5) TP t-stat.
CEO leverage	1.586				
	(1.013)				
CEO leverage* ST3	-2.996				
	(-0.758)				
Relative Leverage Ratio		-0.090			
		(-0.499)			
Relative Leverage Ratio* ST3		-0.531**			
		(-2.384)			
Relative Leverage>1			-5.826		
			(-1.275)		
Relative Leverage>1* ST3			-20.603**		
			(-2.098)		
Relative Incentive Ratio				-0.085	
				(-0.388)	
Relative Incentive Ratio* ST3				-0.662**	
				(-2.417)	
Relative Incentive Ratio >1					-2.063
					(-0.450)
Relative Incentive Ratio >1* ST3					-21.970**
					(-2.279)
ST3	15.372**	18.528**	24.390**	18.479**	23.958**
	(2.025)	(2.394)	(2.438)	(2.385)	(2.526)
Constant	78.002**	76.981**	69.663**	77.325**	72.834**
	(2.399)	(2.377)	(2.140)	(2.390)	(2.238)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
R^2	0.215	0.218	0.220	0.218	0.218
Obs.	9,868	9,868	9,868	9,868	9,868

This table presents regression results of moderating effect of short-term loan on relationship between trade payables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A

Table 2- 15: Effect of short-term debt (ST5) on relationship between CEO inside debt and trade receivables

	(1) TR t-stat.	(2) TR t-stat.	(3) TR t-stat.	(4) TR t-stat.	(5) TR t-stat.
CEO leverage	4.678** (2.576)				
CEO leverage* ST5	-3.552 (-0.886)				
Relative Leverage Ratio		0.936*** (2.759)			
Relative Leverage Ratio* ST5		-1.205*** (-3.926)			
Relative Leverage>1			11.677* (1.854)		
Relative Leverage>1* ST5			-20.647* (-1.819)		
Relative Incentive Ratio				1.218*** (2.919)	
Relative Incentive Ratio* ST5				-1.532*** (-3.968)	
Relative Incentive Ratio >1					15.022** (2.324)
Relative Incentive Ratio >1* ST5					-22.296** (-1.990)
ST5	38.425*** (4.156)	41.194*** (4.513)	45.311*** (3.923)	41.263*** (4.529)	44.781*** (4.071)
Constant	172.929*** (4.106)	167.828*** (3.998)	166.891*** (3.913)	167.573*** (3.988)	167.866*** (3.952)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
R^2	0.290	0.291	0.290	0.291	0.290
Obs.	9,868	9,868	9,868	9,868	9,868

This table presents regression results of moderating effect of short-term loan on relationship between trade receivables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A

Table 2- 16: Effect of short-term debt (ST5) on relationship between CEO inside debt and trade payables

	(1) TP t-stat.	(2) TP t-stat.	(3) TP t-stat.	(4) TP t-stat.	(5) TP t-stat.
CEO leverage	1.983				
	(1.007)				
CEO leverage* ST5	-2.463				
	(-0.760)				
Relative Leverage Ratio		-0.057			
		(-0.259)			
Relative Leverage Ratio* ST5		-0.434*			
		(-1.785)			
Relative Leverage>1			-9.781*		
			(-1.698)		
Relative Leverage>1* ST5			-3.970		
			(-0.488)		
Relative Incentive Ratio				-0.052	
				(-0.192)	
Relative Incentive Ratio* ST5				-0.526*	
				(-1.741)	
Relative Incentive Ratio >1					-4.230
					(-0.737)
Relative Incentive Ratio >1* ST5					-8.309
					(-1.024)
ST5	11.451*	12.437*	11.846	12.388*	13.445*
	(1.697)	(1.875)	(1.478)	(1.870)	(1.746)
Constant	73.544**	72.392**	67.127**	72.707**	68.876**
	(2.245)	(2.223)	(2.054)	(2.233)	(2.102)
Controls	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y
R^2	0.215	0.217	0.218	0.216	0.217
Obs.	9868	9868	9868	9868	9868

This table presents regression results of moderating effect of short-term loan on relationship between trade payables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Table 2- 17: 2SLS Approach

Panel A: First Stage			
	(1)	(2)	(3)
	CEO Leverage	Relative leverage	Relative incentive
CEO age	0.017***	0.119***	0.100***
	(5.942)	(3.075)	(3.266)
New CEO	0.069**	1.217***	1.027***
	(2.127)	(3.383)	(3.579)
Firm size	0.012	-0.778***	-0.709***
	(0.944)	(-4.856)	(-5.585)
Firm age	0.024	-0.469	-0.466*
	(0.850)	(-1.473)	(-1.805)
MTB	-0.032	1.485***	1.180***
	(-1.621)	(3.957)	(3.987)
Negative CFO	0.216**	1.198	0.722
	(1.972)	(1.572)	(1.164)
Industry median CEO leverage	0.886***		
	(7.893)		
Industry median relative leverage		0.969***	
		(26.778)	
Industry median relative incentive			0.929***
			(16.111)
Constant	-1.201***	-1.410	-0.515
	(-4.983)	(-0.366)	(-0.170)
Controls	Y	Y	Y
Year dummy	Y	Y	Y
Industry dummy	Y	Y	Y
F-stat.	10.08	42.36	19.43
R^2	0.134	0.153	0.156
Obs.	10003	10003	10003

Panel B: Second Stage for TR			
	(1)	(2)	(3)
	TR	TR	TR
CEO_leverage (IV)	-16.289		
	(-1.093)		
CEO_relative_leverage (IV)		0.480	
		(0.354)	
CEO_relative_incentive (IV)			1.004
			(0.593)
Constant	160.878***	159.176***	158.726***
	(7.257)	(7.011)	(6.956)
Controls	Y	Y	Y
Year dummy	Y	Y	Y
Industry dummy	Y	Y	Y
R^2	0.243	0.268	0.266
Obs.	10003	10003	10003

This table presents regression results of 2SLS approach on relationship between trade receivables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Panel C: Second Stage for TP

	(1) TP	(2) TP	(3) TP
CEO_leverage (IV)	-3.017		
	(-0.266)		
CEO_relative_leverage (IV)		-4.273***	
		(-3.593)	
CEO_relative_incentive (IV)			-5.456***
			(-4.040)
Constant	96.712***	101.559***	102.038***
	(4.582)	(4.133)	(4.178)
Controls	Y	Y	Y
Year dummy	Y	Y	Y
Industry dummy	Y	Y	Y
R^2	0.202	0.005	0.007
Obs.	10003	10003	10003

This table presents regression results of 2SLS approach on relationship between trade payables and CEO inside debt measures. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Table 2- 18: PSM Approach and Entropy Balancing

	PSM Approach				Entropy Balancing			
Subsample by:	**High and Low**		**High and Low**		**High and Low**		**High and Low**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
	TR	**TP**	**TR**	**TP**	**TR**	**TP**	**TR**	**TP**
High relative leverage	-3.252	-9.240**			-4.689	-7.992**		
	(-0.693)	(-2.172)			(-1.035)	(-1.988)		
High relative incentive			0.347	-7.488*			-4.281	-6.852*
			(0.069)	(-1.682)			(-0.922)	(-1.678)
Size	-8.123***	6.133***	-8.318**	7.601***	-10.715***	5.094**	-10.769***	4.982**
	(-3.175)	(2.690)	(-2.566)	(2.999)	(-4.746)	(2.456)	(-4.757)	(2.415)
Firm Age	5.988	-0.736	6.237	-0.908	6.518	1.731	6.165	1.067
	(1.375)	(-0.192)	(1.250)	(-0.210)	(1.548)	(0.475)	(1.426)	(0.280)
Sale Growth	2.480	9.541	7.693	-4.582	6.846	4.506	7.328	7.329
	(0.369)	(1.383)	(0.996)	(-0.280)	(1.329)	(0.574)	(1.441)	(0.935)
PPE	-192.729***	-43.062***	-189.296***	-43.845***	-198.718***	-52.391***	-202.324***	-56.098***
	(-13.361)	(-3.474)	(-12.021)	(-3.412)	(-12.867)	(-3.832)	(-12.807)	(-4.057)
MTB	-5.092*	-5.824**	-6.868*	-4.505*	-3.636	-7.989***	-3.316	-7.724***
	(-1.648)	(-2.343)	(-1.897)	(-1.760)	(-1.326)	(-3.281)	(-1.255)	(-3.251)
EBIT	89.448***	2.460	106.437***	-17.170	25.028	-17.198	27.104	-20.763
	(2.594)	(0.090)	(2.609)	(-0.683)	(0.999)	(-0.946)	(1.058)	(-1.192)
Cash	-115.407***	20.529	-123.864***	22.427	-114.649***	17.550	-120.104***	13.544
	(-4.371)	(0.691)	(-4.265)	(0.808)	(-4.571)	(0.643)	(-4.811)	(0.500)
Leverage	-53.256**	-65.735***	-46.084*	-64.225***	-58.572***	-50.063***	-60.485***	-50.246***
	(-2.484)	(-4.001)	(-1.954)	(-4.197)	(-3.204)	(-3.480)	(-3.346)	(-3.537)
CAPEX	171.412***	102.298***	139.367**	116.046***	192.351***	150.580***	201.609***	154.272***
	(2.993)	(2.813)	(2.250)	(2.729)	(3.268)	(3.356)	(3.411)	(3.409)
CEO Age	0.294	-0.323	-0.235	-0.667	-0.019	-0.517	-0.035	-0.546
	(0.660)	(-0.700)	(-0.490)	(-1.441)	(-0.042)	(-1.062)	(-0.077)	(-1.163)
CEO Tenure	-0.332	-0.009	-0.060	0.161	-0.159	-0.092	-0.228	-0.146
	(-0.672)	(-0.017)	(-0.113)	(0.321)	(-0.301)	(-0.171)	(-0.447)	(-0.282)
Constant	187.036***	73.814**	223.396***	86.283**	239.535***	90.300***	242.463***	95.746***
	(4.850)	(2.130)	(5.163)	(2.411)	(6.987)	(2.649)	(7.095)	(2.864)
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.296	0.227	0.297	0.244	0.335	0.232	0.342	0.231
Obs.	4575	4575	4489	4489	10003	10003	10003	10003

This table presents regression results of PSM approach and entropy balancing on relationship between trade credit and CEO inside debt. The sample period ranges from 2006 to 2018. (*) Statistical significance at 10% level. (**) Statistical significance at 5% level. (***) Statistical significance at 1% level. The definitions of all variables are given in Appendix A.

Appendix A: Variable Definitions

Variables	Description
AR	Trade accounts receivable divided by the total assets
AP	Trade accounts payable divided by the total assets
CEO leverage	The ratio of CEO inside debt on CEO inside equity
Relative Leverage	The ratio of a CEO's debt to equity scaled by the firm's debt to equity ratio
Relative Leverage>1	The dummy variable that takes the value of 1 if the CEO relative leverage is greater than 1, otherwise 0
Relative Incentive	The ratio of the marginal change in the value of CEO inside debt holdings to the marginal change in CEO inside equity holdings given the firm value, all scaled by the respective firm's ratio
Relative Incentive>1	The dummy variable that takes the value of 1 if the CEO relative incentive is greater than 1, otherwise 0
Size	The natural logarithm of a firm's total assets in U.S. dollars
Firm age	Firm's age, computed as the difference between the year under investigation and the firm's year of birth
Sales growth	The change in net sales in relation to the previous year
PPE	The ratio of net property, plant, and equipment to the book value of total assets
ROA	The ratio of operating income before depreciation to the book value of total assets
MTB	The ratio of the market value of assets to the book value of total assets
EBIT	The ratio of earnings before interest and taxes to the book value of total assets
Cash	The ratio of cash and marketable securities to book value of total assets
Cash flow	The ratio of income before extraordinary items plus depreciation and amortization to the book value of total assets
Leverage	The ratio of total debt to book value of total assets
CAPEX	The ratio of capital expenditures to the book value of total assets
CEO age	The age of the firm's CEO, measured in years
CEO tenure	The number of years the CEO has been in office
Blockholder	The portion of shares held by blockholders, including officers, directors (and their families), trusts, pension/benefit plans, shares held by another corporation, and individuals that hold more than 5%
Analyst forecast error	The absolute mean earnings forecast error made in year t for each firm for earnings of current year t. It is calculated as the mean of absolute differences between individual analyst forecasts and the actual earnings per share, divided by the firm's share price at the beginning of the year.
Analyst forecast dispersion	the standard deviation of analyst forecasts for the year, scaled by the firm's share price at the beginning of the year.
YEAR	Indicator dummy variables of year
INDUSTRY	Indicator dummy variables for industry based on SIC code

CHAPTER THREE: GREENWASING AND ANALYST FORECAST ACCURCY

3.1 Introduction

In recent years, voluntary corporate social responsibility (CSR) participation has garnered an increasing amount of attention. There is a growing number of corporations choosing to integrate environmental, social and responsible corporate governance initiatives into their business strategy and operations in order to align with the interests of stakeholders (European Commission, 2011). Similarly, there has also been a dramatic increase in the number of firms issuing corporate social responsibility (CSR) reports over the last two decades (Dhaliwal et al., 2012). The introduction of voluntary reporting standards, which provide guidance on how to report CSR activities, facilitates companies' CSR disclosures (Ioannou and Serafeim, 2015). Many companies believe that, through signaling their concerns about their CSR engagement and disclosing information of their CSR performance, they could improve their relationships with a broader set of stakeholders, hence enhancing the firm's value and reducing firm risks (e.g., Servaes and Tamayo, 2013; Lins et al., 2017; Flammer and Luo, 2017). At the same time, companies build social capital by increasing their CSR-related activities, and this social trust pays off for the firms with improved financial performances in the face of adverse events, such as the credit crisis, which has a negative impact on the general level of trust in communities and markets. Investors and stakeholders offer better insurance to the companies involved in CSR activities during negative events (Lins et al., 2017). The increase in the number of firms adopting CSR initiatives and the improvement in the disclosures of firms' CSR performances have attracted the attention of participants in financial markets.

However, according to Delmas and Burbano (2011), as the concept of CSR starts to proliferate, the rise of CSR is accompanied by the practice of "greenwashing", brought about by the "intersection of two company behaviours: inadequate corporate environmental performance and favourable communication about their poor environmental performance." Instead of being transparent about their true CSR practices, some businesses may choose to greenwash their

fraudulent or unethical actions by selectively disclosing favourable information about their social and environmental performances to earn the confidence of their communities. As a result, investors and the general public may lose trust in the corporations whose CSR statements are less credible (Du, 2015). According to a survey by TerraChoice (2010), almost 95 percent of green goods sold in the United States and Canada violate at least one of the "sins of greenwashing", such as failing to disclose a material trade-off or blindly following marketing claims.

Greenwashing has attracted a lot of academic attention, after the topic was examined by Greer and Bruno (1996) in their book on environmental marketing. Despite the fact that the body of research is still growing (e.g., Walker and Wan, 2012; Chen, Lin and Chang, 2014; Kim and Lyon, 2015; Majláth, 2017; Seele and Gatti, 2017; Zhang et al., 2018; Torelli, Balluchi and Lazzini, 2020), there is no widely agreed-upon definition of the term and the notion itself remains unclear.

Some studies are based on the definition stated on the Oxford English Dictionary (i.e. Mitchell and Ramey, 2011; Furlow, 2010), where greenwashing is defined as "disinformation disseminated by an organisation so as to present an environmentally responsible public image," Others choose to follow Greenpeace's definition of greenwashing, which is "the act of misleading consumers regarding the environmental practises of a company or the environmental benefits of a product or service"(Chen and Chang, 2013; Delmas and Burbano, 2011; Parguel, Benoît-Moreau and Larceneux, 2011). Some researchers emphasized that the greenwashing "act" must be deliberate and with intention (Mitchell and Ramey, 2011; Nyilasy et al., 2012). Seele and Gatti (2017) proposed a definition that focuses on the view of the beholder: "Greenwashing is the co-creation of an external accusation towards an organization with regard to presenting a misleading green message." Some literature states that greenwashing acts as "poor environmental performance and positive communication about environmental performance." (Delmas and Burbano, 2011) and "…overly positive beliefs

about an organisation's environmental performance, practises, or products." (Lyon and Montgomery, 2015). Furthermore, some papers define greenwashing as exclusively dealing with environmental issues (e.g., Delmas and Burbano, 2011; Chen and Chang, 2013; Lyon and Montgomery, 2015). Others consider issues concerning the welfare of society and humanity (e.g., Bazillier and Vauday, 2009; Lyon and Maxwell, 2011).

In this study, we follow the definition of greenwashing proposed by Walker and Wan (2012) as the difference between ‘‘symbolic’’ and ‘‘substantive’’ social and environmental responsible acts. We consider greenwashing as dealing with both social and environmental issues (e.g., Bazillier and Vauday, 2009; Lyon and Maxwell, 2011) to look at the impact of greenwashing activities in both social and environmental issues on analyst forecast accuracy.

Greenwashing activities have several consequential impacts on firms’ green communication and marketing strategies. According to Hsu (2011), it has become an epidemic in recent decades, yet more and more firms are engaging in behaviours that are considered to be "greenwashing." Greenwashing starts to trigger green scepticism among customers, since they face the difficulty of identifying the true green claims being made by these firms. Green scepticism is proved to have a negative impact on firms’ green communication with their customers and obstructs green marketing since it damages the trust between firms and their customers (Chen et al., 2014). Organizational credibility has suffered as a result of consumers' inherent distrust and the impression that they are being misled. Perceptions of corporation brands are negatively affected in the long run by the public's view of the misalignment of a firm’s social and environmental performance and dishonest green communication (Nyilasy et al., 2014). Mason and Mason (2012) claim that firms adopt greenwashing, in particular in their CSR reports, not only to establish a socially responsible image, but also to generate in-group opinions of the firm. Greenwashing has been shown by Walker and Wan (2012) to impact a company's financial performance. Greenwashing is strongly and negatively correlated with

cumulative abnormal returns (CAR) surrounding the disclosure of environmental misconduct, according to Du (2015).

Due to the fast-growing trend of CSR engagement across the world, the probability of a firm engaging in greenwashing also increases. As mentioned above, greenwashing can have a wide-ranging influence on corporate policies, in aspects such as operating, marketing, financial performance and corporate governance. However, most of the prior studies focus on corporate marketing and branding, and studies examining the influence of greenwashing in financial terms are limited. We attempt to fill the research gap and extend the existing studies on firms' greenwashing behaviour in the field of finance.

Previous theoretical and empirical studies both provide evidence that there are significant associations between CSR performance and firm value and risk, and they suggest that investors consider non-financial information, such as information concerning CSR activities, in their decision making. Particularly crucial to the functioning of the capital markets are the contributions made by financial analysts. Analysts serve as information intermediaries since they collect information and use this to provide earnings projections and suggestions for market players, and so on. In addition, analysts provide investment recommendations (Lang and Lundholm, 1996). Some studies suggest that analysts also incorporate such non-financial information when they provide earnings forecasts (Dhaliwal et al., 2012; Luo et al., 2015; Ioannou and Serafeim, 2015; Lee et al., 2018).

Eccles et al. (2011) show that information on firms' environmental, social and governance (ESG) performances leads to a strong market interest, particularly the interest of both sell-side and buy-side analysts. Analysts incorporate ESG disclosure scores in their valuation models and investment recommendations. To measure the effectiveness of the disclosure of non-financial information, Dhaliwal et al. (2012) utilize the quality of CSR reports as a proxy. The authors indicate that, with the disclosure of enhanced non-financial information, analyst

forecast accuracy is improved. A recent study also finds that firms that achieve higher CSR scores tend to issue higher quality financial reports. Ethical concerns are the main motives that lead managers to issue better quality financial reports (Kim et al., 2012). Other studies suggest that CSR performance drives firms to issue CSR reports, since better performing firms are more likely to highlight their performance through such reports and, in this way, to signal their quality (Clarkson et al., 2008; Dhaliwal et al., 2011; Lyon and Maxwell, 2011). Cho et al. (2013) also find that firms with better CSR performances tend to have less information asymmetry. Lu and Abeysekera (2021) investigate how investors and analysts value firms' strategic CSR disclosures in Chinese firms and find that disclosures of strategic corporate social responsibility are met with approval from investors and analysts. However, the market is unable to determine whether or not these disclosures are trustworthy. In this paper, we attempt to examine whether and how the greenwashing of firms affects the accuracy of analyst earnings forecasts.

Prior studies reveal that analysts value firms' CSR disclosures and CSR performances. Lang and Lundholm (1996) find that analysts depend, to a large extent, on information provided directly by the firms. Although there is a standard requirement on the minimum amount of information that should be disclosed by these firms, they vary considerably in their decisions on disclosures of additional information. The authors find that this kind of variation in the additional disclosures brings about different responses from financial analysts. They find that firms can attract more analyst followings by providing more forthcoming disclosures practices.

Certain previous studies reveal that an increase in analyst followings can improve analyst forecast accuracy, since analysts play the role of the external monitoring force and pressurise firms to provide more accurate financial information (Alford and Berger, 1999; Lang et al., 2003; Bushman et al., 2004; Tan et al., 2011). An increase in disclosures of accurate information is also associated with an improvement in the accuracy of analyst forecasts and a reduction in information asymmetry. Dhaliwal et al. (2012) document that an improvement in the amount and quality of non-financial disclosures, measured by CSR reporting quality, is

associated with a higher level of analyst earnings forecast accuracy. According to Lu and Abeysekera (2021), a greater number of disclosures lead to a rise in the demand for analyst services among investors. These services include the processing and interpretation of new information. In this particular scenario, the number of analysts that follow a company will expand as a result of greater disclosures. It is anticipated that strategic CSR disclosures, this being information that is released in addition to financial disclosures, will increase both the demand for and the supply of analyst services, which will ultimately lead to an increase in the number of analysts following the firm that discloses such information.

However, since analysts depend on both the amount and quality of non-financial information when they undertake their evaluation about a firm's situation, greenwashing is expected to exacerbate the issue of corporate information asymmetry, as it has been proved in certain prior papers to damage a firm's reputation and to bring about scepticism in customers and investors. On the other hand, greenwashing is also a marketing approach that companies use to deceive their stakeholders about the extent of their environmental participation in order to obtain credibility in the eyes of consumers (Walker and Wan, 2012). Firms would intentionally provide more data if doing so would further their declared and apparent commitment to stakeholders (Roulet and Touboul, 2015). However, analysts are attracted by the increase in additional information released by firms before they have determined whether the disclosures are credible (Lu and Abeysekera, 2021). An increase in the amount of misleading information and a higher level of information asymmetry would cause difficulties for financial analysts when they evaluate the firms, resulting in an increase in analyst forecast errors and dispersions. In this way, it is predicted that greenwashing may reduce analyst forecast accuracy.

Nevertheless, it is worth noting that several previous research studies have proved that analysts are incentivized to collude with the management of firms to gain private information. This enables them to improve the accuracy of their forecasts and leads to a lower probability of being fired (e.g., Ke and Yu, 2006; Richardson et al., 2004; Sethuraman et al., 2018; Soltes,

2014; Chen and Matsumoto, 2006). Ke and Yu (2006) describe the evidence on the earnings prediction bias that analysts utilise to appease corporate management and the accompanying advantages that they gain from providing such biased forecasts. Ke and Yu (2006) also demonstrate the benefits that analysts obtain from issuing such biased forecasts. They come to the conclusion that analysts provide distorted earnings estimates in exchange for improved access to confidential information from the management of a company. Chen and Matsumoto (2006) examine the relative analyst forecast accuracy both before and after a recommendation has been issued. They do this under the assumption that increases (or decreases) in the amount of information provided by management will result in increases (or decreases) in analysts' relative forecast accuracy. According to the findings of the authors, analysts who provide more favourable recommendations see a greater improvement in the relative analyst accuracy of their forecasts, when compared to analysts who provide recommendations that are less favourable. In addition, the findings demonstrate that there is a greater improvement in relative accuracy for analysts who provided recommendations that were more favourable.

Sethuraman et al. (2018) investigate the degree to which managers and analysts engage in useful conversation during earnings conference calls. Different analysts have varying degrees of conflicts of interest while working with upper management, and here is where they separate the favoured analysts from those that are unfavoured. Analysts that enjoy management favour cultivate this favour by providing the management with favourable recommendations and profit estimates that are within the realm of possibility. Even though market participants may see conversations with favoured analysts as being prejudiced and lacking in useful information, it is also feasible that favoured analysts have more private access to management, which results in conversations that are richer in useful information. Sethuraman et al. (2018) discover that management interactions with unfavoured analysts are more informative by using intra-day absolute stock price fluctuations surrounding individual analyst-manager talks as a proxy for informativeness. According to the findings of an analysis of the features of conversation, unfavoured analysts are able to extract information from management by continuing lengthier

conversations that include a greater number of iterations that involve going back and forth between the two parties. In sum, financial analysts can obtain better access to private information if they convey information to the public which is in the favour of the managers, in return for more accurate earnings forecasts. This also indicates that analysts have incentives to convey greenwashing information to stakeholders, even though they may know that the information is misleading. As a consequence, we expect a negative association between greenwashing and analyst forecast errors and dispersions.

In this paper, we investigate how firms' greenwashing activities have an impact on the accuracy of analyst earnings forecasts by using comprehensive database of international setting. We use two measures of analyst forecast accuracy: analyst forecast error (Dhaliwal et al., 2012) and analyst forecast dispersion (Johnson, 2004; Liu and Natarajan, 2012). Following Walker and Wan (2012) and Roulet and Touboul (2015), we measure the level of greenwashing by firms using two measures: *GW_ratio* and *GW_diff*. We collect the data of CSR performance scores of a sample of international firms for the period between 2002 and 2019 from the Thomson Reuters ASSET4 ESG database. We follow the definition of greenwashing in Walker and Wan (2012) and Roulet and Touboul (2015), we define "greenwashing" as the distance between a company's claims about its environmental and social responsibility practises and the actual efforts it has taken in this area. We differentiate firms' substantive CSR scores (e.g., total direct flaring or venting of natural gas emissions, percentage of women employees), from their symbolic CSR scores (e.g., does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx (sulfur oxides) or NOx (nitrogen oxides) emissions? Does the company have a policy to ensure the freedom of association of its employees?). ASSET4 asserts that its scores are able to differentiate between the "talk" that companies engage in on CSA and the "walk" that they really walk in relation to their actions. We construct the first measure of greenwashing, *GW_ratio*, by computing the ratio of their symbolic scores scaled by the substantive CSR scores. The second measure of greenwashing, *GW_diff*, is constructed as the difference between the symbolic and substantive CSR scores. We examine the

relationship between analyst forecast accuracy and the level of greenwashing by using panel data regression models. Our baseline model results indicate negative associations between analyst forecast errors and dispersion and the level of greenwashing. Our findings suggest that greenwashing conveys a reduction in the level of analyst forecast error and dispersion and improves analyst forecast accuracy, even though it conveys misleading information.

Our study contributes to the existing literature in several ways. First, this paper extends the literature that explores the impact of firms' greenwashing activities. There is a considerable amount of literature examining the impact of CSR performance on the financial performance of firms (Edmans, 2011; Lin et al., 2015; Dimson et al., 2015), firm risk (Godfrey et al., 2009; Lee and Faff, 2009; Lins et al., 2017; Albuquerque et al., 2019) and better access to finance (Goss and Roberts, 2011; El Ghoul et al., 2011a; Dhaliwal et al., 2011). Other studies focus on the effect of the quality of CSR disclosure on analyst earnings forecast accuracy (Dhaliwal et al., 2012). However, as engagement with CSR as a business strategy expands, the possibility that firms will use CSR disclosures to greenwash also increases, but research into the effect of greenwashing engagement in the field of finance remains scant. To our best knowledge, this is the first study which examines the impact of greenwashing activities on financial analysts. We perform an empirical analysis using a large sample across an international setting. As the analyst forecasts act as an important source of information for the capital markets to recommend the selection of an investment portfolio, investors may be interested in how the information environment of analysts can be influenced by greenwashing activities undertaken by firms. Our investigation provides evidence that greenwashing, despite being used by firms to convey misleading information, is associated with an improvement in analyst forecast accuracy.

Second, our study contributes to the literature of analyst earnings forecasts and the behaviours of analysts. Previous studies focus on the determinants of analysts forecast accuracy, such as financial performance, the quality of disclosures, and corporate governance, while our study

provides evidence that more non-financial information disclosures can improve analyst forecast accuracy. We also provide evidence that analysts may help to convey selected greenwashing information to the public to gain the favour of managers in return for better access to private information, thus, enabling them to make more accurate forecasts. This paper also provides market practitioners with a clear picture of how analysts, as vital participants within the financial markets, can be influenced by firms' greenwashing activities This provides evidence to market participants and regulators on how analysts may respond to firms' greenwashing activities. By examining the relationship between analyst optimism and greenwashing, we show that greenwashing reduces analyst forecast accuracy, as analysts curry the favour of management by incorporating favourable greenwashing information in their estimation reports. Our empirical results provide evidence to support the existence of collusion between managers and analysts. In this way, our paper contributes to the existing literature of analyst behaviour and the determinants of analyst forecast accuracy.

Third, we contribute to the literature on the moderating effects of cash holdings and national cultures. Our findings support the theory that the level of cash holdings moderates the effect of greenwashing on analyst forecast errors. We explain these findings by arguing that firms with more cash holdings have better ability to handle financial distress and liquidity risk in negative events (the precautionary motive) and to have more abundant of cash to invest as desired by managers (the agency problem motive). The same motives incentivise firms to commit greenwashing. We propose that firms rich in cash holdings exhibit less strong impact of greenwashing on analyst forecast error. Our results support this hypothesis. Furthermore, we find that national culture, in terms of the masculinity of a society, leads to a weaker relationship between greenwashing and analyst forecast errors. Firms in countries with higher levels of masculinity are less likely to be concerned by CSR engagement, since the values of such societies promote achievement, competition and monetary success, as opposed to moral standards.

The rest of the paper is structured as follows. Section Two lays out the related literature and the generation of the hypotheses. The data collection, the variable computation and the empirical methodology are described in Section Three. Section Four presents the empirical results from our baseline models, the evidence of the effects of the legal regime on the relationship between CSR performance and analyst forecast accuracy and other additional tests. Section Five presents the robustness checks and Section Six concludes.

3.2 Literature Review

3.2.1 Corporate social responsibility and greenwashing engagements

3.2.1.1 Importance and expansion of corporate social responsibility

Corporate social responsibility (CSR) is defined by the World Business Council for Sustainable Development (WBCSD) as "the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families, the local community, and society at large." The fundamentals of CSR are to maximise the long-term contributions of business to society and to minimise its negative impacts (Holme and Watt, 2000). The early proposals for corporate social responsibility (CSR) policies received considerable criticism from the precursors of agency theory (Milton Friedman, 1970). Some prior studies state that CSR engagement may bring a series of harmful results to firms (e.g., Lee, 2008; Masulis and Reza, 2014; Dewatripont et al., 1999; Jensen, 2001; Krueger, 2015; Di Giuli and Kostovetsky, 2014; Hillman and Keim, 2001; Brown et al., 2006; Dutordoir et al., 2018), whereas others provide evidence that firms can gain financial benefits by investing in CSR practices (e.g., Davis, 1973; Carroll, 1979; Lee and Faff, 2009; Kim et al., 2014; El Ghoul et al., 2011; Dhaliwal et al., 2011; Lins et al., 2017).

Lee (2008) documents that corpoate social responsibility activities should not be the sole reponsibility of firms and should be dealt with by politicians and civil society. Masulis and Reza (2015) perceive CSR investments as a manifestation of agency problems. Managers

pursue the improvement of their own reputation and enhance their own social networks at the expense of corporate resources, destroying the value of the firm. Krueger (2015) also argues that some managers undertake CSR investments to obtain benefits for themselves, such as enhancements to their own reputation and social relationships, while the CSR investments do not actually benefit shareholders. Dewatripont et al. (1999) state that multi-tasks, in relation to the key objectives of a firm, may weaken managerial accountability and reduce the productivity of the agent. They use government agencies as a sample which distinguishes themselves in the characteristics of their missions. Instead of focusing on profit maximization, government agencies need to perform multi-tasks, which effectively reduces their productivity and accountability. Jensen (2001) discusses whether firms should have a single clear objective and whether the objective should be corporate value maximization. He argues that the stakeholder theory causes confusion for managers in terms of their missions and makes them less accountable. Di Giuli and Kostovetsky (2014) find that firms with superior CSR performances exhibit lower stock returns, as investors may perceive spending on CSR activities as unnecessary, thus, reducing firm value. Dutordoir et al. (2018) investigate how investors perceive seasonal equity offerings (SEO) by firms with different CSR ratings and they document that shareholders attribute value-added motives to SEO and are more optimistic towards a firm's future performance if the firm has a higher CSR rating. Some researchers find that if firms are required to meet the demands of the stakeholders, or if managers invest in CSR activities for their own benefit, firms have a higher probability of overinvestment (Masulis and Reza, 2014; Cronqvist and Yu, 2017).

Based on the dominant logic of agency theory, engagement in CSR activity was perceived as destroying shareholders' wealth and manifesting the agency problem. However, later studies provide a wealth of theoretical and empirical evidence of the benefits brought about by CSR investments. In contrast to the advocates of the agency logic of management, the term "corporate social responsibility" started to appear in the early literature of the 1970s (Davis, 1973; Carroll, 1979). Carroll (1979) proposes a conceptual model which defines the

dimensions of social responsibility and suggests that corporate social responsibility should be assessed. Davis (1973) listed several reasons why firms need to be socially responsible. Firms seek to further their long-run self-interests by being socially responsible. A stable social environment and an improved community provide firms with a more favorable environment for enhancing their financial performances.

Several studies document the positive effects of CSR on customers (Brown and Dacin, 1997; Lichtenstein et al., 2004; Servaes and Tamayo, 2013). Some studies provide evidence that employee relationships can be improved through engagement in CSR activities (Flammer and Luo, 2017; Aguilera et al., 2007; Akerlof and Kranton, 2005; Kim et al., 2010; Guiso et al., 2015). Other than improving relations with key stakeholders, such as customers and employees, CSR engagement can help to build social capital and trust (Sacconi and Antoni, 2010; Lins et al., 2017) and to maintain more effective corporate governance (Benabou and Tirole, 2010; Gao et al., 2014; Kim et al., 2012).

Theoretical and empirical evidence suggests that CSR initiatives can be adopted as a risk management tool and firms engage in CSR activities as a form of insurance policy against firm risks, such as social risk (Kytle and Ruggie, 2005), firm-specific legal risk (Godfrey et al., 2009), stock price crash risk (Kim et al., 2014), systematic risk (Albuquerque et al., 2019), unsystematic risk (Lee and Faff, 2009), and event risk (Lins et al., 2017). Evidence has been provided that socially responsible firms incur lower costs of capital (Goss and Roberts, 2011; El Ghoul et al., 2011a; Dhaliwal et al., 2011) due to a lower level of firm-level risk.

There are other positive effects brought by CSR engagement. Bushee (2001) and Bushee and Noe (2000) document that socially responsible firms are more likely to receive positive recommendations from sell-side analysts, than those who are not socially responsible. Some studies also reveal that firms which perform better in CSR reports are associated with lower costs of capital (e.g., Goss and Roberts, 2011; El Ghoul et al., 2011; Dhaliwal et al., 2011).

Deng et al. (2013) study the effects of CSR performance on mergers and acquisitions. According to the findings, companies with a strong commitment to monitoring their own social responsibility have larger abnormal returns and enjoy superior long-term post-acquisition financial performances. Dimson et al. (2015) find that firms that successfully engage in CSR investment achieve improved accounting performances and corporate governance. Lin et al. (2015) suggest that, by participating in CSR activities, firms can establish political connections, and hence generate an improved future performance.

3.2.1.2 Firms' greenwashing engagements

One of the most contentious issues in the discussion of corporate social responsibility in recent decades has been the instrumental and strategic adoption by businesses of green and social claims (CSR). The term "greenwashing" was coined by Delmas and Burbano (2011) to describe "the convergence of two company behaviours: poor environmental performance and favourable communication about environmental performance." They are of the opinion that the proliferation of CSR is followed by the occurrence of "greenwashing." An increasing number of businesses are being called out for "not walking the walk," which implies that their corporate social responsibility (CSR) assertions on environmental or social concerns have not been backed up by their real corporate operations (Walker and Wan, 2012). When there is a discrepancy between socially responsible rhetoric and actions, it is commonly called "greenwashing." Instead of being transparent about their true CSR operations, some companies may decide to greenwash their dishonest actions or misconduct by selectively presenting favourable material about their social and environmental performance. When this occurs, the public and potential investors may lose trust in the companies whose CSR statements were affected (Du, 2015). In a report published in 2010, TerraChoice (2010) indicates that 95% of products sold in the United States and Canada that claim to be environmentally friendly are guilty of committing at least one of the "sins of greenwashing." These sins range from the sin of the obscured trade-off to the sin of worshipping untrue labels. There is currently a sizeable body of literature that addresses problems linked to greenwashing as a direct result of the

significant growth in public concern about greenwashing over the last two decades. This growth in concern has been accompanied by a matching rise in academic study.

There are several reasons and incentives for firms to commit to greenwashing activities based on the previous literature. Mitchell and Ramey (2011) suggest that greenwashing activities are motivated by unconventional consumer habits in relation to green products. The authors believe that customers will continue to pay a premium for environmentally friendly products and services, even in challenging economic times when they are looking for value in the products and services they buy. The idea of competitive altruism offers reasons for why customers spend much more money, time, effort, and other valuable resources to obtain goods and services that are seen as being less harmful to the environment. This pattern of consumer behaviour prompts businesses to prepare themselves to fulfil the requirements posed by the prevalent trend, and some of these organisations seek to participate in greenwashing. Regrettably, as per Mitchell and Ramey (2011), some companies see the trend of "becoming green" as a chance to adopt unethical techniques in order to compete with their rivals for market share and profits, and they are taking advantage of this present opportunity. Because of the potential for higher income from green premiums, businesses may exaggerate their environmental claims in an effort to deceive customers into selecting their goods or services, rather than those of their rivals.

Budinsky and Bryant (2013) contend that the current system of advertising narratives promotes selfishness, materialism, and consumerism, all of which weaken aggregate social issues, such as environmental concerns. These researchers also study specific advertising campaigns to illustrate how environmental messages and concepts are taken and exploited to mask environment-related issues. The role of advertising in inducing greenwashing is further discussed in the study by Bazillier and Vauday (2009), who conceive strategic CSR favors the diffusion of greenwashing, since it discourages the engagement in substantive socially responsible activities that do not maximize profit. Hummel and Festl-Pell (2015) document the

shortcomings of current disclosure guidelines, explaining that they are inadequate and are unable to account for material sector-specific sustainability issues.

Greenwashing activities also lead to internal consequences for firms and a series of consequences for stakeholders, such as consumers and the environment and society at large (Gatti et al., 2019). First, greenwashing activities may have certain internal consequences for firms in the market. According to Furlow (2010), the proliferation of "green" products has prompted many businesses to reconsider the value of branding their wares as eco-friendly in order to appeal to a new, more environmentally conscious consumer base. Companies often make statements that appear environmentally conscious. However, in practice, they are nebulous and are, in some cases, outright untrue, leading to elevated levels of customer distrust. Any competitive advantage that may have resulted from corporations' honest efforts to reduce their environmental impact would then be lost. As customers "discount" any environmental marketing promises, corporations may have less incentive to provide ecologically useful goods. Walker and Wan (2012) conducted an empirical study on one hundred Canadian companies and came to the conclusion that substantive activities regarding environmental issues (green walk) neither harm nor benefit firms financially, whereas symbolic activities (green talk) are negatively linked to financial performance. In addition, they discover that greenwashing, which refers to a disconnect between green talk and green performance, has a negative effect on profitability, but green-highlighting, which refers to efforts that are focused on both talk and action, has no impact on financial success.

When investigating the effect of social media on greenwashing, Lyon and Montgomery (2013) discovered that corporate environmental marketing may backfire if citizens and activists perceive a corporation to be engaged in excessive self-promotion. The authors argue that not all businesses will see the same degree of reduction in corporate greenwashing as a result of the use of social media. When there is bad news to disclose alongside good, green companies should consider downplaying their green achievements, whereas brown companies, companies

perceived to be less environmentally and socially responsible, should try reporting the full extent of their environmental impact.

Du (2015) looks at how the market views greenwashing, and whether differences in the market response between environmentally friendly and unfriendly enterprises can be explained by differences in corporate environmental performance. The author discovers that the competitive effect for ecologically friendly enterprises and the infectious effect for prospective environmental wrongdoers are the two unique effects of corporate environmental performance on cumulative abnormal returns (CAR) surrounding the exposing of greenwashing. Greenwashing is considerably adversely related to CAR around the exposure of greenwashing, whereas corporate environmental performance is strongly and favourably associated with CAR around the exposure of greenwashing, according to the empirical findings of this research.

By fusing signaling theory with legitimacy theory, Seele and Gatti (2017) provide a new perspective on what constitutes greenwashing. They provide context for how an accusation of greenwashing spreads via the media and how a damaging narrative develops as a result of that accusation, thus, questioning its legitimacy. The authors contend that an external accusation of greenwashing is what constitutes the concept of greenwashing epistemologically. The greenwashing accusation is understood as a distortion factor altering the signal reliability of green messages. However, the authors suggest that an external accusation leads to a negative effect on corporate legitimacy and corporate reputation, even if firms do not provide misleading communication. Greenwashing is a subjective phenomenon that arises when there is a mismatch between what people believe to be true and what they are really being told.

Du et al. (2016) look at the opaque relationship between Chinese listed companies' lack of environmental responsibility and their propensity for charitable giving by using hand collected data. The results show that, in order to relieve the pressure induced by stakeholders, the charitable giving of environmentally unfriendly Chinese public companies helps to offset the

negative impact of their inadequate environmental action. Greenwashing via corporate charity is a popular tactic among Chinese businesses in polluting sectors. Furthermore, the authors provide evidence that publicity in the media strengthens the significant connection between the deficiency in environmental responsibility on the part of corporations and corporate charitable giving.

In addition, a number of studies reveal that greenwashing triggers a series of consequences for consumers. Furlow (2010) discusses the effects of greenwashing on consumers' attitude towards green products and states that greenwashing confuses consumers knowledge of firms' green products, resulting in an increase in consumer scepticism. Consumers, according to Parguel et al. (2011), find it difficult to distinguish between false and genuine CSR efforts because they are inundated with numerous contradictory claims. This ambiguity promotes greenwashing and threatens the efficiency of CSR operations. In this research, the authors examine how consumers' reactions to CSR communication from corporations are affected by independent sustainability assessments. The authors conclude that consumers' perceptions of companies' social responsibility are negatively impacted by low sustainability scores and greenwashing propaganda. Mason and Mason (2012) investigate the corporate environmental reports of one hundred companies that were included in the 2009 Fortune 1000 in order to demonstrate how this particular genre of messages convey a green corporate ethos to members of the audience who are attempting to differentiate between greenwashing strategies and a firm's genuine concern for the environment. According to the findings of the study, these reports attempt to utilise ideological persuasion in order to sway or alter the perspectives of audience members with regard to the environmental sustainability of corporations.

The impact of green corporate advertising on environmental performances are studied by Nyilasy et al. (2012). Factors contributing to the success of green advertisements are explained using attribution theory, which is drawn from the field of general psychology. The results of this study suggest that there is an interaction effect between green advertising communication

and Corporate Environmental Performance. Specifically, when firm performance is positive, green advertising leads to marginally more favourable brand attitudes than general positive corporate messaging. However, when firm performance is negative, green advertising leads to significantly less favourable brand attitudes than when a general corporate message is used.

Green consumer uncertainty and green perceived risk both play mediating roles, as discovered by Chen and Chang (2013) when they investigate the impact of greenwashing on green trust. The Taiwanese customers who have made purchases of informational and electronic items in Taiwan are the subject of this study's research, which focuses on the Taiwanese consumer market. Their findings indicate that greenwashing has a detrimental effect on environmental trust. As a result, the findings of this research imply that businesses should cut down on their greenwashing behaviours in order to strengthen the confidence that their customers have in their environmental performance. In addition, the findings of this research show that green consumer disorientation and green potential risk are the mediators of the unfavourable link between greenwashing and green trust. The findings also show that green consumers' perplexity and their perception of risk in the green sector are strongly correlated with greenwashing, which has a dampening effect on green trust. What this implies is that greenwashing has a multiplicative effect on green trust, diminishing it indirectly via green consumer uncertainty and green potential risk. Therefore, businesses that want to lessen the unfavourable correlation between greenwashing and consumers' faith in them need to take steps to address their customers' uncertainty and to alleviate their concerns.

Chen et al. (2014) examine the effect of greenwashing on the corporate word-of-mouth marketing of green items, and investigate the roles that consumer perception on green products and customer satisfaction both play as mediators in this relationship. The findings suggest that greenwashing has a detrimental effect on the word-of-mouth marketing of environmentally friendly products. This research shows that the connection between greenwashing and unfavourable word-of-mouth marketing may be alleviated via the use of consumer perceived

quality of green items and their satisfaction with these items. Researchers concluded that both reducing greenwashing practices and increasing customers' perceived quality in environmentally friendly items and their satisfaction with these items will promote green word-of-mouth marketing.

The impact of green advertising and a company's environmental performance on consumer perceptions of corporate brand and their intentions to buy from a particular brand are two areas explored by Nyilasy et al. (2014). Their findings suggest that green advertising exacerbates the negative impact of a company's poor performance on brand perceptions, as compared to both conventional corporate advertising and no advertising at all. Additionally, when a company's environmental record is good, consumers are less likely to view the brand favourably after being exposed to either green or conventional corporate advertising.

According to de Vries et al. (2015), corporations in the energy industry are confronted with a challenging problem when it comes to explaining their stance on environmental issues to the general public. Claiming that their environmental policies and activities are motivated by environmental concerns could induce positive reactions; however, it is also possible that doing so could lead to suspicions of corporate greenwashing, this being the idea that corporations intentionally demonstrate their operations as "green" in order to appear environmentally responsible. The outcomes of three separate trials show that individuals are quick to believe that an energy firm is greenwashing when the company invests in environmentally friendly practices. It is important for firms to acknowledge their economic incentives, rather than to express environmental objectives for such expenditures, in order to avoid the likelihood of being suspected of corporate greenwashing. Perceived corporate greenwashing is influenced both directly and indirectly by the disclosed motivation, with the latter being mediated by suspicions of strategic organisational behaviour. This second-order impact is most noticeable in those who are not naturally sceptical of a company's official statements. The results of this study stress the need for corporations to give serious consideration to the optimal methods for

disseminating information regarding the environmental policies they adopt to the general public.

Using information from 500 customers, Akturan (2018) investigates the connection between greenwashing engagement, green brand image, brand trustworthiness, green brand connotations, and the likelihood of a customer making a purchase. Green brand image was shown to have a positive and powerful effect on customers' propensity to make purchases, while green brand connotations and brand trustworthiness were found to favourably influence green brand image. Green brand image and purchasing intent are also adversely impacted by greenwashing because of the negative perceptions and customer confidence in a brand.

Greenwashing also has an impact on the environment and society at large. Employee outcomes, as per Donia and Sirsly (2016), may be better understood by tracing the formation of employees' diverse attributions of responsibility for those outcomes to their respective employers' corporate social responsibility (CSR) efforts. The authors present a model of employee attribution formation of corporate CSR activities as substantive vs symbolic. Drawing on theory and evidence from the literature on organisational behaviour, marketing, and strategy, they distinguish between the positive outcomes for businesses when they are causally judged as engaging in substantive CSR and the null or perhaps negative effects to employees when similar initiatives are ascribed as symbolic. The findings indicate that employee outcomes from symbolic CSR engagements will be neutral at best and detrimental at worst.

In general, the existing literature on greenwashing reveals that greenwashing activities should be regulated. Companies are discouraged from making environmentally friendly decisions when scepticism of corporate greenwashing arises, according to critics of greenwashing (Dahl, 2010). However, there are a few studies which reveal that greenwashing can bring positive externality to the market (Lee et al., 2018).

Lee et al. (2018) argue from an economic aspect that greenwashing should not be regulated, since greenwashing encourages firms to go green and eventually improves the overall level of CSR engagement in the market. Several pieces of literature prove that “market informedness” plays an important role in firms’ marketing and pricing decisions. Lee et al. (2018) define “market informedness” as the proportion of customers who know a product’s environmental quality. The authors argue the issue in relation to two scenarios, these being when the market is informed and uninformed. When greenwashing is regulated, all firms (both green firms and brown firms) choose to engage in CSR activities based on the cost and profit equilibrium of the CSR investments. Particularly when recognition of CSR is not high and environmental consideration is not considered to be critical in society, CSR engagements are an inferior strategy when the cost of implementing CSR is high. Firms will eventually choose to go brown as CSR is profit-reducing.

However, when greenwashing is not regulated, the authors discuss the market outcomes from two informedness scenarios. When there is a lower level of market informedness, there are two types of customers, informed and uninformed. Firms have the option of being “green”, but "brown" companies have a motive to "greenwash" the market by giving the impression that they are environmentally conscious, even when doing so would have a negative impact on their profitability. The reason for this is that if a brown company announces its poor environmental standards, it may attract consumers who, had they known the truth, would have paid less for its products. Since the brown business needs to raise prices to replicate the high product price of the green firm to also identify itself as a green firm, the knowledgeable consumers who previously preferred the brown firm's product, mainly due to the cheaper price, would now buy from the green firm. If corporate social responsibility (CSR) is profit reducing, then market mechanisms will cause enterprises to provide green product alternatives for consumers, which is better for the environment.

3.2.2 The role of financial analysts and their effects

Analysts influence investors' decisions in two ways: by issuing analyst recommendations and by making future performance forecasts. A number of studies show that analysts' forecasts on firms' performances are an effective proxy of the expectations of firms' shareholders (Fried and Givoly, 1982; O'Brien, 1988). Market participants employ analysts' forecasts and recommendations extensively when they make decisions. In this way, analysts' forecasts and recommendations indirectly influence firms' share prices and trading volumes (e.g., Stickel, 1995; Womack, 1996; Francis and Soffer, 1997). As important participants in the financial markets, analysts depend heavily on the information available to them to create their forecasts.

On the other hand, plenty of prior studies document the phenomenon of the corporate principal-agency theory observed over the past forty years. Management is perceived as an agency of shareholders who are likely to pursue their personal interests at the expense of corporate resources (Fama and Jensen, 1983; Useem, 1993; Westphal and Zajac, 1995). Meckling and Jensen (1976) defined a firm as a legal fiction which enables the conflicting objectives of both principal and agent to be brought to equilibrium within their contractual framework. They state that the conflict arises when the owner-manager (in this case, the agent) tends to expend resources which exceed the portion that they own for their non-pecuniary benefits. The external owners of the firm perceive this behavior to be harmful to their interests and are willing to pay less to acquire the assets of the firm. The authors define the agency costs as the aggregation of the cost of monitoring the agent, the cost of bonding by the agent and the residual loss due to the divergence of decisions made by the principal and the agent. The agency costs can be reduced effectively by monitoring the behaviours of the agent, which makes it desirable for the principal to spend more on monitoring. In contrast with previous studies, which state that security analysis is meaningless, the authors argue that activities undertaken by security analysts are an effective way to monitor an agent's behaviour and to reduce agency costs derived from the separation of ownership and control. Moyer et al. (1989) empirically test the theories proposed by Meckling and Jensen (1976). Their results provide empirical evidence

that the activities of security analysts help to control the agency costs due to the separation of ownership and control, to provide the markets with more useful information and to ultimately make the market more efficient.

Agency theory postulates that information asymmetry exists among management, shareholders and other stakeholders (Eisenhardt, 1989; Adams, 1994; Hill and Jones, 1992). While analyst activities act as monitoring activities which improve the information environment in the market and reduce agency costs, their activities depend heavily on the availability of firm information. Prior studies suggest that information asymmetry significantly affects analyst forecast accuracy.

The existing literature demonstrates that the improved availability of financial information and an increased amount of financial information disclosed can improve analyst forecast accuracy (Brown et al., 1987; Lang and Lundholm, 1996; Abarbanell and Bushee, 1997; Behn et al., 2008). Brown et al. (1987) suggest that analyst forecast accuracy is improved by the dimensionality of analysts' information set and is positively related to analysts' information environment. Lang and Lundholm (1996) demonstrate that more informative disclosures issued by firms have led to a greater analyst following, smaller analyst earnings forecast errors, less dispersed analyst earnings forecasts and less volatile forecast revisions. Abarbanell and Bushee (1997) investigate how fundamental signals contained in financial reports affect earnings forecasts and the revision of earning forecasts. They find that analysts use multiple aspects of the fundamental information gained from financial reports. Based on the theory that higher audit quality leads to improved unobservable financial reporting quality, Behn et al. (2008) study the link between audit quality and the predictability of analyst earnings forecasts. Their findings indicate that the higher the quality of the audit, the more accurate the analyst earnings forecast accuracy. They also suggest that the level of accuracy is positively related to the level of enforcement of the disclosure. He argues that prescribed rules of disclosure effectively reduce the uncertainty of analyst forecasts. Zhang (2006) proves that greater information uncertainty results in greater sell-side analysts forecast bias.

Literature shows that it is not only the financial information relating to the predictability of analyst forecasts that plays an important role in influencing the accuracy of analyst forecasts, but that non-financial information does too. Lang and Lundholm (1996) demostrate that both the financial and non-financial transparency of firms, measured by ratings of firms' disclosures, are positively related to analyst forecast accuracy. Vanstraelen et al. (2003) investigate the quality of nonfinancial disclosures issued by firms in three continental European countries. They find that the greater the quantity of forward-looking non-financial disclosures issued by firms, the smaller the dispersions of financial analyst earnings forecasts and the more accurate the financial analyst earnings forecasts. Using the quality of CSR reports issued by firms as a proxy of non-financial information available to analysts, Dhaliwal et al. (2012) analyse the impacts of non-financial disclosure on analyst forecast errors. They argue that disclosures of non-financial information, such as CSR reporting, improve transparency and reduce analyst forecast errors. Furthermore, they find that the relationship is stronger in countries that are more stakeholder-oriented.

3.2.3 Corporate social responsibility, greenwashing and analyst forecasts

Several recent studies investigate the transformation from conventional shareholder-oriented logic to the stakeholder-oriented logic of corporate strategy. CSR initiatives can have an impact on channels of financial performance, such as sales, costs, productivity, operational efficiency, financing, brand value and firm reputation. Previous academic studies have given strong support to the legitimation of CSR and stakeholder-oriented business strategy. Ioannou and Serafeim (2015) investigate how market participants, including sell-side analysts, changed their perception of CSR ratings from the early 1990s to the late 2000s. They find that firms with high CSR ratings were more likely to receive pessimistic recommendations from sell-side analysts in the early 1990s, and gradually their recommendations became less pessimistic, even becoming optimistic towards firms with better CSR performances over time. The authors argue in their paper that, gradually, there is a weakening agency logic. Recent perceptions of CSR by

investors and analysts have gradually become more positive. Ioannou and Serafeim (2012) state in their study that analysts with more experience and analysts in larger broker houses have gradually found it easier to shift their view towards CSR investments. They will become less pessimistic or even optimistic towards CSR over time. Four hundred mainstream fund managers and financial analysts from nine European countries were surveyed by Deloitte, CSR Europe, and EuroNext in 2003. Among the respondents, approximately 80 percent agreed that CSR activities, especially social and environmental management, would have long-term effects on a firm's value. Approximately 50 percent of respondents said that they utilize the information from management CSR disclosures issued by the firms (Dhaliwal et al., 2012).

Furthermore, Eccles et al. (2011) also show that information of firms' environmental, social and governance (ESG) performance has led to strong market interest, especially from both sell-side and buy-side analysts. Analysts also incorporate ESG disclosure scores in their valuation models and investment decisions. Studies provide evidence that analysts currently incorporate both financial and non-financial information when they issue forecast reports and recommendations. The emergence of CSR inevitably provides analysts with a comprehensive way of looking at firm performance. The recent development of the CSR rating criterion and CSR reporting standard further facilitates accessibility for market participants to relevant information.

There are two competing views on how CSR disclosures are useful for financial analysts. The voluntary disclosure hypothesis presupposes a positive link between CSR performance and disclosure, and information economics-based research supports this idea by arguing that the sharing of material CSR information diminishes information asymmetries (Clarkson et al., 2008; Merkl-Davies and Brennan, 2007). AYet, another research stream, often referred to by the term "impression management", argues that the disclosure of CSR information is biased and primarily acts as a method of corporate image enhancement. The impression management perspective holds that managers should use these knowledge gaps to their advantage in order

to shape public opinion. To boost a company's credibility and reputation, they choose to conceal the company's true CSR performance (Cho et al., 2015; Rezaee and Tuo, 2019).

Recent studies provide empirical evidence that more information disclosure leads to more analyst followings and more accurate analyst forecasts. Prior studies reveal that analysts value firms' CSR disclosures and CSR performances. Lang and Lundholm (1996) find that analysts depend, to a large extent, on information provided directly by the firms. Although there is a standard requirement on the minimum amount of information that should be disclosed by these firms, they vary considerably in their decisions on the disclosures of additional information. The authors find that this kind of variation in additional disclosures brings about different responses from the financial analysts. They find that firms can attract more analyst followings by providing more forthcoming disclosures regarding their practices. More information disclosures are also associated with an improvement in the accuracy of analyst forecasts and a reduction in information asymmetry. As per Lu and Abeysekera (2021), investors' need for analyst services in processing and analysing extra information rises as more information is disclosed to the public. In this instance, more information is better since it increases the likelihood that analysts will start studying a company. Strategic CSR disclosures as supplementary data alongside financial disclosures are anticipated to boost demand for, and supply of, analyst services. This would lead to a greater number of analysts tracking a firm's performance, thus, making any analyst projections, ultimately, more precise. However, the author finds that analysts fail to determine the creditworthiness of the disclosed information.

Das et al. (1998) examine the cross-sectional diversity in analysts' optimistic behaviour. They investigate firms with less publicly available information and those with more publicly available information, and find that analysts tend to make more optimistic forecasts for firms with less publicly available information. Many studies also argue from the viewpoint of agency theory. Firms with higher CSR ratings have superior corporate governance and lower levels of information asymmetry among managers, shareholders and other stakeholders. Higher levels

of transparency would lead to more accurate analyst forecasts. Kim et al. (2012) also document that socially responsible firms tend to issue better quality financial reports and, in this way, this improves the disclosure transparency. Consistent with their findings, Dhaliwal et al. (2012) assert that the quality of CSR reporting is positively related to analyst forecast accuracy, since CSR reporting improves disclosure transparency. They also state that information about firms' CSR performances is an important source of non-financial information. Such non-financial information will affect the accuracy of analyst forecasts. Dhaliwal et al. (2014) further prove that CSR disclosure, as an important source of non-financial information, improves the information transparency and the quality of CSR disclosures, thus, leading to a reduction of the cost of capital.

3.2.4 Hypotheses development

The increase in the adoption of CSR as an operational business strategy has led to more firms engaging in greenwashing. Greenwashing may influence financial analysts in different ways.

Firstly, greenwashing is believed to be harmful to firm image and reputation, resulting in the scepticism of customers and stakeholders. Greenwashing activities have several impacts on firms' green communication and the influence of their marketing activities. Greenwashing starts to trigger green scepticism among customers, since they find it difficult to identify the true green claims being made by these firms. Green scepticism is proved to have a negative impact on firms' green communication with their customers and obstructs green marketing since it damages the trust between firms and their customers (Chen et al., 2014). The presence of consumer suspicion, in conjunction with the perception of dishonesty, has had a detrimental effect on firms' organisational credibility. This is in addition to the misalignment of the perception of corporate environmental performance and green propaganda which jointly lead to major ethical damage (Davis 1992). In the long run, it hurts all businesses (Nyilasy et al., 2014).

Mason and Mason (2012) claim that firms adopt greenwashing, CSR reports in particular, not only to establish a socially responsible image, but also to generate in-group opinions (for example, with employees and shareholders). Walker and Wan (2012) find that greenwashing is negatively associated with a firm's financial performance. Du (2015) provides strong evidence to show that greenwashing is significantly negatively associated with cumulative abnormal returns (CAR) around the exposure of a firm's environmentally harmful wrongdoing. If a firm's greenwashing activities negatively affect a firm's green image, and the misleading information further reduces the informational transparency of these firms, we should expect a negative association between greenwashing and analyst forecast accuracy.

However, on the other hand, many pieces of literature prove that analysts obtain both public and private information from firms to create earnings forecasts and recommendations. Although the adoption of greenwashing by firms is for the purpose of impression management, they provide more non-financial information relating to issues in which the stakeholders are interested. Studies on financial analysts reveal that more information availability leads to a greater analyst following and a higher level of forecast accuracy (Lang and Lundholm, 1996). However, a recent study by Lu and Abeysekera (2021) suggests that, although firms' strategic CSR disclosures attract more analysts, analysts fail to determine whether the information being disclosed is credible. Since analysts play the role of the external monitoring force, more analyst coverage puts pressure on these firms to provide higher quality financial disclosures, leading to a higher level of earnings forecast accuracy, in spite of the fact that these firms convey misleading non-financial information.

In addition, empirical evidence proves that analysts have incentives to please the management of firms to obtain private information. In this way, they can then improve the accuracy of their forecasts and have a lower probability of being fired (e.g., Ke and Yu, 2006; Richardson et al., 2004; Sethuraman et al., 2018; Soltes, 2014; Chen and Matsumoto, 2006). Analysts have incentives to please managers by providing favourable recommendations and they may include

misleading greenwashing information in the opinions that they share. In return, managers provide these analysts with private information, making their earnings forecasts more accurate. Analysts have incentives to please managers by providing favourable recommendations, and therefore, they have the intention to include misleading greenwashing information in the opinions that they share. Based on this, we expect that greenwashing is associated with a higher level of analyst forecast accuracy. Summarizing the above findings and discussions, we generate the first hypothesis:

Hypothesis 1: Greenwashing is negatively associated with analyst forecast error.

Firms hoard cash based on a variety of motives. First, the transaction motive of cash holdings suggests that managers decide to increase cash holdings to protect firms from liquidity risk. They do this, for example, to make sure that firms have enough cash to make payments without liquidating the physical assets or without the need to seek external financing, thus, avoiding the transaction costs of converting noncash assets into cash (Miller and Orr, 1966). The precautionary view of cash holdings implies that firms hoard cash to protect themselves from unpredictable negative shocks which require a higher cost of financing, for example, capital market friction (Almeida et al., 2004; Han and Qiu, 2007; Harford et al., 2014). Jensen (1986) states that agency problems lead to higher levels of cash holdings by firms, since entrenched managers tend to hoard cash for the purposes of investment which they may take advantages for self-interests. The agency motive of pileup cash is later supported by a number of studies (Harford, 1999; Gao et al., 2013; Nikolov and Whited, 2014).

Firms recognise the trend of "becoming green" as a chance to adopt unethical techniques in order to compete with their rivals for profits, and they are taking advantage of this opportunity (Bazillier and Vauday, 2009; Budinsky and Bryant, 2013; Mitchell and Ramey, 2011). Numerous research demonstrates that better ESG performance is associated with better performance (Edmans, 2011; Lin et al., 2015; Dimson et al., 2015) and lower costs (Goss and

Roberts, 2011; El Ghoul et al., 2011a; Dhaliwal et al., 2011), hence, in an effort to win over their stakeholder base, several businesses use greenwashing strategies similar to those used by their rivals. Firms with higher cash holdings have better ability to deal with financial constraints and liquidity problem (precautionary motive) and also more cash to be invested as per wish of the management (agency problem motive). Greenwashing as a means to improve financial performance or lower financing costs is less compelling for these companies. We therefore expect the effect of greenwashing on analyst forecast error to be less pronounced in firms with a higher level of cash holdings. Summarizing the above discussions, we generate the second hypothesis:

Hypothesis 2: The negative effect of greenwashing on analyst forecast error is less pronounced in firms with a higher level of cash holdings.

Habisch et al. (2005) argue that cultural characteristics significantly shape business and social mindsets, in this way influencing the decision-making processes and CSR related strategy settings in firms. The authors find that different national culture characteristics result in significant variances in current and future CSR engagement. Several studies provide empirical evidence that the dimensions of national culture influence firms' CSR performances (Waldman et al., 2006; Svensson et al., 2009; Ho et al., 2012; Peng et al., 2012; Thanetsunthorn, 2015).

In this paper, we apply the four national culture dimensions developed by Hofstede (1980), Power Distance *(PWD),* Individualism *(IND),* Uncertainty Avoidance (UAI) and Masculinity *(MAS),* to measure the different culture characteristics in the countries.

Power Distance measures the extent to which people accept a hierarchical order and inequality without the need for further justification. The higher the level of Power Distance, the more likely the managers are to make centralized decisions. Waldman et al. (2006) find that firms in countries where there is a higher level of Power Distance are less likely to consider the interests

of stakeholders, since stakeholders in these countries have a higher toleration for the inequality of power and are less likely to pressurize firms to consider stakeholder interests. Therefore, we expect that, in countries with higher Power Distance, the effect of greenwashing on analyst forecasts is lower, since there is less demand by firms to seek the benefits that can usually be gained by pursuing greenwashing activities. Based on this, our next hypothesis is as follows:

Hypothesis 3a: The effect of greenwashing on analysts' forecast error is less pronounced in firms with a higher level of Power Distance.

Individualistic culture is described as a culture or social structure in which people in society mainly concentrate on their personal interests and those of their immediate families, rather than on collective interests (Hofstede, 1980). Thus, in highly individualistic cultures, interpersonal bonds are casual at minimum. On the other hand, in collectivistic societies, members prioritise the group's needs and goals above their own. We expect that, in countries with higher levels of individualism, the effect of greenwashing on analyst forecast errors is less pronounced, since people are less concerned with the interests of the community. In firms, stakeholders require less protection of their interests. Firms in countries where the level of individualism is higher place less emphasis on stakeholder orientation and are less eager to engage in greenwashing. This leads us to our next hypothesis:

Hypothesis 3b: The effect of greenwashing on analysts' forecast error is less pronounced in firms with a higher level of individualism.

Competition, accomplishment, aggressiveness, power, and monetary reward for success are valued more highly in masculine communities. Relationships, collaboration, care, modesty, and life satisfaction are valued more highly in feminine communities, than in masculine ones (Hofstede, 1980). Male-dominated societies tend to produce members who are less likely to coordinate with and support others (Tice and Baumeister, 1985; Steensma et al., 2000).

Conforming to the above-mentioned values of competition, accomplishment, aggressiveness, power, and monetary reward for success, men in masculine societies are more likely to engage in immoral activity in order to advance their own interests (Vitell and Festervand, 1987). We, again, expect that the impact of greenwashing on analyst forecast accuracy is less pronounced in countries where the level of masculinity is higher. Since firms and managers in these countries focus more on competition and achievement, they are less concerned with stakeholder interests and community welfare. Based on this, our next hypothesis is as follows:

Hypothesis 3c: The effect of greenwashing on analysts' forecast error is less pronounced in firms with a higher level of masculinity.

How people in a society react to confusion and uncertainty is measured by the "uncertainty avoidance index" (UAI). People who live in cultures with a high level of uncertainty avoidance tend to feel uneasy in ambiguous or unclear settings. To reduce risk, they favour rigorous rules, regulations, and standards of behaviour. Conversely, those who live in communities that score low on uncertainty avoidance are more likely to be flexible in their perspectives and methods of activity. What is more, they are more prone to take risks in general (Hofstede, 1980). As per Thanetsunthorn (2015), there is a strong link between recklessness and immoral activity. Previous research also demonstrates a strong positive correlation between the uncertainty avoidance index (UAI) and CSR outcomes (Ho et al., 2012; Peng et al., 2012). It seems to reason that businesses in societies with a high uncertainty avoidance index (UAI), where stringent rules, laws, and regulations are implemented, would demand a more dedicated focus on stakeholder orientation and community welfare. We, then, expect that, in countries with a higher level of uncertainty avoidance, the greenwashing effect on analyst forecast errors are more pronounced. This brings us to our next hypothesis:

Hypothesis 3d: The effect of greenwashing on analysts' forecast error is more pronounced in firms with a higher level of uncertainty avoidance.

3.3 Data and Methodology

3.3.1 Main variables

3.3.1.1 Greenwashing data

Following Roulet and Touboul (2015), we collected the CSR performance score data of firms across an international setting for the period from 2002 to 2019 from the Thomson Reuters ASSET4 ESG database. Thomson Reuters ASSET4 ESG scores provide individual scores for the measurements of firms' ESG performances in the following three areas: environmental, social, and corporate governance (Ioannou and Serafeim, 2012). We differentiate the firms' substantive CSR scores (e.g., total direct flaring or venting of natural gas emissions, percentage of women employees), from their symbolic CSR scores (e.g., does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx (sulfur oxides) or NOx (nitrogen oxides) emissions? Does the company have a policy to ensure the freedom of association of its employees?). ASSET4 claims that its ratings are able to measure firms' ''talk'' versus their ''walk'' in relation to their CSA. We construct the first measure of greenwashing, *GW_ratio*, by computing the ratio of symbolic to substantive CSR scores. The second measure of greenwashing, *GW_diff*, is constructed as the difference between the symbolic and substantive CSR scores. Our sample originally included firms from 69 countries. After eliminating countries with less than eight firms, we finally include firms from 48 countries.

3.3.1.2 Analyst forecasts data

We use the mean absolute errors of earnings per share as the measure of analyst forecasts, and we perform further tests by using another measure of analyst forecast error, the dispersion of analyst earnings forecasts. Following Hong and Kubik (2003), analyst earnings forecast error is used as a measure of analyst forecast accuracy. Forecast error (*EFE*) is defined as the mean absolute error of forecasts made for a firm in the year for earnings, divided by the stock price at the beginning of the year:

$$EFE_{it} = \frac{1}{N}\sum_{j=1}^{N}\left|FE_{it,j} - ERP_{it}\right| / P_{it-1} \quad (1)$$

where *i* denotes firm *i*, *t* denotes year *t* and *j* denotes a forecast made by analyst *j*. We investigate analyst forecasts for three consecutive years because, as the forecast horizon increases, the analyst forecast accuracy reduces substantially (De Bondt and Thaler, 1990). We do not include forecasts beyond the third year as the sample size reduces dramatically for forecasts made beyond the third fiscal year. Analysts rarely issue forecasts beyond two fiscal years. *FE* stands for the analyst earnings forecast error. *EPS* refers to the actual earnings per share, which is obtained from the I/B/E/S database. *P* denotes the stock price at the beginning of the fiscal year. *N* is the number of forecasts made for the target earnings.

3.3.2 Baseline regression models

Following Dhaliwal et al. (2012), panel regression models are employed to examine the link between greenwashing and analyst earnings forecast accuracy. We estimate the following models to examine the first hypothesis:

$$Forecast_{it} = \beta_0 + \beta_1 Greenwashing_{it-1} + \beta_2 FirmControls_{it-1} + \beta_3 CountryControls_{it-1} + \beta_4 Industry_i + \beta_5 Year_t + \beta_6 Country_i + \varepsilon_{it} \quad (2)$$

where the dependent variable, $Forecast_{it}$, refers to the two measures of analyst forecast accuracy, analyst forecast error and analyst forecast dispersion for the current year for firm *i* in year *t*. The independent variable $Greenwashing_{it-1}$ is the greenwashing measure computed for firm *i* in year *t-1*.

3.3.3 Control variables

We include firm-level control variables in our models: the number of reports issued by analysts for the target earnings throughout the year ($NESTIMATES$), the firm size ($SIZE$), the firm leverage (*LEV*), the cash flow (*CASHFLOW*), the firm's Tobin's Q (*Q*), and the firm's level of cash holdings (*CASH_HOLDINGS*). We also include country-level control variables: the

country's GDP per capita (*GDP*) and the GDP growth rate (*GDP_GROWTH*). Additionally, we control for the fixed effects of industry ($Industry_i$), year ($Year_t$) and country ($Country_i$).

Lys and Soo (1995) state that analyst forecast accuracy is affected by the number of analysts following the firms, since a greater number of analysts following a firm indicates greater competition among the analysts, meaning that the analysts have a stronger need to improve the accuracy of their forecasts. The number of reports issued by analysts during the year, *NESTIMATES*, is the number of analyst forecast reports issued throughout the year for earnings of year t. Analyst following is expected to be negatively related to analyst forecast error. Prior research shows that firm size affects the pre-disclosure information available to analysts for making predictions (Freeman, 1987; Atiase, 1985). We, therefore, include firm size *(SIZE)* as a control variable and expect a negative association between firm size and analyst forecast error. The firm size, *SIZE*, is measured as the natural logarithm of a firm's total assets at the end of the previous fiscal year in U.S. dollars. Ahmed et al. (2006) find a significant effect of prior-year cash flow on analyst forecast error due to analysts' optimistic perceptions of the persistence of operating cash flows at the firms in the following year. We control for firms' operating cash flow (*CASHFLOW*) and cash holdings (*CASH_HOLDINGS*) in order to address this effect. Firms with better performance and higher growth prosperity attract more analyst attention, leading to more accurate forecasting, and therefore, we control for the growth opportunity of the firm by including Tobin's Q *(Q)*. Finally, we control for firm financial leverage since highly leveraged firms are more likely to report volatile earnings (Hope, 2003).

We include country-level control variables to capture country-level effects. CSR and greenwashing activities may be encouraged or limited by macroeconomic environment within a country. We include time-series country-level variables, GDP per capita (*GDP*) and GDP growth rate (*GDP_GROWTH*). These two variables capture the income and wealth effects of the country. Liang and Renneboog (2017) argue that people in richer countries may pay more attention to sustainability, hence firms in these countries give greater consideration to CSR activities.

3.3.4 Sample and data

The greenwashing data for firms across a global setting are obtained from the Thomson Reuters ASSET4 ESG Scores for the period from 2002 to 2019. Besides the ESG ratings obtained from the MSCI KLD database, the Thomson Reuters ASSET4 ESG Scores database is one of the most comprehensive and trustworthy CSR ratings providers collecting CSR data from over 7,000 public companies globally. ASSET4 ESG Scores collects CSR-related information from publicly available sources to compute more than 250 firm-level key performance indicators (KPIs) to group into 18 categories in three major dimensions, i.e., environmental, social and corporate governance. The ESG KPIs are, in turn, aggregated to z-scored ratings across the following four pillars: economic, environmental, social, and corporate governance (Ioannou and Serafeim, 2012). Following Roulet and Touboul (2015), we differentiate firms' substantive CSR scores (e.g., total direct flaring or venting of natural gas emissions, percentage of women employees), from their symbolic CSR scores (e.g., does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx (sulfur oxides) or NOx (nitrogen oxides) emissions? Does the company have a policy to ensure the freedom of association of its employees?). We construct the first measure of greenwashing, *GW_ratio*, by computing the ratio of symbolic to substantive CSR scores. The second measure of greenwashing, *GW_diff*, is constructed as the difference between symbolic and substantive CSR scores. After matching with the analyst forecast data obtained from the Institutional Brokers' Estimate System (I/B/E/S), our final data sample includes 4,523 firms with 39,278 firm-year observations from 48 countries. We also exclude countries where there are less than eight firms. We obtain financial and accounting data from the Datastream database.

Table 3-1 presents the descriptive statistics for the variables used in the analysis. All continuous variables are winsorized at the 1st and 99th percentiles to ensure our results are not driven by extreme values. The average firm level greenwashing measures, *GW_diff* and *GW_ratio*, are -12.602 and 0.743 respectively, indicating that, on average, the symbolic score is lower than the

substantive score. The standard deviations of *GW_diff* and *GW_ratio* are 13.723 and 0.286, respectively. The average analyst earnings forecast error is 33.682 and the standard deviation is 79.390. This indicates that the variation of the forecast errors for the firms is significant. The average size of our sample firms, measured by the natural logarithm of the total assets in U.S. dollars, is 22.708, indicating that the analysts are more likely to be attracted to larger firms. The variation of the firm size is small in our sample, since the standard deviation is 1.634. The firms in our sample have an average leverage ratio of 0.604 and a Tobin's Q of 1.759. The average log number of reports issued for the sample firms is 2.395. The countries in which the firms are located have an average GDP per capita of 43,207 and a GDP growth rate of 2.122.

[Insert Table 3-1 around here]

Table 3-2 shows the summary of the average value of the main dependent variables and independent variables by country. We obtain samples from a total of 50 countries. The first column shows the number of firm-year observations and the number of firms by country. We notice that 1,477 firms are from the United States, accounting for the largest proportion of observations in our sample (12,050 observations), followed by Japan, where 400 firms are located and where we have 5,241 observations. We include countries where there are at least eight firms in order to eliminate problems relating to a small sample size. Columns 3 to 6 present the average value of the main independent variables, *GW_diff* and *GW_ratio,* and the average value of the main dependent variables, analyst forecast error and analyst forecast dispersion. The forecast errors in the U.S. and Japan are relatively low, with average forecast errors of 22.692 and 24.985, respectively. The forecast dispersions in these two countries are also shown to be low, these being 2.767 and 6.269, respectively. We also notice that, in other developed countries, such as the United Kingdom, France, Germany and Canada, the analyst forecast error and analyst forecast accuracy are relatively low, indicating a better information environment for analysts. However, in developing countries, such as China, India, Thailand and Indonesia, the analyst forecast error and dispersion values are relatively higher.

[Insert Table 3-2 around here]

Table 3-3 refers to the correlation coefficients between the main variables and control variables. A high correlation between regressors in a model may result in multicollinearity, which affects the precision of the estimated coefficients and standard errors. We assess the correlation coefficients between each two explanatory variables. We consider those pairs of variables with correlation coefficients that are larger than 0.5 to be highly correlated. The remedy for multicollinearity is to avoid one of the highly correlated variables. From Table 3-3, there is no strong correlation between the independent variables and control variables. Therefore, we assume that multicollinearity should not be present between the independent variables and control variables. The greenwashing measures, *GW_diff* and *GW_ratio,* are negatively correlated with forecast errors, indicating that the level of greenwashing is higher when the level of forecast errors is lower. The firm size and Tobin's Q are negatively correlated with forecast error. This reveals that firms of a larger size and with a better market performance exhibit a lower level of forecast errors.

[Insert Table 3-3 around here]

3.4 Empirical Results

3.4.1 Greenwashing and analyst earnings forecast errors

Table 3-4 shows the results of the regression analysis of the relationship between greenwashing measures, *GW_diff* and *GW_ratio* and analyst earnings forecast errors. In models (1) and (2), we regress the dependent variables, the analyst earnings forecast errors of the current year's forecasts on the independent variables, the first lagged *GW_diff* and *GW_ratio,* without including the control variables. We control for year-fixed effects, industry-fixed effects and country fixed effects. We also use robust standard errors clustered at the firm level. Results suggest that the forecasts of *GW_diff* and *GW_ratio* are significantly and negatively associated with analyst earnings forecast error at 1% significance level, with t-statistics of -6.090 and -

6.804, respectively. The results shown in Column (1) and (2) of Table 3-4 are consistent with our hypothesis that there is a negative connection between greenwashing and analyst forecast error. Column (3) and (4) present the results when we include year fixed effects, industry fixed effects, country fixed effects, firm-level control variables, including firm size (*Firm size*), leverage ratio (*Leverage*), cash flow ratio (*Cash flow*), a firm's Tobin's Q (*Tobin's Q*), a firm's cash holding level (*Cash holdings*), and the number of forecast reports issued by analysts (*No. of reports*). We also control for country level variables, *GDP per capita* and *GDP growth*. The results remain statistically significant at 1% significance level and indicate a negative association between CSR performance and analyst earnings forecast errors, with t-statistics of -5.246 and -6.113. Column (3) presents that the coefficient of *GW_diff* is -0.306, illustrating *GW_diff* increases by 1, the analyst forecast error reduces by 0.306 percentage point. Column (4) shows that the coefficient of *GW_ratio* is -17.823, representing *GW_ratio* increases by one, the analyst forecast error reduces by 17.823 percentage point. The results suggest that, with higher greenwashing levels, the analyst forecast error level reduces, providing support for our Hypothesis 1.

[Insert Table 3-4 around here]

We find significant positive association between leverage and forecast error, and the results provide evidence that highly levered firms have more incentive to manipulate earnings in order to beat analyst forecasts, inducing greater bias in analyst forecasts. This finding is in line with Baum et al. (2003) who also suggest the same notion. Operating cash flow are found to be significantly and negatively associated with forecast errors. We explain the result as firms in average with better ability to generate higher operating cash flow have less intension to manipulate financial reports, leading to more accurate analyst forecasts by reducing the information asymmetry between analysts and the firms. The view is consistent with Lee et al. (1999). The regression results also indicate that firms with higher cash holdings are associated with greater analyst forecast error. This result is consistent with free cash flow theory which proposes that firms that hold greater amount of cash tend to exhibit higher information

asymmetry (Nohel and Tarhan, 1998; Mello and Miranda, 2010; Drobetz et al., 2010). We therefore expect positive association between cash holdings and analyst forecast error. Our findings also reflect that increase in analyst following reduces analyst forecast error, in alignment with well documented views in previous studies (Lys and Soo, 1995; Irani and Karamanou, 2003; Yu, 2008).

3.4.2 Cash holdings, greenwashing and analyst earnings forecast errors

Using Hypothesis 2, we intend to test how the level of cash holdings can have an effect on the relationship between greenwashing and analyst earnings forecast errors. We measure the level of cash holdings by using cash and cash equivalents deflated by the book value of total assets. We then obtain the country-time median cash holdings and form a dummy variable for firms with high levels of cash holdings. Firms with higher levels of cash holdings above the country-time median cash holdings take the value of 1, otherwise they take 0. We then add in the interaction terms, *GW_diff*high_cash_holdings* and *GW_ratio*high_cash_holdings* to our models to test the effect of high levels of cash holdings on the relationship between greenwashing and analyst forecast errors. Table 3-5 shows the results of the empirical tests.

[Insert Table 3-5 around here]

The first two columns of Table 3-5, columns (1) and (2), show the results without including the control variables. *GW_diff* and *GW_ratio* remain robust as being negatively and significantly associated with analyst forecast error. The interaction terms, *GW_diff*high_cash_holdings* and *GW_ratio*high_cash_holdings*, are positively and statistically significant at the 1% significance level. This indicates that the reducing effect of greenwashing on analyst forecast error is less pronounced in firms with a higher level of cash holdings. This test result is in line with our Hypothesis 2. We expect that higher levels of cash holdings have better ability to cope with liquidity risk and financial distress in negative events (the precautionary view) (Almeida et al., 2004; Han and Qiu, 2007; Harford et al., 2014) and also can better fulfil managers' desire of investments (the agency problem view) (Harford,

1999; Gao et al., 2013; Nikolov and Whited, 2014; Jensen, 1986). These firms have less demand to use greenwashing to establish their social capital to seek to relief in financial constraints and investment opportunity. Research demonstrates that better ESG performance is associated with better performance (Edmans, 2011; Lin et al., 2015; Dimson et al., 2015) and lower costs (Goss and Roberts, 2011; El Ghoul et al., 2011a; Dhaliwal et al., 2011), hence, in an effort to win over their stakeholder base, several businesses use greenwashing strategies similar to those used by their rivals. Firms recognise the trend of "becoming green" as a chance to adopt unethical techniques in order to compete with their rivals for profits, and they are taking advantage of this opportunity (Bazillier and Vauday, 2009; Budinsky and Bryant, 2013; Mitchell and Ramey, 2011).

Columns (3) and (4) report the test results when the control variables are added into the regression models. The main independent variables, *GW_diff* and *GW_ratio* remain robust. The interaction terms, *GW_diff*high_cash_holdings* and *GW_ratio*high_cash_holdings*, remain positively and statistically significant at the 1% significance level. The test results are robust.

3.4.3 National culture, greenwashing and analyst earning forecast errors

We test how the impact of greenwashing on analyst forecast errors varies in countries with different national culture characteristics. Following Ho et al. (2012), Peng et al. (2012) and Thanetsunthorn (2015), we use national culture dimensions developed by Hofstede (1980) to capture the different culture characteristics in the countries. There are four dimensions: Power Distance *(PWD)*, Individualism *(IND)*, Uncertainty Avoidance (UAI) and Masculinity *(MAS)*. We again use interaction terms to test the effect of these culture dimensions on the relationship between greenwashing and the activities of analysts.

[Insert Table 3-6 around here]

In panel A of Table 3-6, we present the regression results when analyst forecast error is regressed on *GW_diff* and its interaction terms of national culture dimensions. We notice that,

with the interaction terms, the main independent variable, *GW_diff*, remains robust for Power Distance *(PWD)*, Uncertainty Avoidance (*UAI*) and Masculinity *(MAS)*. However, the findings indicate that it is only for Masculinity *(MAS)* that the interaction term is positively and statistically significant. This is in line with our Hypothesis 3c, implying that, for societies where there is a higher level of masculinity, firms and managers focus mainly on competition and achievement, and are less concerned with stakeholders' interests and community welfare. In these settings, firms are less eager to engage in greenwashing activities. For the other national dimensions, Power Distance *(PWD)*, Individualism *(IND)* and Uncertainty Avoidance (*UAI*), we do not find a significant effect of the interaction terms. Panel B of Table 3-6 reports the test results of analyst forecast errors regressing on *GW_ratio*, and its interaction terms of national culture dimensions. The test results are consistent with those reported in panel A.

3.5 Robustness Check

3.5.1 Robustness tests

We perform several robustness tests by using alternative measures of the independent variables. First, we repeat the baseline tests using an alternative measure of analyst forecast accuracy, this being analyst forecast dispersions, which is the standard deviation of the analyst forecasts for the year, scaled by the firm's share price at the beginning of the year. According to previous research, disagreement among analysts, measured as analyst forecast dispersion, reflects the transparency of the information environment of the analysts (Byard et al., 2011; Preiato et al., 2015). The higher the dispersion, the lower the accuracy of the forecast.

Table 3-7 shows the test results for regressing analyst forecast dispersions on *GW_diff* and *GW_ratio*. Columns (1) and (2) present the regression results when the forecast dispersion is regressed on greenwashing measures when no control variables are added. Columns (3) and (4) present the regression results when firm specific and country specific control variables are included in the models. The results reveal the negative and significant association between *GW_diff* and *GW_ratio* and analyst forecast dispersion. This is in line with our main regression

results when analyst forecast error is adopted. The coefficient of *GW_diff* is -0.080, indicating that a 1 unit increase in *GW_diff* reduces the analyst forecast dispersion by 0.080. The coefficient of *GW_ratio* is -4.184, showing that a 1 percentage point increase in *GW_ratio* reduces the analyst forecast dispersion by 4.184. The test results for control variables remain robust and are consistent with the baseline model results in Table 3-4. Leverage, cash holdings, analyst following and GDP per capita are positively associated with analyst forecast accuracy. Whereas cash flow and GDP growth are negatively associated with analyst forecast dispersion.

[Insert Table 3-7 around here]

Second, we use an alternative measure of cash holdings to test Hypothesis 2. Instead of a dummy variable, we use the cash holdings ratio, calculated by using cash and cash equivalents scaled by the book value of total assets. Table 3-8 reports the test results, showing that the results are consistent with those in Table 3-5. Columns (1) and (2) present the regression results when firm specific and country specific control variables are not included. Whereas columns (3) and (4) show the regression results when control variables are included. Again, the main independent variables, *GW_diff* and *GW_ratio*, are negatively and significantly related to greenwashing. The interaction term of greenwashing and cash holdings is shown to be positive and significant, which is consistent with the test results in Table 3-5. The results are in line with Hypothesis 2, indicating that the negative relationship between greenwashing and analyst forecast error is less pronounced in firms with more cash holdings. The independent variables and interaction terms remain robust.

[Insert Table 3-8 around here]

3.5.2 Endogeneity concerns

We intend to explore the effect of greenwashing on analyst forecast accuracy. However, it may be the case that an increase in analyst attention on engagement with CSR pressurizes firms to

act “green”, leading to more greenwashing activities being committed by the firms. To address the endogeneity concerns brought by reverse causality, we adopt Two-Stage-Least-Square (2SLS) and Generalized Method of Moments (GMM) estimations. Wang (2015) and Gippel et al. (2015) state that 2SLS and GMM approaches are the two effective common ways to address endogeneity concerns due to reverse causality and omitted variables. Both approaches adopt instrumental variables to isolate factors that are correlated with main independent variable, leaving unbiased coefficient of independent variable. According to Gippel et al. (2015), 2SLS approach is an extended approach of OLS where lagged levels of variables are included. GMM approach extends 2SLS approach by also including lagged difference of the variables, and therefore, does not require stationarity analysis. An endogeneity concern is also raised due to the issue of confounding variables. If the magnitude of analyst forecast error associated greenwashing depends on firm characteristics affecting the extent to that firms decide to commit greenwashing activities, the coefficient of negative relationship between greenwashing and analyst forecast error does not reflect the influence of greenwashing alone. In order to reduce the bias caused by observed confounding firm specific characteristics, we employ the approach of propensity score matching (PSM) (Rosenbaum and Rubin, 1979) and entropy balancing (Hainmueller, 2012).

We use the first lag and the second lag of the independent variables, GW_diff_{t-1}, GW_diff_{t-2}, GW_ratio_{t-1} and GW_ratio_{t-2}, as the instrumental variables. Leszczensky and Wolbring (2019) state that lagged explanatory variables are powerful devices for tackling endogeneity problems caused by unobserved omitted variables and reverse causality. This method is also proved to be an effective tool for solving endogeneity problems in the studies by Vo (2010) and Bellemare et al (2017). The test results are provided in Tables 3-9 to 3-12. In the first stage of the estimations, the current period independent variable, *GW_diff* and *GW_ratio*, are regressed on the instrument variables, their first or second lags. We then obtain the predicted values of the first stage regressions. In the second stage of the estimations, we use the original dependent

variable, analyst forecast error, to regress on the predicted values obtained in the first stage. The model specifications are defined as:

The first stage:

$$Greenwashing_{it} = \beta_0 + \beta_1 Greenwashing_{it-k} + \beta_2 FirmControls_{it-1} + \beta_3 CountryControls_{it-1} + \beta_4 Industry_i + \beta_5 Year_t + \beta_6 Country_i + \varepsilon_{it} \quad (4)$$

The second stage:

$$Forecast_{it} = \beta_0 + \beta_1 Greenwashing\_predicted_{it-1} + \beta_2 FirmControls_{it-1} + \beta_3 CountryControls_{it-1} + \beta_4 Industry_i + \beta_5 Year_t + \beta_6 Country_i + \varepsilon_{it} \quad (5)$$

Where $Greenwashing_{it}$ represents the original independent variable, GW_diff_{it} and GW_ratio_{it}, $Greenwashing_{it-k}$ represents the first and second lag of GW_diff_{it} and GW_ratio_{it}. *FirmControl* and *CountryControl* refers to a set of firm level control variables and country level control variables. We still include industry, year and country fixed effect.

Table 3-9 and Table 3-10 show the results of the 2SLS models for analyst forecast errors. First, we regress analyst forecast error on the instrumental variables of *GW_diff* and *GW_ratio*, the first and the second lag of the explanatory variables. The coefficients of the lagged *GW_diff* and *GW_ratio* show a negative and significant relationship with analyst forecast error. The result is consistent with the baseline model results found in Table 3-4. The control variables also remain robust as baseline model results. The results show that, when we capture the effects of unobserved heterogeneity and reverse causality, the negative relationship between greenwashing and analyst forecast error still remains significant.

[Insert Tables 3-9 and 3-10 around here]

Table 3-11 and Table 3-12 report the test results for analyst forecast errors and analyst forecast dispersions, respectively, when the GMM approach is adopted. Again, we regress analyst

forecast error and analyst forecast dispersion when lagged greenwashing measures are adopted as instrumental variables. The coefficients of the instrumental variables remain negative and significant, providing additional evidence for the endogeneity tests. In general, the test results remain robust when instrumental variables are used and are shown to be significantly and negatively associated with analyst forecast error and dispersion when endogeneity is addressed.

[Insert Tables 3-11 and 3-12 around here]

In Table 3-13 and Table 3-14, we repeat the 2SLS approach and GMM approach by using alternative instrumental variables: industry-year mean and industry-country-year mean of the greenwashing measures. We compute the industry-year mean by using the average *GW_diff* and *GW_ratio* for each industry and fiscal year. We exclude the firm of interest itself when we calculate the industry-year average greenwashing. We compute the industry-country-year mean by using the average *GW_diff* and *GW_ratio* for each industry and fiscal year in each country. We exclude the firm of interest itself when we calculate the industry-country-year average greenwashing. In both Table 3-13 and Table 3-14, we notice that the coefficients of *GW_diff* and *GW_ratio* are significant and negative, which is consistent with the results of our baseline model. By adopting the industry-year mean greenwashing and the industry-country-year mean greenwashing as instrumental variables, we can confirm that our results are robust.

[Insert Tables 3-13 and 3-14 around here]

An endogeneity concern is also raised due to the issue of confounding variables. If the magnitude of analyst forecast error associated greenwashing depends on firm characteristics affecting the extent to that firms decide to commit greenwashing activities, the coefficient of negative relationship between greenwashing and analyst forecast error does not reflect the influence of greenwashing alone. In order to reduce the bias caused by observed confounding firm specific characteristics, we employ the approach of propensity score matching (PSM) (Rosenbaum and Rubin, 1979) and entropy balancing (Hainmueller, 2012). These two approaches help to address the non-random mutual selection bias.

We split the samples into treatment and control groups and into high and low greenwashing levels by using the industry-year median of greenwashing measures, *GW_diff* and *GW_diff*. Firms with greenwashing levels that are higher than the industry-year mean are allocated to the high greenwashing group (*High_GW_diff* and *High_GW_ratio*) and firms with greenwashing levels that are lower than the industry-year mean are allocated to the low greenwashing group (*Low_GW_diff* and *Low_GW_ratio*). The high *GW_diff* (High GW_ratio) subsample is allocated as the treatment group and the low GW_diff (Low GW_ratio) subsample is allocated as the control group. For the PSM approach, we first estimate the probability that a firm with a set of firm characteristics variables is run by higher greenwashing firms. To ensure comparable treatment sample and control sample, the matching sample is constructed by using a nearest-neighbor one-to-one match with replacement, and has a caliper width of 0.01.

Table 3-15 reports the regression results using a PSM approach and an entropy balancing approach. Columns (1) and (2) present the results when analyst forecast errors is regressed on *High_GW_diff* and *High_GW_ratio* using the PSM approach. The coefficients of *High_GW_diff* and *High_GW_ratio* are significant and negative. The results confirm the significant negative association between analyst forecast errors and greenwashing. The regression results are consistent with our baseline model results reported in Table 3-15. Columns (3) and (4) present the regression results when the estimate is made using entropy balancing. To ensure that treatment and control samples have a similar distribution of firm-level features, entropy balancing is used to identify weights for the control sample. Previous studies have shown that entropy balancing may greatly enhance model specification by lowering coefficient bias in comparison to propensity-score matched models (Hainmueller, 2012; Mcmullin and Schonberger, 2020). The regression results are consistent with our hypotheses and test results in our baseline models. The results obtained after addressing the endogeneity due to observable confounding firm-level characteristics by employing PSM and

entropy balancing approaches illustrate that the coefficients of independent variables and control variables remain significant and robust.

[Insert Table 3-15 around here]

3.5.3 Mandatory disclosure

Due to the increasing scenario of greenwashing, countries implementing mandatory disclosures intend to curb greenwashing (i.e., Delmas and Burbano, 2011; Gatti, Seele and Rademacher, 2019) and insufficient disclosure by firms. As per Dhaliwal et al. (2012), mandatory CSR reporting could enhance the quality of CSR reports and hence increase their informativeness. Dhaliwal et al. (2012) also argue that the incorporation of CSR information helps improve analyst forecast precision. This is also found to be true in the Taiwan market in Tseng and Shih (2022). In order to test whether analysts forecast error reduces due to mandatory disclosure instead of greenwashing, we performed the test on the association between mandatory disclosure and forecast errors, forecast dispersion, and the number of analyst followers. We seek to investigate whether the effect of greenwashing on analyst forecast errors may be due to mandatory disclosures of CSR performance in certain countries. As per Dhaliwal et al. (2012), mandatory CSR reporting could enhance quality of CSR reports and hence increase the informativeness. Dhaliwal et al. (2012) also argue that incorporation of CSR information help to improve analyst forecast precision. This is also found to be true in Taiwan market in Tseng and Shih (2022).

We perform a channel effect test to reveal whether mandatory disclosures have an impact on analyst forecasts and analyst followings. Following Krueger et al. (2021), we used dummy variable, *Mandatory*, to indicate the year a country starts to implement mandatory disclosure on ESG information and years thereafter the implementation. *Mandatory* equals one for all country-years starting with the first year after a country introduced mandatory ESG disclosure

regulation, and zero otherwise. Table 3-16 presents the test results when analyst forecast errors, analyst forecast dispersions and analyst following are regressed on mandatory disclosure. The test regression results reveal that all three coefficients of mandatory disclosure are insignificant, indicating that there is no effect of mandatory disclosure on analyst forecast accuracy and analyst following. We then conclude that the effect of greenwashing on analyst forecast error is not due to mandatory disclosure.

[Insert Table 3-16 around here]

3.5.4 Analyst optimism

We propose that the channel which greenwashing reduce analyst forecast error is that analyst carry favourable information in their profit projections that collude managers in return for greater forecast precision. We argue that analysts incorporate favourable information to please management in order to gain more private access to confidential managerial information. Analysts may then issue forecasts which are more favourable for the firms, thus, increasing the forecast optimism. When analysts produce forecasts which contain greenwashing information, the level of analyst forecast optimism increases. Therefore, we expect there to be a positive association between analyst forecast optimism and greenwashing. Following (Hong and Kubik, 2003; Jackson, 2005; Li et al., 2021), we calculate analyst forecast optimism by using average analyst forecasts for earnings per share subtract the actual earnings per share for the fiscal year scaled by previous year's closing price. Table 3-17 presents the regression results when analyst forecast optimism is regressed on greenwashing. The coefficients of *GW_diff* and *GW_ratio* are both positive and significant, illustrating a significant and positive relationship between analyst forecast optimism and greenwashing. The results provide evidence that analysts try to cater to the demands of managers by incorporating favorable greenwashing information within their forecasts. This supports our argument that greenwashing lead to reduced analyst forecast error since analyst issue more optimistic profit projections to favour managers. Greenwashing

exaggerates the agency problem inherent in the relationship between analysts and firm management.

[Insert Table 3-17 around here]

3.6 Conclusion

Previous papers mainly focus on the determinants and consequences of corporate social responsibility performance. Very few studies, especially in the field of finance, investigate the impact of greenwashing in aspects of corporate finance. In this paper, we examine how firms' greenwashing activities, measured by using the difference between their symbolic CSR performance and substantive CSR performance, and the ratio between the two, affect analyst forecast accuracy. We also test how the impact of greenwashing varies for firms with different levels of cash holdings and for firms located in countries with different national culture characteristics.

We find that, analyst forecast errors are significantly and negatively associated with greenwashing. This provides the evidence that analysts may collude with firm managers to improve a firm's reputation and image creation. In return, analysts may receive private information to improve the accuracy of their forecasts. We also find that the greenwashing effect on analyst forecast errors is less pronounced in firms with higher levels of cash holdings. This may suggest that firms with greater cash holdings exhibit higher levels of idiosyncratic risk and systematic risk, implying that they are less creditworthy. Shareholders and stakeholders request more transparency and impose a higher cost of financing on these firms, leading to a lower likelihood of firms engaging in greenwashing activities. The agency theory also suggests that higher levels of cash holdings may be caused by entrenched managers holding a greater level of power. Managers pay less attention to stakeholder interests and community welfare, leading to a reduced demand for committing to greenwashing activities.

Additionally, we find that, out of four dimensions of national culture, Masculinity (*MAS*) has a significant influence on the relationship between greenwashing and analyst forecast errors. The negative association between greenwashing and analyst forecast errors is less pronounced in countries with a higher level of masculinity. Whereas we find no significant effect of the other three cultural dimensions: Power Distance *(PWD)*, Individualism *(IND)*, Uncertainty Avoidance (*UAI*).

Our paper contributes to the existing literature in several ways. First, this paper extends the literature that explores the impact of firms' greenwashing activities. There is a considerable quantity of literature examining the impact of CSR performance in the fields of management, business operation, accounting and finance. Others focus on the effect of the quality of CSR disclosure. As the adoption of CSR activities as a business strategy expands, firms are increasingly faced with the public scepticism of greenwashing. The effect of greenwashing engagement in the field of finance remains relatively unexplored. To our knowledge, this is the first paper which examines the impact of greenwashing activities on financial analysts. We perform an empirical analysis based on a large sample across an international setting. Our investigation provides evidence that greenwashing, although used by firms to convey misleading information, is associated with an improvement in analyst forecast accuracy. Our study also contributes to the literature of analyst earnings forecasts and behaviours of analysts. Our study provides evidence that an increase in non-financial information disclosures will improve analyst forecast accuracy. We also provide evidence that analysts may collude with management to help to convey greenwashing information, as a way of gaining the favour of managers in return for improved access to private information. This then enables the analysts to produce more accurate forecasts. In addition, this paper provides market practitioners with a clearer picture of how analysts, as vital participants within the financial markets, can be influenced by firms' greenwashing activities, and provides information to market participants and regulators on how analysts can respond to firms' greenwashing activities.

Table 3- 1: Descriptive statistics

Variables	Count	Mean	p25	p50	p75	Standard Deviation
Forecast error	39278	33.682	1.889	8.559	28.271	79.390
Forecast dispersion	39278	9.061	0.718	2.655	7.649	21.520
GW_diff	39278	-12.602	-22.928	-13.567	-2.390	13.723
GW_ratio	39278	0.743	0.519	0.708	0.947	0.286
Firm size	39278	22.708	21.601	22.576	23.718	1.634
Leverage	39278	0.604	0.456	0.607	0.760	0.217
Cash flow	39278	0.081	0.040	0.077	0.119	0.081
Tobin's Q	39278	1.759	1.051	1.333	1.952	1.232
Cash holdings	38779	0.091	0.027	0.063	0.124	0.094
No. of reports	39278	2.395	1.946	2.565	2.944	0.782
GDP per capita	39270	43207	40045	47403	51809	18487
GDP growth	39265	2.122	1.268	2.161	2.996	2.479

This table reports the descriptive statistics. The sample period is from 2002 to 2019. Table 3-1 presents the time-series mean, median, the 25th percentile, the 75th percentile and standard deviation of the variables. All variables are defined in Appendix B.

Table 3- 2: Summary by countries

Country	No. of Obs.	No. of Firms	Mean			
			Forecast Error	*Forecast dispersion*	*GW_diff*	*GW_ratio*
Argentina	51	17	234.780	31.140	-10.841	0.766
Australia	67	8	40.798	15.981	-18.752	0.595
Austria	219	26	25.668	10.827	-11.712	0.767
Belgium	341	37	25.825	13.699	-10.931	0.776
Bermuda	592	69	42.424	14.774	-17.258	0.634
Brazil	556	77	67.728	23.483	-9.112	0.824
Canada	2369	264	40.822	8.531	-13.817	0.716
Cayman Islands	295	43	55.049	14.479	-22.395	0.546
Chile	232	31	37.226	12.744	-14.493	0.706
China (Mainland)	1054	268	81.717	21.174	-21.238	0.559
Colombia	75	13	50.210	8.844	-6.637	0.867
Denmark	374	35	23.196	10.015	-12.563	0.742
Finland	372	32	20.063	10.315	-7.673	0.848
France	1262	123	22.958	10.977	-4.805	0.911
Germany	1024	118	35.502	15.010	-6.583	0.873
Greece	207	21	118.843	41.427	-12.487	0.747
India	828	125	42.165	14.896	-9.227	0.816
Indonesia	309	38	49.180	4.327	-15.928	0.686
Ireland	398	33	40.827	9.825	-9.748	0.806
Israel	154	18	30.071	6.950	-15.474	0.679
Italy	500	56	54.863	21.420	-6.090	0.875
Japan	5241	400	22.692	6.369	-17.205	0.651
Kuwait	53	8	17.064	8.157	-18.594	0.602
Luxembourg	77	8	47.894	18.646	-9.180	0.812
Malaysia	375	49	26.776	8.689	-12.033	0.756
Mexico	257	33	41.440	15.495	-10.993	0.778

Country	No. of Obs.	No. of Firms	Mean			
			Forecast Error	*Forecast dispersion*	*GW_diff*	*GW_ratio*
Netherlands	460	43	29.076	13.758	-5.600	0.889
New Zealand	210	29	25.666	4.362	-17.287	0.645
Norway	246	29	51.254	21.308	-10.360	0.794
Oman	38	8	21.611	7.988	-24.025	0.496
Peru	54	14	182.818	31.154	-19.134	0.625
Philippines	203	24	34.543	11.614	-15.506	0.681
Poland	204	30	43.938	16.577	-14.398	0.687
Portugal	110	11	46.514	28.266	-5.598	0.893
Qatar	67	12	25.057	6.111	-24.942	0.468
Russia	219	31	81.065	22.560	-12.604	0.745
Saudi Arabia	110	19	26.077	7.398	-23.895	0.514
Singapore	487	40	18.224	7.666	-17.277	0.646
South Africa	708	95	30.927	8.342	-5.967	0.883
South Korea	877	113	84.806	22.270	-16.415	0.683
Spain	535	47	29.031	16.324	-5.288	0.910
Sweden	703	80	35.693	11.093	-9.898	0.807
Switzerland	874	92	19.939	8.868	-10.153	0.792
Thailand	313	58	52.042	12.306	-9.642	0.812
Turkey	249	37	86.959	30.469	-12.395	0.759
United Arab Emir	59	13	42.706	13.132	-19.360	0.596
United Kingdom	3220	271	25.065	8.770	-8.578	0.828
United States	12050	1477	24.985	2.767	-13.026	0.730
Total	39278	4523				

This table reports the descriptive statistics of main regression variables by countries. The sample period is from 2002 to 2019. Table 2-2 presents the number of firm-year observations, the number of firms and mean of dependent variables and independent variables by countries. All variables are defined in Appendix B.

Table 3- 3: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Forecast error	1											
(2) Forecast dispersion	**0.574**	1										
(3) GW_diff	-0.009	0.002	1									
(4) GW_ratio	**-0.010**	0.003	**0.987**	1								
(5) Firm size	**-0.026**	**0.063**	**0.366**	**0.370**	1							
(6) Leverage	**0.026**	**0.074**	**0.125**	**0.120**	**0.469**	1						
(7) Cash flow	**-0.067**	**-0.085**	**-0.013**	-0.007	**-0.198**	**-0.308**	1					
(8) Tobin's Q	**-0.019**	**-0.080**	**-0.074**	**-0.070**	**-0.369**	**-0.245**	**0.453**	1				
(9) Cash holdings	**0.026**	**-0.005**	**-0.113**	**-0.108**	**-0.241**	**-0.251**	**0.094**	**0.298**	1			
(10) No. of reports	**-0.077**	**0.036**	**0.337**	**0.346**	**0.414**	**0.055**	**0.143**	**0.109**	**-0.035**	1		
(11) GDP per capita	**-0.089**	**-0.124**	-0.001	-0.007	**-0.078**	**-0.062**	**-0.017**	**0.027**	**0.048**	**-0.011**	1	
(12) GDP growth	**0.046**	**0.017**	**-0.076**	**-0.078**	**0.011**	0.003	**0.063**	**0.098**	**-0.017**	**0.037**	**-0.312**	1

This reports the correlation matrix of the variables. The sample period is from 2002 to 2019. A correlation in bold indicates the statistically significance at 5 percent level or above. All variables are defined in Appendix B.

Table 3- 4: The impact of greenwashing on analyst forecast error

	(1) Forecast error	(2) Forecast error	(3) Forecast error	(4) Forecast error
GW_diff	-0.300***		-0.306***	
	(-6.090)		(-5.246)	
GW_ratio		-16.439***		-17.823***
		(-6.804)		(-6.113)
Firm size			0.442	0.761
			(0.647)	(1.103)
Leverage			17.807***	17.759***
			(4.698)	(4.690)
Cash flow			-57.193***	-57.049***
			(-5.814)	(-5.806)
Tobin's Q			1.230*	1.269*
			(1.889)	(1.952)
Cash holdings			17.477**	17.844**
			(2.202)	(2.249)
No. of reports			-2.296*	-2.120*
			(-1.939)	(-1.790)
GDP per capita			0.001	0.001
			(1.270)	(1.240)
GDP growth			-2.137***	-2.140***
			(-5.572)	(-5.584)
Constant	194.150***	209.177***	173.974***	182.132***
	(4.261)	(4.592)	(3.517)	(3.718)
Industry fixed effect	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.121	0.121	0.128	0.128
Obs.	38766	38766	38766	38766

The table summarizes the results of panel data regressions of analyst forecast errors on greenwashing measures. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 5: The impact of high cash holdings on the relationship between greenwashing and analyst forecast error

	(1) Forecast error	(2) Forecast error	(3) Forecast error	(4) Forecast error
GW_diff	-0.404***		-0.390***	
	(-7.069)		(-5.934)	
High_cash_holding* GW diff	0.260***		0.212***	
	(3.411)		(2.802)	
GW_ratio		-21.309***		-21.703***
		(-7.703)		(-6.748)
High_cash_holding* GW ratio		12.534***		10.332***
		(3.465)		(2.875)
High_cash_holding	3.350**	-9.295***	3.622**	-6.671**
	(2.301)	(-3.046)	(2.455)	(-2.201)
Firm size			0.473	0.774
			(0.691)	(1.120)
Leverage			16.202***	16.131***
			(4.318)	(4.299)
Cashflow			-56.219***	-56.160***
			(-5.781)	(-5.781)
Tobin's q			1.515**	1.553**
			(2.327)	(2.387)
No. of reports			-2.647**	-2.477**
			(-2.215)	(-2.071)
GDP per capita			0.001	0.001
			(1.227)	(1.203)
GDP growth			-2.098***	-2.100***
			(-5.492)	(-5.501)
Constant	191.183***	211.155***	173.534***	186.129***
	(4.196)	(4.632)	(3.532)	(3.825)
Industry fixed effect	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.120	0.121	0.127	0.127
Obs.	39278	39278	39265	39265

The table summarizes the results of panel data regressions of analyst forecast errors on greenwashing measures and the interaction term of greenwashing measures with high cash holdings dummy variables, *GW_diff*High_cash_holdings* and *GW_ratio*High_cash_holdings*. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 6: The effect of national culture of the country on the relationship between greenwashing and analyst forecast error

Panel A: Greenwashing difference

	(1) Forecast error	(2) Forecast error	(3) Forecast error	(4) Forecast error
GW_diff	-0.462***	-0.123	-0.743***	-0.455***
	(-3.109)	(-0.809)	(-3.939)	(-3.199)
Power distance	25.948***			
	(4.231)			
GW_diff*	0.003			
	(1.135)			
Individualism		-5.195***		
		(-4.233)		
GW_diff*		-0.003		
		(-1.388)		
Masculinity			-38.433***	
			(-4.181)	
GW_diff*			0.007***	
			(2.696)	
Uncertainty				5.892***
				(4.289)
GW_diff*				0.002
				(1.183)
Constant	-1096.733***	412.690***	2326.162***	-331.197***
	(-4.155)	(4.122)	(4.199)	(-3.876)
Controls	Y	Y	Y	Y
Industry fixed	Y	Y	Y	Y
Country fixed	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.130	0.130	0.131	0.130
Obs.	37426	37426	37426	37426

Panel B: Greenwashing ratio

	(1) Forecast error	(2) Forecast error	(3) Forecast error	(4) Forecast error
GW_ratio	-22.656***	-10.769	-39.552***	-23.366***
	(-3.272)	(-1.430)	(-4.799)	(-3.530)
Power distance	25.693***			
	(4.196)			
GW_ratio*	0.100			
	(0.753)			
Individualism		-5.059***		
		(-4.098)		
GW_ratio*		-0.110		
		(-1.073)		
Masculinity			-38.661***	

			(-4.215)	
GW_ratio*			0.348***	
			(3.053)	
Uncertainty				5.762***
				(4.169)
GW_ratio*				0.092
				(0.925)
Constant	-1075.627***	413.146***	2349.251***	-314.112***
	(-4.079)	(4.118)	(4.251)	(-3.662)
Controls	Y	Y	Y	Y
Industry fixed	Y	Y	Y	Y
Country fixed	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.131	0.131	0.131	0.131
Obs.	37426	37426	37426	37426

The table summarizes the results of panel data regressions of analyst forecast errors on greenwashing measures and the interaction term of greenwashing measures, *GW_diff* and *GW_ratio* with the national culture indexes variables, *GW_diff*national culture indexes* and *GW_ratio*national culture indexes. National culture index* includes *Power distance index, Individualism index, Masculinity index* and *Uncertainty avoidance index*. The sample period is from 2002 to 2019. Panel A presents the regression results of analyst forecast error on *GW_diff* and *GW_diff*national culture indexes.* Panel B presents the regression results of analyst forecast error on *GW_ratio* and *GW_ratio*national culture indexes.* Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 7: The impact of greenwashing on analyst forecast dispersion (Robustness check)

	(1) Forecast dispersion	(2) Forecast dispersion	(3) Forecast dispersion	(4) Forecast dispersion
GW_diff	-0.024		-0.080***	
	(-1.582)		(-4.658)	
GW_ratio		-1.262*		-4.184***
		(-1.708)		(-4.928)
Firm size			-0.059	-0.017
			(-0.291)	(-0.085)
Leverage			6.124***	6.114***
			(5.627)	(5.618)
Cash flow			-19.283***	-19.246***
			(-7.127)	(-7.114)
Tobin's Q			-0.211	-0.205
			(-1.333)	(-1.293)
Cash holdings			4.428**	4.499**
			(2.070)	(2.103)
No. of reports			1.985***	2.006***
			(7.062)	(7.133)
GDP per capita			0.000*	0.000*
			(1.947)	(1.935)
GDP growth			-0.530***	-0.530***
			(-4.481)	(-4.478)
Constant	30.919***	32.094***	24.589**	27.500***
	(3.206)	(3.333)	(2.426)	(2.737)
Industry fixed effect	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.117	0.117	0.130	0.131
Obs.	38766	38766	38766	38766

The table summarizes the results of panel data regressions of analyst forecast dispersions on greenwashing measures. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 8: The effect of cash holdings on the relationship between greenwashing and analyst forecast error

	(1) Forecast error	(2) Forecast error	(3) Forecast error	(4) Forecast error
GW_diff	-0.409***		-0.410***	
	(-5.823)		(-5.235)	
Cash holdings* GW diff	1.262**		1.064*	
	(2.204)		(1.872)	
GW_ratio		-22.161***		-23.342***
		(-6.534)		(-6.127)
Cash holdings* GW ratio		67.452**		58.927**
		(2.465)		(2.173)
Cash holdings	31.209***	-34.778	35.323***	-20.944
	(2.928)	(-1.644)	(3.254)	(-0.993)
Firm size			0.564	0.880
			(0.830)	(1.282)
Leverage			17.262***	17.132***
			(4.553)	(4.523)
Cash flow			-57.313***	-57.269***
			(-5.815)	(-5.815)
Tobin's Q			1.332**	1.375**
			(2.051)	(2.118)
No. of reports			-2.293*	-2.123*
			(-1.936)	(-1.793)
GDP per capita			0.001	0.001
			(1.283)	(1.259)
GDP growth			-2.146***	-2.149***
			(-5.600)	(-5.610)
Constant	190.318***	210.904***	168.769***	182.311***
	(4.154)	(4.606)	(3.404)	(3.717)
Industry fixed effect	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.121	0.122	0.128	0.129
Obs.	38766	38766	38766	38766

The table summarizes the results of panel data regressions of analyst forecast errors on greenwashing measures and the interaction term of greenwashing measures with firms' cash holdings, *GW_diff* cash_holdings* and *GW_ratio* cash_holdings*. *Cash_holdings* is the amount of cash and cash equivalents scaled by total assets at the end of the previous year. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 9: The impact of greenwashing on analyst forecast error using 2SLS

	(1) GW_diff	(2) forecast	(3) GW_ratio	(4) forecast	(5) GW_diff	(6) forecast	(7) GW_ratio	(8) forecast
L.GW_diff	0.872***							
	(275.591)							
GW_diff_Pred		-0.303***				-0.329***		
		(-4.618)				(-4.404)		
L.GW_ratio			0.898***					
			(289.621)					
GW_ratio_Pred				-17.526***				-18.706***
				(-5.421)				(-5.138)
L2.GW_diff					0.790***			
					(148.680)			
L2.GW_ratio							0.828***	
							(159.775)	
Firm size	0.604***	0.546	0.011***	0.858	0.996***	0.717	0.018***	1.028
	(19.834)	(0.753)	(18.451)	(1.175)	(18.458)	(0.927)	(17.303)	(1.316)
Leverage	0.030	17.238***	-0.001	17.210***	0.092	17.884***	0.000	17.873***
	(0.180)	(4.406)	(-0.211)	(4.403)	(0.305)	(4.417)	(0.047)	(4.417)
Cash flow	0.454	-60.512***	0.011	-60.350***	0.632	-65.767***	0.019	-65.536***
	(1.092)	(-5.715)	(1.450)	(-5.708)	(0.931)	(-5.597)	(1.417)	(-5.584)
Tobin's Q	0.012	1.021	0.000	1.054	0.035	1.229	0.000	1.256
	(0.403)	(1.435)	(0.339)	(1.482)	(0.685)	(1.577)	(0.396)	(1.614)
Cash holdings	0.113	17.628**	0.003	18.007**	0.180	17.648**	0.005	18.078**
	(0.306)	(2.189)	(0.396)	(2.237)	(0.272)	(2.136)	(0.391)	(2.189)
No. of reports	0.425***	-2.470*	0.007***	-2.294*	0.791***	-2.203	0.014***	-2.024
	(7.843)	(-1.864)	(7.291)	(-1.731)	(8.187)	(-1.539)	(7.836)	(-1.414)
GDP per capita	-0.000	0.001	-0.000	0.001	-0.000	0.000	-0.000	0.000
	(-1.527)	(1.181)	(-1.106)	(1.156)	(-0.961)	(0.759)	(-0.659)	(0.735)
GDP growth	0.008	-2.049***	0.000	-2.057***	-0.005	-1.680***	-0.000	-1.686***
	(0.393)	(-5.253)	(0.117)	(-5.274)	(-0.157)	(-4.001)	(-0.061)	(-4.015)
Constant	-13.312***	235.341**	-0.107***	245.547**	-17.488***	229.014**	-0.088	240.875**
	(-9.506)	(4.586)	(-3.643)	(4.833)	(-5.528)	(4.440)	(-1.212)	(4.728)
Industry fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.867	0.130	0.889	0.130	0.790	0.133	0.817	0.133
Obs.	34133	34133	34133	34133	30159	30159	30159	30159

The table summarizes the results of 2SLS approach of analyst forecast errors on instrumental variables of greenwashing measures. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 10: The impact of greenwashing on analyst forecast dispersion using 2SLS

	(1) GW_diff	(2) Forecast dispersion	(3) GW_ratio	(4) Forecast dispersion	(5) GW_diff	(6) Forecast dispersion	(7) GW_ratio	(8) Forecast dispersion
L.GW_diff	0.872***							
	(275.591)							
GW_diff_Pred		-0.087***				-0.092***		
		(-4.432)				(-4.183)		
L.GW_ratio			0.898***					
			(289.621)					
GW_ratio_Pred				-4.338***				-4.535***
				(-4.622)				(-4.403)
L2.GW_diff					0.790***			
					(148.680)			
L2.GW_ratio							0.828***	
							(159.775)	
Firm size	0.604***	0.032	0.011***	0.059	0.996***	0.103	0.018***	0.124
	(19.834)	(0.152)	(18.451)	(0.274)	(18.458)	(0.454)	(17.303)	(0.548)
Leverage	0.030	5.986***	-0.001	5.976***	0.092	5.883***	0.000	5.873***
	(0.180)	(5.456)	(-0.211)	(5.446)	(0.305)	(5.338)	(0.047)	(5.328)
Cash flow	0.454	-18.330***	0.011	-18.300***	0.632	-19.597***	0.019	-19.566***
	(1.092)	(-6.640)	(1.450)	(-6.629)	(0.931)	(-6.620)	(1.417)	(-6.607)
Tobin's Q	0.012	-0.225	0.000	-0.220	0.035	-0.208	0.000	-0.204
	(0.403)	(-1.366)	(0.339)	(-1.336)	(0.685)	(-1.232)	(0.396)	(-1.209)
Cash holdings	0.113	3.785*	0.003	3.854*	0.180	4.086*	0.005	4.158*
	(0.306)	(1.696)	(0.396)	(1.727)	(0.272)	(1.782)	(0.391)	(1.813)
No. of reports	0.425***	1.855***	0.007***	1.868***	0.791***	1.736***	0.014***	1.746***
	(7.843)	(6.002)	(7.291)	(6.041)	(8.187)	(5.232)	(7.836)	(5.262)
GDP per capita	-0.000	0.000*	-0.000	0.000*	-0.000	0.000	-0.000	0.000
	(-1.527)	(1.780)	(-1.106)	(1.774)	(-0.961)	(1.471)	(-0.659)	(1.466)
GDP growth	0.008	-0.533***	0.000	-0.533***	-0.005	-0.491***	-0.000	-0.491***
	(0.393)	(-4.432)	(0.117)	(-4.431)	(-0.157)	(-3.636)	(-0.061)	(-3.633)
Constant	-13.312***	26.177**	-0.107***	29.907***	-17.488***	32.180**	-0.088	36.281***
	(-9.506)	(2.547)	(-3.643)	(2.937)	(-5.528)	(2.368)	(-1.212)	(2.688)
Industry fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.867	0.127	0.889	0.128	0.790	0.135	0.817	0.135
Obs.	34133	34133	34133	34133	30159	30159	30159	30159

The table summarizes the results of 2SLS approach of analyst forecast dispersions on instrumental variables of greenwashing measures. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 11: The impact of greenwashing on analyst forecast error using GMM

	(1) GW_diff	(2) Forecast error	(3) GW_ratio	(4) Forecast error	(5) GW_diff	(6) Forecast error	(7) GW_ratio	(8) Forecast error
L.GW_diff	0.872***							
	(275.591)							
GW_diff_Pred		-0.303***				-0.329***		
		(-4.618)				(-4.404)		
L.GW_ratio			0.898***					
			(289.621)					
GW_ratio_Pred				-17.526***				-18.706***
				(-5.421)				(-5.138)
L2.GW_diff					0.790***			
					(148.680)			
L2.GW_ratio							0.828***	
							(159.775)	
Firm size	0.604***	0.546	0.011***	0.858	0.996***	0.717	0.018***	1.028
	(19.834)	(0.753)	(18.451)	(1.175)	(18.458)	(0.927)	(17.303)	(1.316)
Leverage	0.030	17.238***	-0.001	17.210***	0.092	17.884***	0.000	17.873***
	(0.180)	(4.406)	(-0.211)	(4.403)	(0.305)	(4.417)	(0.047)	(4.417)
Cash flow	0.454	-60.512***	0.011	-60.350***	0.632	-65.767***	0.019	-65.536***
	(1.092)	(-5.715)	(1.450)	(-5.708)	(0.931)	(-5.597)	(1.417)	(-5.584)
Tobin's Q	0.012	1.021	0.000	1.054	0.035	1.229	0.000	1.256
	(0.403)	(1.435)	(0.339)	(1.482)	(0.685)	(1.577)	(0.396)	(1.614)
Cash holdings	0.113	17.628**	0.003	18.007**	0.180	17.648**	0.005	18.078**
	(0.306)	(2.189)	(0.396)	(2.237)	(0.272)	(2.136)	(0.391)	(2.189)
No. of reports	0.425***	-2.470*	0.007***	-2.294*	0.791***	-2.203	0.014***	-2.024
	(7.843)	(-1.864)	(7.291)	(-1.731)	(8.187)	(-1.539)	(7.836)	(-1.414)
GDP per capita	-0.000	0.001	-0.000	0.001	-0.000	0.000	-0.000	0.000
	(-1.527)	(1.181)	(-1.106)	(1.156)	(-0.961)	(0.759)	(-0.659)	(0.735)
GDP growth	0.008	-2.049***	0.000	-2.057***	-0.005	-1.680***	-0.000	-1.686***
	(0.393)	(-5.253)	(0.117)	(-5.274)	(-0.157)	(-4.001)	(-0.061)	(-4.015)
Constant	-13.312***	235.341***	-0.107***	245.547***	-17.488***	229.014***	-0.088	240.875***
	(-9.506)	(4.586)	(-3.643)	(4.833)	(-5.528)	(4.440)	(-1.212)	(4.728)
Industry fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.867	0.130	0.889	0.130	0.790	0.133	0.817	0.133
Obs.	34133	34133	34133	34133	30159	30159	30159	30159

The table summarizes the results of GMM approach of analyst forecast errors on instrumental variables of greenwashing measures. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 12: The impact of greenwashing on analyst forecast dispersion using GMM

	(1) GW_diff	(2) Forecast dispersion	(3) GW_ratio	(4) Forecast dispersion	(5) GW_diff	(6) Forecast dispersion	(7) GW_ratio	(8) Forecast dispersion
L.GW_diff	0.872***							
	(275.591)							
GW_diff_Pred		-0.087***				-0.092***		
		(-4.432)				(-4.183)		
L.GW_ratio			0.898***					
			(289.621)					
GW_ratio_Pred				-4.338***				-4.535***
				(-4.622)				(-4.403)
L2.GW_diff					0.790***			
					(148.680)			
L2.GW_ratio							0.828***	
							(159.775)	
Firm size	0.604***	0.032	0.011***	0.059	0.996***	0.103	0.018***	0.124
	(19.834)	(0.152)	(18.451)	(0.274)	(18.458)	(0.454)	(17.303)	(0.548)
Leverage	0.030	5.986***	-0.001	5.976***	0.092	5.883***	0.000	5.873***
	(0.180)	(5.456)	(-0.211)	(5.446)	(0.305)	(5.338)	(0.047)	(5.328)
Cash flow	0.454	-18.330***	0.011	-18.300***	0.632	-19.597***	0.019	-19.566***
	(1.092)	(-6.640)	(1.450)	(-6.629)	(0.931)	(-6.620)	(1.417)	(-6.607)
Tobin's Q	0.012	-0.225	0.000	-0.220	0.035	-0.208	0.000	-0.204
	(0.403)	(-1.366)	(0.339)	(-1.336)	(0.685)	(-1.232)	(0.396)	(-1.209)
Cash holdings	0.113	3.785*	0.003	3.854*	0.180	4.086*	0.005	4.158*
	(0.306)	(1.696)	(0.396)	(1.727)	(0.272)	(1.782)	(0.391)	(1.813)
No. of reports	0.425***	1.855***	0.007***	1.868***	0.791***	1.736***	0.014***	1.746***
	(7.843)	(6.002)	(7.291)	(6.041)	(8.187)	(5.232)	(7.836)	(5.262)
GDP per capita	-0.000	0.000*	-0.000	0.000*	-0.000	0.000	-0.000	0.000
	(-1.527)	(1.780)	(-1.106)	(1.774)	(-0.961)	(1.471)	(-0.659)	(1.466)
GDP growth	0.008	-0.533***	0.000	-0.533***	-0.005	-0.491***	-0.000	-0.491***
	(0.393)	(-4.432)	(0.117)	(-4.431)	(-0.157)	(-3.636)	(-0.061)	(-3.633)
Constant	-13.312***	26.177**	-0.107***	29.907***	-17.488***	32.180**	-0.088	36.281***
	(-9.506)	(2.547)	(-3.643)	(2.937)	(-5.528)	(2.368)	(-1.212)	(2.688)
Industry fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.867	0.127	0.889	0.128	0.790	0.135	0.817	0.135
Obs.	34133	34133	34133	34133	30159	30159	30159	30159

The table summarizes the results of GMM approach of analyst forecast dispersions on instrumental variables of greenwashing measures. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 13: 2SLS approach of effect of greenwashing on forecast accuracy (IV: Industry year mean)

	(1) GW_diff	(2) Forecast error	(3) GW_ratio	(4) Forecast error	(5) GW_diff	(4) Forecast error	(7) GW_ratio	(8) Forecast error
GW_diff_mean	0.993***							
(Industry)	(1445.884)							
GW_diff_Pred		-0.336***				-0.308***		
		(-5.733)				(-4.401)		
GW_ratio_mean			0.992***					
(Industry)			(1532.125)					
GW_ratio_Pred				-19.220***				-17.572***
				(-6.568)				(-4.960)
GW_diff_mean					0.809***			
(Industry country)					(115.946)			
GW_ratio_mean							0.804***	
(Industry country)							(109.534)	
Firm size	0.025***	0.569	0.001***	0.889	1.123***	0.731	0.024***	1.023
	(3.160)	(0.832)	(3.700)	(1.285)	(16.355)	(1.063)	(16.632)	(1.472)
Leverage	-0.085**	17.835***	-0.002***	17.785***	-0.790**	16.386***	-0.019***	16.331***
	(-2.307)	(4.722)	(-3.264)	(4.713)	(-2.349)	(4.315)	(-2.707)	(4.304)
Tobin's Q	-0.149**	-57.245***	-0.001	-57.089***	-0.558	-50.891***	-0.007	-50.781***
	(-2.018)	(-5.839)	(-0.374)	(-5.829)	(-0.896)	(-5.226)	(-0.550)	(-5.220)
Cash flow	0.014**	1.251*	0.000	1.291**	0.167***	1.127*	0.003***	1.166*
	(2.087)	(1.926)	(0.590)	(1.990)	(3.066)	(1.706)	(2.876)	(1.766)
Cash holdings	-0.131*	17.309**	-0.003*	17.688**	0.794	19.132**	0.023*	19.477**
	(-1.699)	(2.189)	(-1.832)	(2.238)	(1.245)	(2.368)	(1.753)	(2.412)
Following	0.030**	-2.249*	0.001***	-2.076*	0.400***	-2.484**	0.010***	-2.330*
	(2.399)	(-1.906)	(2.629)	(-1.759)	(4.111)	(-2.044)	(4.764)	(-1.912)
GDP pa	-0.000	0.001	-0.000	0.001	-0.000***	0.001	-0.000***	0.001
	(-0.274)	(1.291)	(-0.689)	(1.259)	(-7.892)	(1.053)	(-8.044)	(1.033)
GDP growth	0.003	-2.130***	0.000	-2.133***	-0.062**	-2.176***	-0.001**	-2.179***
	(0.650)	(-5.656)	(0.856)	(-5.669)	(-2.295)	(-5.387)	(-2.009)	(-5.395)
Constant	-18.753***	170.184***	0.600***	179.723***	-47.764***	176.067***	-0.039	184.798***
	(-57.974)	(3.443)	(92.660)	(3.673)	(-13.589)	(3.441)	(-0.530)	(3.655)
Industry fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.996	0.129	0.996	0.130	0.875	0.130	0.880	0.131
Obs.	38766	38766	38766	38766	37358	37358	37358	37358

The table summarizes the results of 2SLS approach of analyst forecast errors on instrumental variables of greenwashing measures. The sample period is from 2002 to 2019. We adopt industry-year mean as the instrumental variable. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests.

Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 14: GMM approach of effect of greenwashing on forecast accuracy (IV: Industry year mean)

	(1) GW_diff	(2) Forecast error	(3) GW_ratio	(4) Forecast error	(5) GW_diff	(4) Forecast error	(7) GW_ratio	(8) Forecast error
GW_diff_mean	0.993***							
(Industry)	(1445.884)							
GW_diff_Pred		-0.334***				-0.308***		
		(-5.690)				(-4.401)		
GW_ratio_mean			0.992***					
(Industry)			(1532.125)					
GW_ratio_Pred				-19.112***				-17.572***
				(-6.530)				(-4.960)
GW_diff_mean					0.809***			
(Industry country)					(115.946)			
GW_ratio_mean							0.804***	
(Industry country)							(109.534)	
Firm size	0.025***	0.578	0.001***	0.898	1.123***	0.731	0.024***	1.023
	(3.160)	(0.845)	(3.700)	(1.298)	(16.355)	(1.063)	(16.632)	(1.472)
Leverage	-0.085**	18.230***	-0.002***	18.181***	-0.790**	16.386***	-0.019***	16.331***
	(-2.307)	(4.838)	(-3.264)	(4.829)	(-2.349)	(4.315)	(-2.707)	(4.304)
Tobin's Q	-0.149**	-56.025***	-0.001	-55.867***	-0.558	-50.891***	-0.007	-50.781***
	(-2.018)	(-5.700)	(-0.374)	(-5.691)	(-0.896)	(-5.226)	(-0.550)	(-5.220)
Cash flow	0.014**	1.235*	0.000	1.275**	0.167***	1.127*	0.003***	1.166*
	(2.087)	(1.901)	(0.590)	(1.965)	(3.066)	(1.706)	(2.876)	(1.766)
Cash holdings	-0.131*	18.836**	-0.003*	19.215**	0.794	19.132**	0.023*	19.477**
	(-1.699)	(2.388)	(-1.832)	(2.437)	(1.245)	(2.368)	(1.753)	(2.412)
Following	0.030**	-2.613**	0.001***	-2.441**	0.400***	-2.484**	0.010***	-2.330*
	(2.399)	(-2.201)	(2.629)	(-2.056)	(4.111)	(-2.044)	(4.764)	(-1.912)
GDP pa	-0.000	0.001	-0.000	0.001	-0.000***	0.001	-0.000***	0.001
	(-0.274)	(1.463)	(-0.689)	(1.432)	(-7.892)	(1.053)	(-8.044)	(1.033)
GDP growth	0.003	-2.362***	0.000	-2.365***	-0.062**	-2.176***	-0.001**	-2.179***
	(0.650)	(-5.781)	(0.856)	(-5.792)	(-2.295)	(-5.387)	(-2.009)	(-5.395)
Constant	-18.753***	99.160***	0.600***	108.557***	-47.764***	176.067***	-0.039	184.798***
	(-57.974)	(2.664)	(92.660)	(2.959)	(-13.589)	(3.441)	(-0.530)	(3.655)
Industry fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.996	0.126	0.996	0.126	0.875	0.130	0.880	0.131
Obs.	38766	38766	38766	38766	37358	37358	37358	37358

The table summarizes the results of GMM approach of analyst forecast errors on instrumental variables of greenwashing measures. The sample period is from 2002 to 2019. We adopt industry-year mean as the instrumental variable. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests.

Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 15: Propensity score mating (PSM) and entropy balancing approach

	(1) Forecast error	(2) Forecast error	(1) Forecast error	(2) Forecast error
GW_diff	-0.268***		-6.843***	
	(-3.824)		(-4.174)	
GW_ratio		-20.471***		-7.073***
		(-5.555)		(-3.896)
Firm size	0.556	1.635	0.614	0.604
	(0.568)	(1.537)	(0.690)	(0.664)
Leverage	19.479***	16.598***	22.301***	22.208***
	(3.836)	(3.331)	(5.005)	(4.689)
Tobin's Q	-39.317***	-65.151***	-50.359***	-56.191***
	(-2.780)	(-4.480)	(-3.733)	(-3.670)
Cash flow	0.613	2.034**	1.443	1.985*
	(0.693)	(2.291)	(1.449)	(1.688)
Cash holdings	25.916**	15.757	16.803*	18.523*
	(2.501)	(1.524)	(1.763)	(1.841)
Following	0.009	1.387	-1.433	-1.191
	(0.006)	(0.890)	(-0.931)	(-0.741)
GDP pa	0.001*	0.001	0.001*	0.001
	(1.898)	(1.644)	(1.708)	(1.307)
GDP growth	-1.577***	-1.943***	-1.797***	-1.750***
	(-3.010)	(-3.483)	(-3.221)	(-2.839)
Constant	124.556**	123.423**	150.342***	157.220***
	(2.444)	(2.376)	(3.438)	(3.264)
Industry fixed effect	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.144	0.149	0.132	0.129
Obs.	15407	14688	39018	39018

The table summarizes the results of PSM approach and entropy balancing approach. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 16: Effect of mandatory disclosure on analyst forecast accuracy

	(1) Forecast error	(2) Forecast dispersion	(3) Following
Mandatory	-6.761	-0.508	-0.051
	(-1.133)	(-0.278)	(-1.595)
Firm size	-1.195	-0.715**	0.263***
	(-1.314)	(-2.255)	(42.781)
Leverage	16.044***	5.967***	-0.343***
	(3.012)	(3.056)	(-10.823)
Tobin's Q	0.580	-0.063	0.122***
	(0.356)	(-0.116)	(16.770)
Cash flow	-53.837**	-29.241***	0.666***
	(-2.319)	(-3.612)	(7.828)
Cash holdings	19.725	3.996	0.130*
	(1.201)	(0.844)	(1.892)
Following	-11.243***	1.936**	
	(-4.396)	(2.185)	
Equity index return	0.039	0.053	-0.000
	(0.277)	(1.262)	(-0.730)
GDP pa	0.004***	0.002***	0.000
	(3.231)	(4.267)	(1.012)
GDP growth	-2.760**	-0.832**	-0.005
	(-2.524)	(-2.077)	(-1.211)
Forecast error			-0.001***
			(-7.165)
Forecast disp			0.002***
			(7.529)
Constant	325.387***	60.407***	-4.535***
	(14.031)	(5.133)	(-25.476)
Industry fixed effect	Y	Y	Y
Country fixed effect	Y	Y	Y
Year fixed effect	Y	Y	Y
R^2	0.116	0.094	0.524
Obs.	13234	13234	13234

The table summarizes the results of panel data regressions of analyst forecast accuracy measures on mandatory disclosure. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and country-year clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. All variables are defined in Appendix B.

Table 3- 17: The impact of greenwashing on analyst forecast optimism

	(1) Forecast optimism	(2) Forecast optimism	(3) Forecast optimism	(4) Forecast optimism
GW_diff	-0.017		0.083**	
	(-0.607)		(2.306)	
GW_ratio		-0.924		4.458**
		(-0.676)		(2.480)
Firm size			-0.631	-0.683
			(-1.508)	(-1.613)
Leverage			-6.095***	-6.085***
			(-2.662)	(-2.659)
Tobin's Q			2.158	2.119
			(0.260)	(0.255)
Cash flow			-3.349***	-3.357***
			(-6.294)	(-6.308)
Cash holdings			0.722	0.645
			(0.139)	(0.124)
Following			-3.645***	-3.675***
			(-4.335)	(-4.366)
GDP pa			-0.000	-0.000
			(-0.422)	(-0.411)
GDP growth			-0.382	-0.382
			(-1.471)	(-1.468)
Constant	-11.019	-10.189	18.436	15.654
	(-0.505)	(-0.468)	(0.761)	(0.656)
Industry fixed effect	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y
R^2	0.026	0.026	0.033	0.033
Obs.	35412	35412	34894	34894

The table summarizes the results of panel data regressions of analyst forecast optimism on greenwashing measures. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. All variables are defined in Appendix B.

Appendix B: Variable Definitions

Variables	Description
GW_diff	The ratio of symbolic to substantive CSR scores based on Thomson Reuters Asset4 ESG ratings for year *t-1*. CSR KPI scores are separated into firms substantive CSR scores (e.g., amount of CO_2 emissions reduced in the past year, number of injuries and fatalities at work) and the symbolic CSR scores (e.g., does the firm claim to have a policy for reducing environmental emissions? Does it claim to strive to improve its employee health and safety?).
GW_ratio	The difference between symbolic to substantive CSR scores based on Thomson Reuters Asset4 ESG ratings for year *t-1*. CSR KPI scores are separated into firms substantive CSR scores (e.g., amount of CO_2 emissions reduced in the past year, number of injuries and fatalities at work) and the symbolic CSR scores (e.g., does the firm claim to have a policy for reducing environmental emissions? Does it claim to strive to improve its employee health and safety?).
Forecast error	The absolute mean earnings forecast error of forecasts made in year *t* for each firm for earnings of current year *t*. It is calculated as the mean of absolute differences between individual analyst forecasts and the actual earnings per share, divided by the firm's share price at the beginning of the year.
Forecast dispersion	The dispersion of earning forecasts made in year *t* for each firm for earnings of current year *t*. It is computed as the standard deviation of analyst forecasts for the year, scaled by the firm's share price at the beginning of the year.
Firm size	The natural logarithm of a firm's total assets dollars at the end of the previous year.
Leverage	The firm's total debt scaled by total assets at the end of the previous year.
Cash flow	The ratio of income before extraordinary items plus depreciation and amortization to the book value of total assets at the end of the previous year.
Tobin's Q	The market value of assets plus book value of liabilities as a ratio of total assets the end of the previous year.
Cash holdings	The amount of cash and cash equivalents scaled by total assets at the end of the previous year.
No. of reports	The number of analysts reports issued through the year for earnings of year *t*.
GDP per capita	The annual GPD per capita of the country where the firm locates in
GDP growth	The annual GDP growth rate of the country where the firm locates in
Power distance	The power distance index developed by Hofstede (1980). The extent to which a society accepts the fact that power in institutions and organizations is distributed unequally.
Individualism	The individualism index developed by Hofstede (1980). A loosely knit social framework in which people are supposed to take care of themselves and their immediate families only.

Variables	Description
Masculinity	The masculinity index developed by Hofstede (1980). The extent to which a society feels threatened by uncertain and ambiguous situations by providing career stability, establishing more formal rules, not tolerating deviant ideas and behaviors, and believing in absolute truths and the attainment of expertise.
Uncertainty avoidance	The masculinity index developed by Hofstede (1980). The extent to which the dominant values in society are 'masculine'—that is, assertiveness, the acquisition of money and things, and not caring for others, the quality of life, or people.
YEAR	Indicator dummy variables of year
INDUSTRY	Indicator dummy variables for industry based on ICB code
COUNTRY	Indicator dummy variables for country based on country of incorporation.

CHAPTER FOUR: GREENWASHING AND TRADE CREDIT

4.1 Introduction

The business world and the financial markets have paid an increasing level of attention to the concept of corporate social responsibility (CSR) in recent years. There have been major shifts in the means, themes, and audiences of corporate communication. Companies are under growing pressure to demonstrate social responsibility by catering to a wide range of stakeholders, many of whom are interested in factors other than financial performance. Additionally, prior studies find that non-financial information can significantly affect a firm's market competitiveness, in terms of credit and reputation (Vanstraelen et al., 2003; Dhaliwal et al., 2012b; Eccles et al., 2011). However, when firms undertake CSR investments and disclose their CSR related information to meet the expectations of the stakeholders and society, firms can only signal to the markets by providing information and attempting to influence the opinions of their stakeholders owing to the credence attributes of CSR. Critics of this signaling mechanism have raised questions on the legitimacy of this information, since some firms offer misleading information on their CSR performance and only claim to be "green" instead of being genuinely green. In this paper, we refer to "greenwashing" as being an action where a firm strategically discloses CSR information and tries to influence the perceptions of the markets and stakeholders. Critics argue that businesses are dissuaded from making real environmental efforts because of disclosures of misleading information on CSR performance. The purpose of this article is to understand whether greenwashing firms, as suppliers, provide more (or less) trade credit or, as buyers, adopt more (or less) trade credit.

Greenwashing has attracted a lot of academic attention, after the topic was examined by Greer and Bruno (1996) in their book on environmental marketing. Despite the fact that the body of research is still growing (e.g., Walker and Wan, 2012; Chen, Lin and Chang, 2014; Kim and Lyon, 2015; Majláth, 2017; Seele and Gatti, 2017; Zhang et al., 2018; Torelli, Balluchi and Lazzini, 2020), there is no widely agreed-upon definition of the term and the notion itself remains unclear.

Some studies are based on the definition stated on the Oxford English Dictionary (i.e. Mitchell and Ramey, 2011; Furlow, 2010), where greenwashing is defined as "disinformation disseminated by an organisation so as to present an environmentally responsible public image," Others choose to follow Greenpeace's definition of greenwashing, which is "the act of misleading consumers regarding the environmental practices of a company or the environmental benefits of a product or service"(Chen and Chang, 2013; Delmas and Burbano, 2011; Parguel, Benoît-Moreau and Larceneux, 2011). Some researchers emphasized that the greenwashing "act" must be deliberate and with intention (Mitchell and Ramey, 2011; Nyilasy et al., 2012). Seele and Gatti (2017) proposed a definition that focuses on the view of the beholder: "Greenwashing is a co-creation of an external accusation towards an organization with regard to presenting a misleading green message." Some literature states that greenwashing results in "poor environmental performance and positive communication about environmental performance." (Delmas and Burbano, 2011) and "…overly positive beliefs about an organization's environmental performance, practices, or products." (Lyon and Montgomery, 2015). Furthermore, some papers define greenwashing as exclusively dealing with environmental issues (e.g., Delmas and Burbano, 2011; Chen and Chang, 2013; Lyon and Montgomery, 2015). Others consider issues concerning the welfare of society and humanity (e.g., Bazillier and Vauday, 2009; Lyon and Maxwell, 2011).

In this study, we follow the definition of greenwashing proposed by Walker and Wan (2012) as the difference between ‘‘symbolic’’ and ‘‘substantive’’ social and environmental responsible acts. We consider greenwashing as dealing with both social and environmental issues (e.g., Bazillier and Vauday, 2009; Lyon and Maxwell, 2011).

We seek to examine the two mechanisms in which greenwashing affects the supply and use of trade credit. First, if greenwashing is a technique for improving a company's financial situation and it may be used in place of trade credit to reduce financial distress, then we can infer that it has an impact on trade credit and that there is a substitutional effect between greenwashing and trade credit. Second, we argue from the angle of social trust. Greenwashing has been proved to be harmful to firms' reputation and damage trust between firms and stakeholders. We expect it has

significant impact on trade credit. We provide detailed discussion of the two mechanisms in following paragraphs.

Prior research demonstrates that improved environmental, social, and governance (ESG) practices may reduce firm risk and increase firm access to external financing with lower costs of capital and financial institution loans (Goss and Roberts, 2011; Hoepner et al., 2016; Nandy and Lodh, 2012; Sharfman and Fernando, 2008). Superior overall performances, in terms of ESG, may also suggest improved access to financing from outside sources and a greater capacity for reducing economic pressures. Chen et al. (2014) claim that there are two main reasons why companies that implement strong ESG policies have fewer financial limitations. To begin, an improved ESG performance is linked to enhanced stakeholder orientation, which reduces the likelihood of engaging in short-sighted opportunism and, as a consequence, lowers the overall costs associated with contracting. This, in turn, leads to higher revenue and profit over the long term. Second, if a firm has a better ESG performance, it is more likely to announce its ESG activities, which, in turn, will draw the interest of institutional investors, as well as the attention of financial analysts (Dhaliwal et al., 2011). A decrease in the gap in knowledge between a company and its investors is a direct effect of improved data availability and quality (Hail and Leuz, 2006; El Ghoul et al., 2011; Khurana and Raman, 2004), and this reduces the constraints on capital access (Hubbard, 1997). A lower cost of financing for firms is achieved by increasing the information accessibility to lending parties (Hubbard, 1997).. However, investors may have difficulty selecting assets that integrate ESG features because companies can increasingly engage in "greenwashing" by distorting their ESG disclosures.

As a consequence of this, it is reasonable to propose that businesses acknowledge the importance of ESG performances and use it to sway public attitudes, while also reaping the financial benefits. Previous research has shown that a company may lessen the negative effect of environmental damage (or comparable incidents) on its corporate reputation and fair value by increasing the transparency of its ESG performance (Brown and Deegan, 1998; Cho and Patten, 2007). This method can also be used as a means of reestablishing a firm’s legitimacy(Campbell et al., 2003).

Meanwhile, stakeholders put a significant amount of faith in corporate messages, despite the fact that they may not always be an accurate representation of a company's actual ESG performance (Marquis et al., 2016; Van Halderen et al., 2016). Companies with limited financial resources have a stronger motivation to reveal their ESG engagements, which leads to a greater level of greenwashing (Zhang, 2022). Furthermore, firms that are highly leveraged may face additional financial pressure in the short- and long-run, thus, exacerbating their greenwashing behaviour. Berrone, Fosfuri, and Gelabert (2017) find that companies acquire environmental legitimacy by conforming to external environmental expectations.

Companies with low stock volatility and those with a comparatively greater weighted average cost of capital (WACC) stand to gain the most from greenwashing. Companies with substantial pricing power also benefit from greenwashing. Greenwashing is more commercially viable due to the high information asymmetry (Gregory, 2021). Companies with less volatility in terms of their stock prices are more likely to engage in greenwashing, since the consequences of getting caught are less severe for them. As the potential cost of being detected, the deadweight loss, is discounted more heavily for companies with a higher WACC than for firms with a lower WACC, these firms are more inclined to participate in greenwashing. As a consequence of this, greenwashing becomes more appealing. Companies who have greater information asymmetry will have an advantage when it comes to greenwashing, since they can conceal the fact that they have been engaging in greenwashing for a longer period of time, which, in turn, generates further greenwashing advantages.

Concerning the relationship between a company's trade credit policies and the practice of greenwashing, there are two schools of thought that are in direct contrast with one another. Combining the views obtained in prior studies, we argue that greenwashing plays a role in improving a firm’s financial condition, whereas trade credit also serves as a device for reducing financial constraints as an informal source of financing. The two devices should play substituting roles in reducing financial constraints. Therefore, we expect that an increase in greenwashing activities is associated with a reduction in the adoption of trade credit by firms.

From the perspective of trust, the second channel we proposed, it is suggested that greenwashing damages customer trust and the reputation of a firm that is conveyed to the stakeholders, thus, reducing the provision and adoption of trade credit. Based on the empirical research, it appears that trust and/or reputation may be used as an effective motivational method for ensuring the continuation of incomplete contracts, such as trade credit agreements. While there may be no official enforcement mechanisms in place, Karlan (2005) finds that individuals are more likely to lend and repay loans in communities that they believe to be honest. Evidence such as this bolsters the argument that trust is a useful tool for ensuring the continuity of incomplete contracts, such as trade credit. Prior studies find that greenwashing, instead of building trust in firms, can bring harmful effects to a firm's reputation and can damage the trust between firms and stakeholders (Hamann and Kapelus, 2004; Pomering and Johnson, 2009; Lyon and Maxwell, 2011; Chen and Chang, 2013b; Guo et al., 2017). It is reasonable to expect there to be a negative association between greenwashing and trade credit, since firms which undertake greenwashing activities are perceived as being untrustworthy.

Despite the fact that greenwashing is often associated with a poor information environment, private lenders' insider information about potential greenwashing companies may reduce the costs associated with adverse-selection and moral-hazard for these loans (Boot, 2000; Bhattacharya and Chiesa, 1995). Relationship lending dominates the private debt market (e.g., Bharath et al., 2011), giving private lenders (as opposed to public debt holders) superior capabilities for collecting and processing borrowers' private information (e.g., Fama, 1985; James and Smith, 2000). This gives them an advantage when pricing the securities of informationally opaque firms (Hadlock and James, 2002). Attig et al. (2021) show that greenwashing in public reporting can trick private lenders, who have access to extensive private datasets, into providing cheaper loans. The authors illustrate that private lenders utilise a complicated pricing system, rather than a single price metric, such as a loan spread, to achieve an acceptable expected return. Greenwashing firms face higher collateral requirements and stricter covenants in terms of private loans. Similarly, we reasonably propose that trade creditors, as an informal form of financing, depend more on private information and require stricter policies to compensate for the risks associated with greenwashing.

Due to its arm's-length connection, trade credit serves as one of the most critical external financial intermediaries. A previous study found that companies with higher ESG performance can obtain more trade credit to help them to overcome financial restrictions and to improve their performance (Zhang and Lucey, 2022). However, greenwashing activities have a negative effect upon a firm's "green reputation", leading to stricter policies being used for greenwashing firms and a higher overall cost of lending on trade credit, which finally induces a reduced use of trade credit by these firms.

In this study, we intend to investigate the impact of greenwashing on provision and adoption of trade credit by companies in U.S. firms for period range from 2002 to 2019. We employ two metrics of company trade credit practices, which are based on those proposed by Shang (2020). The first measure is Receivables (*TR*), measuring a company's propensity to provide credit to its business partners, which is computed as the ratio of accounts receivable over the total assets of a firm. The second measure is Payables (*TP*), measuring a firm's willingness to rely on trade credit provided by its suppliers, which is calculated as accounts payable divided by the total assets. Following Roulet and Touboul (2015), we collect the CSR performance score data of U.S. firms from the Thomson Reuters ASSET4 ESG database. We differentiate firms' substantive CSR scores (e.g., total direct flaring or venting of natural gas emissions, percentage of women employees.) from their symbolic CSR scores (e.g., does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx (sulfur oxides) or NOx (nitrogen oxides) emissions? Does the company have a policy to ensure the freedom of association of its employees?). ASSET4 asserts that its ratings can differentiate between what companies say and what they actually do with regard to corporate CSR performance. We construct the first measure of greenwashing, *GW_ratio*, by computing the ratio of symbolic scaled by substantive CSR scores. The second measure of greenwashing, *GW_diff*, is constructed as the difference between symbolic and substantive CSR scores. Our empirical results present that both trade receivables and trade payables are negatively associated with greenwashing. We prove that the negative association between trade payables and greenwashing is driven by the financial constraints channel. The evidence shows that the associations found in the main regression models cannot be explained by social trust channel. In addition, we find the association between greenwashing and trade credit is less strong in firms with higher institutional investor ownership and higher information asymmetry.

Motivated by the limited research on the influence of greenwashing on firms' financing strategies, our study makes a three-fold contribution to the related literature. First, to our best knowledge, this is the first study on the impact of greenwashing activities on firms' trade credit policies. The existing literature focuses on how greenwashing affects market outcomes and the information environment of a firm, while little attention has been paid to the alternative financing activity, this being trade credit. With an increasing number of businesses now relying on trade credit to make transactions, our research sheds light on the factors that drive this phenomenon, including financing motives. In particular, previous studies have mainly focused on the harmful effects of greenwashing on the market reaction, customer perception and a firm's reputation (i.e. Du, 2015; Akturan, 2018; Brouwer, 2016). There is limited literature exploring how greenwashing is associated with factors which affect firm financing decisions.

Our paper differs from previous papers, such as Cheung and Pok (2019) and Xu et al.(2020), as we focus on greenwashing activities, instead of corporate social responsibility performance. We argue that firms adopt greenwashing to relieve financial distress, and consequently depend less on trade credit. In addition, we adopt measures of greenwashing, computed by the difference between symbolic CSR ratings subtracting the substantive CSR ratings, and the ratio of symbolic CSR ratings over the substantive CSR ratings, while previous studies focus mainly on the overall CSR ratings of the firms. At the same time, we provide additional evidence to support the financial constraints theory of trade credit.

We also make contributions to literature of institutional investors, in terms of the monitoring role of institutional investors in reducing agency problem associated with greenwashing. We also find that, due to the external monitoring effects of institutional investors, firms with stronger external monitoring forces have less incentive to adopt greenwashing. Therefore, for firms with greater ownership of institutional investors, the negative association between greenwashing and trade credit is less pronounced. In addition, we contribute to the literature of greenwashing in a way to prove information asymmetry moderate the impact of greenwashing activities. We find that the negative association between greenwashing and trade payables are less pronounced with higher

information asymmetry. Our results suggest that information asymmetry reduce return a firm can pursue from greenwashing activities, hence reduce impact of greenwashing on trade payables.

This paper is structured as follows. Section Two lays out the related literature and the generation of the hypotheses. Section Three describes the data collection, the variable computation and the empirical methodology. Section Four presents the empirical results from our baseline models, moderating effects and channel effects, robustness checks and other additional tests. Section Five concludes.

4.2 Literature Review

4.2.1 Greenwashing

4.2.1.1 Impact of greenwashing

The public discussion regarding corporate social responsibility (CSR) has shifted over recent decades to focus on corporations' instrumental and strategic embrace of environmental and social claims. Here, an increasing number of businesses are being criticised for "not walking the walk." Essentially, "not walking the walk" refers to the fact that many businesses have been criticised for failing to back up their corporate social responsibility (CSR) assertions about environmental or social concerns with action (Walker & Wan, 2012). When there is a mismatch between environmentally and socially responsible rhetoric and actions, it is called "greenwashing." There is currently a volume of literature exploring the concerns linked to greenwashing as public recognition about the practice has developed dramatically over the past two decades, generating a matching surge in academic study.

There are several reasons and incentives for firms to engage in greenwashing activities based on the previous literature. Mitchell and Ramey (2011) suggest that greenwashing activities are motivated by unconventional consumer habits in relation to green products. Even when people are faced with economic challenges and are seeking value in the products that they buy, customers continue to pay a surcharge for environmentally friendly products and services. Consumers are willing to pay extra, in terms of time, money and resources, for items and services that they believe to be environmentally friendly, and the competitive altruism theory explains why this is the case.

As a result of this shift in consumer habits, businesses are gearing up to fulfil the expectations brought about by the new norm, and some of those businesses are succumbing to greenwashing. Some businesses, however, see the current "green" movement as a chance to gain an edge over rivals by committing to unethical means of competition. Several businesses, lured by the promise of increased profits through green premiums, may exaggerate the positive impact of their goods on the environment in order to entice customers into choosing them over the competition.

As per Budinsky and Bryant (2013), the current system of advertising rhetoric promotes individuality, greed, and consumerism, all of which weaken the importance of addressing collective societal problems, such as environmental protection. Additionally, the writers employ analyses of specific advertisements and campaigns to demonstrate how environmental themes and ideas are taken and exploited to obscure environmental concerns. The role of advertising in inducing greenwashing is further discussed in the study by Bazillier and Vauday (2009), which suggests that the method of conceiving instrumental CSR favors the diffusion of greenwashing, since it discourages engagement in substantive socially responsible activities that do not maximize profit. Hummel and Festl-Pell (2015) document the shortcomings of current disclosure guidelines, explaining that they are inadequate and are unable to account for material sector-specific sustainability issues.

Greenwashing activities also lead to internal consequences for firms and a series of consequences for stakeholders, such as consumers, and the environment and society at large (Gatti et al., 2019). First, greenwashing activities may have certain internal consequences for firms in the market. An increasingly environmentally conscious population is being targeted by an infusion of "ecofriendly" goods, as discussed by Furlow (2010), prompting many businesses to reconsider the usefulness of "green" marketing. Promises which appear to be environmentally conscious are often made by these businesses, but consumers tend to be sceptical because of the lack of specificity and the likelihood that the claims are misleading. Businesses that make honest efforts to reduce their environmental impact then lose whatever competitive advantage they may have acquired. Businesses will have less incentive to create ecologically friendly goods if customers "discount" all green marketing promises, since they would receive reduced returns on their green investments. Based on their empirical research using a sample of one hundred Canadian companies, Walker and

Wan (2012) conclude that companies who take concrete steps to address environmental challenges (the "green walk") observe neither detrimental or positive effects on their financial performance, but those that only talk the talk (the "green talk") do harm their financial records. The authors also discover that "greenwashing," or a lack of alignment between "green talk" and "green walk," negatively impacts financial performance, while "green-highlighting," or a concerted attempt to match "green talk" with "green walk," had no impact on financial results.

Social media may have a negative effect on a company's greenwashing efforts, as shown in the research by Lyon and Montgomery (2013). This is because citizens and activists may see a company's environmental marketing as being excessive self-promotion. In spite of the widespread belief that social media would curb corporate greenwashing, the authors argue that various sectors will feel the effects of this phenomenon to varying degrees and in varying means. While companies with economically unfriendly (brown firms) records should consider sharing all of their environmental impacts when they have negative news to disclose, those with green reputations should consider minimizing the marketing of their green successes.

Du (2015) looks at the market's perception of greenwashing and whether or not differences in the market's mixed response to green companies and brown companies could be accounted for by corporate environmental performance. The author demonstrates that the competitive impact for ecofriendly companies and the spreading effect for prospective environmental wrongdoers are the two separate effects of corporate environmental performance on cumulative abnormal returns (CAR) surrounding the uncovering of greenwashing. The study's empirical findings reveal that greenwashing is closely and negatively linked with CAR surrounding the exposure of greenwashing, whereas corporate environmental performance is positive and significantly connected with greenwashing exposure.

Using a combination of signaling theory and legitimacy theory, Seele and Gatti (2017) provide a new definition of "greenwashing" and analyse the process of communication surrounding the accusation of "greenwashing," including the occurrence of a negative phase as a result of the allegation and its effect on credibility. In this article, the authors claim that an external charge is what constitutes greenwashing epistemologically. The charge of greenwashing is recognised as a

signal-altering factor which distorts the actual green accomplishments being conveyed by the firms. However, the authors suggest that an external accusation negatively affects corporate legitimacy and corporate reputation, even if a firm is not providing misleading communication. The phenomena of "greenwashing" exists at the intersection of unmet expectations, misinterpreted signals, and skewed perspectives.

Using manually gathered data, Du et al. (2016) look into the link between corporate charity and an absence of environmental responsibility among Chinese public companies. The results show that, in order to relieve the pressure from stakeholders, public Chinese firms that are environmental unfriendly often turn to charitable activities as a means of offsetting the potentially damaging effects of insufficient corporate environmental responsibility. Greenwashing is a common practice among Chinese firms that are involved in polluting sectors, and this practice often takes the form of corporate charity. In addition, the authors provide evidence that publicity in the media bolsters the favourable link between a lack of environmental responsibility and charitable activities undertaken by such corporations.

In addition, a number of pieces of literature reveal that greenwashing leads to a series of consequences for consumers. Furlow (2010) discusses the effects of greenwashing on consumer attitudes towards green products and states that greenwashing confuses consumers knowledge of firms' green products, resulting in increased consumer scepticism. According to Parguel et al. (2011), customers are often unable to recognise truly responsible businesses because they are inundated with corporate social responsibility (CSR) claims that are, in some cases, well-founded. This misconception promotes a practice known as "greenwashing" and may reduce the efficiency of CSR practices. The purpose of this research study is to evaluate the influence of independent sustainability assessments on the reactions of customers to the CSR communication of organisations. The authors come to the conclusion that consumers' perceptions of a company's social responsibility is negatively impacted when businesses have low sustainability ratings and engage in communication practices that are seen to be greenwashing. To demonstrate how the CSR forms convey a green corporate ethos to an audience seeking to differentiate between greenwashing and authentic environmental considerations, Mason and Mason (2012) analyse the corporate environmental reports of 100 businesses included in the 2009 Fortune 1000. The study

shows that these reports use ideological propaganda in an effort to sway the views of their audiences on the subject of corporate environmental sustainability.

The impacts of green corporate marketing on company environmental behaviour are studied by Nyilasy et al. (2012). This research applies the attribution theory from the field of psychology to the question of what makes green advertisements effective. This study's findings suggest a substantial interaction effect between green advertisements and corporate environmental performance, such that when the environmental performance of a company is good, green advertising leads to somewhat more positive brand attitudes than general positive corporate messaging. However, when a firm's environmental performance is unfavourable, green advertising leads to significantly less positive brand attitudes than when a general corporate communication is utilised.

Consumer disorientation and the potential risks associated with corporate green engagement play mediating roles as observed by Chen and Chang (2013), who examine the impact of greenwashing on green trust. This study's research subject consists of individuals with experience of shopping for information and technology goods in Taiwan. Structured equation modelling is applied to conduct an empirical examination for this research. The findings indicate that greenwashing undermines environmental confidence. In order to increase customers' green faith, this research proposes that businesses cut down on greenwashing tactics. This research also shows that the negative connection between greenwashing and green trust is mediated by green consumer perplexity and green perceived risk. The findings also show that consumer perplexity and the perceived risk raised by green marketing are significantly associated with greenwashing, which has a dampening effect on green confidence. This implies that greenwashing has a multiplicative effect on confidence in the green market, undermining it both directly and indirectly via multiple mechanisms, including green consumer confusion and green perceived risk. Therefore, businesses who want to lessen the unfavourable connection between greenwashing and confidence in their environmental practices should work to lessen the level of green consumer perplexity and green perceived risk among their core audience.

Consumer perceptions of green quality and customer satisfaction on green goods are examined as potential mediators between greenwashing and positive word of mouth (WOM), as discussed in a study by Chen et al. (2014). Consumers in Taiwan with real experience of buying information and technology items are the study's primary focus. In order to conduct an empirical study, this investigation makes use of structural equation modelling. The findings show that greenwashing has a detrimental effect on environmental word of mouth. Green word-of-mouth is favourably influenced by consumer perceptions of green quality; however this article shows that greenwashing lowers both the perceived quality of a firm's green performance and the consumer satisfaction with the green goods. This research shows that the negative connection between greenwashing and green WOM is mediated by consumers' perceived quality of a firm's green performance and the consumer satisfaction with those items. This indicates that greenwashing, not only negatively affects green WOM in its direct form, but also negatively affects it in its indirect form, via the perceived quality of green performance and satisfaction with green products. According to the results of the research, in order to raise their green WOM, businesses should reduce greenwashing practices and instead focus on improving their customers' perceptions of, and experiences with, their green products and services.

Examining how consumer perceptions of a brand and their willingness to buy are affected by a company's environmental performance is the focus of the study by Nyilasy et al. (2014). Results show that green advertising exacerbates the negative impact on brand image caused by a company's poor performance, as compared to both conventional corporate advertising and no advertising at all. In addition, when a company's environmental record is good, consumers are less likely to view the brand favourably after being exposed to either green or conventional corporate advertising.

Companies in the energy industry, according to de Vries et al. (2015), have a challenge when deciding how to make the general public aware of their environmental policy. The public's perception of a company's environmental policies and actions as being inspired by real environmental concern is likely to be positive, but it can also give rise to accusations of "greenwashing," the idea that companies intentionally frame their actions as "green" so as to appear environmentally conscious. In three separate experiments, consumer scepticism of an energy firm's

environmental initiatives was justified. By focusing on the financial benefits, rather than the environmental benefits of these initiatives, companies may lessen the likelihood that they will be accused of greenwashing. Corporate greenwashing is seen to be more prevalent when there is suspicion of purposeful organisational behaviour. Indirectly, the effect of this is more noticeable to those who are not naturally sceptical of official messages sent by companies. These results stress the need for businesses to give serious consideration to their environmental policy communication strategies.

Using information from 500 customers, Akturan (2018) investigates the connection between greenwashing, green brand capital, brand trust, green brand connotations, and consumer desire to buy. Green brand capital was shown to have a positive and significant effect on customer intent to make a purchase, while green brand connotations and brand trust were found to favourably influence green brand capital. Furthermore, greenwashing has a harmful effect on consumer perceptions of, and trust in, green brands, which in turn influences green brand capital and the consumer desire to buy.

Greenwashing also has an impact on the environment and society at large. Employee outcomes, according to Donia and Tetrault Sirsly (2016), may be better understood by tracing the formation of employees' diverse attributions of responsibility for those outcomes back to their respective employer's corporate social responsibility (CSR) efforts. The authors present a model of employee attribution formation of corporate CSR activities as being substantive vs symbolic. This is done to distinguish the good results for firms when they are causally regarded as being engaged in substantive CSR from the null or perhaps negative employee outcomes when such initiatives are ascribed as being symbolic. This model integrates theory and results from the literature of organisational behaviour, marketing, and strategy. The findings indicate that symbolic CSR will not incur any positive individual effects and may even deliver negative ones. In general, the research on greenwashing suggests that such practices ought to be controlled. Many people are against greenwashing because they believe that it prevents businesses from undertaking environmentally friendly actions (Dahl, 2010).

4.2.1.2 Positive externality

Some research, however, shows that greenwashing may, in fact, have a beneficial effect on the marketplace. Lee et al. (2018) argue from an economic perspective that greenwashing should not be regulated, since greenwashing encourages firms to "go green" and eventually improves the overall level of CSR engagement in the market. Several pieces of literature prove that "market informedness" plays an important role in firms' marketing and pricing decisions. Lee et al. (2018) define "market informedness" as the proportion of customers who know a product's environmental quality. The authors argue from two scenarios, these being when the market is informed and uninformed. When greenwashing is regulated, all firms (both green and brown firms) choose to engage in CSR activities based on the cost and profit equilibrium of the CSR investments. Especially when recognition of CSR is not high and environmental consideration is not considered to be critical in society, CSR engagements are an inferior strategy when the cost of implementing CSR is high. Firms will eventually choose to go brown as CSR is profit-reducing. However, when greenwashing is not regulated, the authors discuss the market outcomes from two informedness scenarios. When there is a lower level of market informedness, there are two types of customers: informed and uninformed. The brown business, on the other hand, has the incentive to greenwash the market by advertising itself as being a friendly firm, even when CSR reduces profits. This is because, if a brown company admits to having poor environmental standards, it may increase its profits by appealing to uninformed consumers who, had they had the facts, would have placed a lower value on that company's goods. When a brown company raises its prices to compete with a green company's high product price, the informed consumers, who previously preferred the brown company's product owing to the cheaper price, would now choose to buy from the green company. Due to the dynamic adjustments in how the market works, an increasing number of companies are offering environmentally friendly products to their clients, even though CSR has a negative impact on profits.

A number of studies investigate how firm CSR performance affects information asymmetry and they reveal that information asymmetry is negatively related to CSR performance (Cui et al., 2012; Cho et al., 2013; Naqvi et al., 2021). Cui et al. (2012) investigate the relationship between CSR performance and information asymmetry by employing the U.S. firm samples from the KLD database for the period from 1991 to 2010. The authors find an inverse association between the two variables and support the stakeholder orientation explanation of reducing information

asymmetry through CSR engagements. Cho et al. (2013) obtain the same results by using the KLD database of U.S. firms for the period from 2003 to 2009. The authors explain that CSR performance drives firm transparency, as firms with good CSR performances signal their quality by their superior performances, and poor CSR-performing firms are keen to explain their poor performances (Clarkson et al., 2008; Patten, 2002). In addition, firms which undertake more CSR activities are less likely to engage in earnings management or to issue financial reports with higher levels of transparency (Kim et al., 2012). A positive CSR performance also improves accessibility to capital by reducing the information asymmetry (Cheng et al., 2014).

In addition, several previous studies reveal that a higher level of transparency reduces information asymmetry (Diamond and Verrecchia, 1991; Lambert et al., 2007). By using data from a sample of Chinese firms for the period from 2008 to 2018, Naqvi et al. (2021) find a negative relationship between CSR performance and information asymmetry in the Chinese market. The authors also find that analyst coverage plays a moderating role in the relationship between CSR performance and information asymmetry. Based on the above studies, greenwashing induces firms in the market to go green and results in a higher level of firm CSR performance. Higher CSR performance is negatively associated with information asymmetry through the stakeholder orientation channel.

4.2.2 Trade credit

Short-term financing may be accomplished in a significant part via the use of trade credit. According to some estimates (Wilson and Summers, 2002), more than 80 % of business-to-business transactions in the United Kingdom (UK) are done on credit, while in the United States (U.S.), around 80 percent of companies provide their goods on trade credit. Accounts payable provide 15% of total financing for large non-financial enterprises in the United States, while small businesses depend even more heavily on this source of funding. These levels may be considerably higher on a global scale, because short-term bank lending cannot compare to the magnitude of the trade credit among businesses (Seifert et al., 2013).

According to the findings of previous research, businesses depend extensively on trade credit, not only to fund inventory purchases, but also to fulfil unforeseen financial demands (Haley and Higgins, 1973; Yang and Birge, 2018). Previous studies show that a firm’s decision to use and

provide trade credit can be affected by its access to external debt financing and equity financing (Petersen and Rajan, 1997a; Fisman and Love, 2003; Love et al., 2007; Shenoy and Williams, 2017; Abdulla et al., 2017; Shang, 2020). When businesses are confronted with more challenges when attempting to acquire external finance, they have a tendency to depend more heavily on trade credit.

There are a variety of motivations for adopting and providing trade credit. Schwartz (1974) identifies two reasons for using credit sales: the first is the financing motive, and the second is the transactions motive. The transactions motive contends that there is a cost associated with coordinating the payment for commodities at the time that they are received, and that this coordination incurs a cost. When invoices are allowed to build for periodic payment, it is to the buyer's advantage. In addition, purchasers have more time to prepare for the payment of unforeseen purchases, are able to make more accurate projections of their future cash expenses, and their cash management is simplified when they have access to trade credit. The sellers have the chance to offer credit to the buyers meaning that the buyers benefit. It is highly likely that the transactions motivation can explain a significant portion of the overall balance of trade credit. The author also considers the likelihood that access to finance could be a possible motive. Due to the benefit that accrues on money over time, customers are at an advantage when they receive credit sales that allow them to buy more factors of production. Therefore, there is an additional incentive for businesses to provide their customers with credit. When compared to their customers, some businesses have more convenient and less expensive access to the capital markets; as a result, these businesses have an incentive to make use of their borrowing capacity for the purpose of extending credit to their customers.

Emery (1984) examines the inefficiencies of the financial markets as an explanation for why businesses provide trade credit and how clauses of sale are determined. The purely financial intermediary motivation for trade credit is explained by the seller's need to maintain a liquid reserve in the event of imperfect financial markets, and by the seller's desire to obtain a return on the reserve above the market rate. An interest rate on market borrowings that is higher than the interest rate on market lending was seen as a financial market tariff, and this was used to analyse the purely financial motivation to transfer this liquid reserve to consumers. The seller and the

customer both suffer a loss of surplus due to the widening gap between the market price paid and received for the goods plus a loan. When the tariff source does not apply to direct loans to customers, trade credit lending allows the seller and/or the buyer to recoup at least some of this loss. This condition is met because the trade credit lender has an advantage over the financial intermediaries in terms of the information collection costs due to its familiarity with the company's customers and product, thereby offsetting the tariffs imposed by the transaction costs inherent to the financial market.

Smith (1987) proposes a model which defines that suppliers provide two-part credit to customers so that they can identify a prospective customer default more quickly than when only short-term bank credit is adopted. At the same time, suppliers also provide trade credit as a product quality guarantee to their customers and with the aim of building a long-term relationship with their customers. According to the research of Chant and Walker (1988), trade credit may act as a supplement to, or perhaps a replacement for, traditional bank lending. Ono (2001) and Danielson and Scott (2004) also suggest the same point of view that trade credit is a substitute for bank loans. Elliehausen and Wolken (1993) state that, compared with other sources of finance, the use of trade credit helps to lower transaction prices. Wilson and Summers (2002) corroborate this finding by demonstrating that small businesses use trade credit to lower the costs embedded in their transactions.

Customers with a significant amount of influence in the market may demand to buy the items on credit from the seller, which will boost their customer surplus, as explained by Van Horen (2011). This benefit to the consumer surplus rises as the degree of asymmetry in product quality information between the buyer and the supplier rises. As a consequence of this, businesses that are considered to be riskier often have little choice but to offer their products on credit since they are particularly vulnerable to the market power of customers. The author finds evidence to support this notion after analysing an extensive dataset comprised of a broad sample of companies in Eastern Europe and Central Asia. Based on their findings, there is a robust positive relationship between customers' market dominance and suppliers' offer of trade credit. Moreover, this connection is amplified when dealing with a risky supplier or when in a country with an underdeveloped finance market or a weak judicial system. Similarly, Petersen and Rajan (1997)

conduct empirical studies on the factors that influence businesses' decisions to utilise and extend trade credit using data from a sample of small businesses. They imply that companies with restricted access to outside funding from financial institutions are more likely to rely on trade credit. Firms with a competitive advantage in their ability to gather information about their clients, an advanced ability to liquidate assets, or an implied ownership interest in their customers are more likely to offer trade credit to those consumers. Trade credit is more likely to be extended by companies who have easier access to outside financing.

Fisman and Love (2003) use samples from 43 countries and prove that, in nations with undeveloped and ineffective financial sectors, firms which have a greater reliance on trade credit exhibit faster growth. The authors suggest that, in less developed financial markets, trade credit serves as a substitutional source of financing and firms benefit from the use of trade credit. By using samples of 890 firms from six emerging markets, Love et al. (2007) analyse how the recent financial crisis has affected the availability and utilization of trade credit. During the financial crisis, the firms which were more vulnerable to a financial crisis were less likely to offer trade credit to their customers. They claim that their results suggest that bank lending is transferred from financially stronger companies to weaker companies in the form of trade credit, which is consistent with the "redistribution perspective" of trade credit. The impact of a financial crisis on enterprises' access to, and willingness to provide, trade credit is studied by Garcia-Appendini and Montoriol-Garriga (2013). The authors discover that businesses that were more liquid before the financial crisis are more inclined to extend trade credit to their clients. With tighter constraints during a financial crisis, firms with limited liquidity adopt more trade credit as an alternative source of financing. The authors argue that suppliers provide liquidity insurance to their customers when bank loans are limited. Shenoy and Williams (2017) investigate how bank liquidity affects supplier-customer relationships through the provision of trade credit. As an exogenous shock to the availability of bank loans to businesses, the authors propose staged reforms to existing regulations governing the branching of interstate banks. What they discover is that businesses with a greater ability to obtain bank loans are more likely to provide trade credit to their clients. The authors also discover that loosening regulations on bank branching increases the likelihood of supplier-customer ties being strengthened.

Abdulla et al. (2017) examine the differences in how trade credit is adopted by public firms and private firms. The authors argue that, since public firms can have easier access to cheaper and less risky external sources of financing, they depend less on trade credit. The authors also suggest that both private and public firms adjust their level of trade credit towards the optimal trade credit levels. Public firms adjust their level of trade credit faster than private firms. Shang (2020) examines how a firm's stock liquidity affects the use and provision of trade credit. The author finds that businesses are more likely to grant trade credit to clients and are less dependent on the use of trade credit when the level of stock liquidation is high. Companies with limited resources, a high reliance on external finance, and high levels of short-term debt exhibit this relationship to a greater degree.

Long et al. (1993) focus on suppliers' decisions to provide trade credit. The authors argue that a major motive that encourages suppliers to offer trade credit is product quality guarantees. When there is incomplete knowledge about the quality of a product between suppliers and customers, trade credit works as a tool to distinguish between high-quality products and low-quality products. Consistent with Long et al. (1993), Deloof and Jegers (1996) find similar results that support the product quality guarantee hypothesis using samples of Belgian industrial firms and Belgian wholesale distribution firms. Ng et al. (1999) perform empirical tests using industry-specific samples of lending policies and agreements between businesses, and the authors document a rich variation. They examine the determinants of the credit policies and find results which support the theories of product quality guarantee and information asymmetry regarding customers' creditworthiness.

Wu et al. (2014) investigate how social trust influences the adoption of trade credit in China. The authors find that, in regions with a higher level of social trust, the suppliers are willing to provide more favorable trade credit to their customers. They argue that private firms in China depend more on trade credit, compared with state-owned firms which can access bank credit more easily. Social trust can help to overcome the problems faced by private firms in their financing activities. While limited bank credit is available to them, they use more trade credit as an alternative source of finance. Fabbri and Klapper (2016) use Chinese firms as their sample and examine the relationship between supplier bargaining power and their provision of trade credit. The authors find that

suppliers with weaker bargaining power tend to offer more favorable trade credit terms, such as longer credit terms, a larger proportion of products being sold by credit and a higher possibility of the extension of credit sales. Important customers are more likely to make payment after the credit repayment is overdue. When suppliers with weak bargaining power are faced with financial constraints, they are less likely to provide trade credit. Kong et al. (2020) study how CEO hometown connections with suppliers help in shaping the trade credit policies in China. They argue that a CEO hometown connection plays an important role in influencing access to trade credit from suppliers. The authors argue that, since a closer hometown connection reduces information asymmetry and establishes stronger social trust, suppliers are more certain about customers' creditworthiness and are willing to provide more favorable trade credit. They also find that firms with CEOs from places with a stronger merchant guild culture or those that hold important positions in a chamber of commerce are more easily able to obtain trade credit.

4.2.3 Hypotheses development

Prior research demonstrates that an increase in ESG practices reduces corporate risk and facilitates access to cheaper external financing and bank credit (Goss and Roberts, 2011; Hoepner et al., 2016; Nandy and Lodh, 2012; Sharfman and Fernando, 2008). A superior ESG performance may also be indicative of better access to outside financing and a greater capacity to overcome economic constraints. However, it is becoming increasingly difficult for investors to select assets that integrate ESG factors because of the way that firms engage in "greenwashing" and manipulate their ESG disclosures. Chen et al., (2014) found that firms with superior ESG practices had reduced capital restrictions. First, an improved ESG performance is connected with better stakeholder orientation, a limiting of short-term opportunistic behaviour and a lowering of total contracting costs, resulting in higher long-term revenue and profit. A higher ESG performance increases a company's probability of exposing its ESG activities, thus attracting institutional investors and analysts (Dhaliwal et al., 2011). Increasing the data availability and quality decreases the information asymmetry between the company and investors (Hail & Leuz, 2006; El Ghoul et al., 2011), resulting in reduced capital restrictions (Hubbard, 1997). As a result, lending groups have better quality information and firms pay less for external financing (Hubbard, 1997).

Consequently, it is feasible for businesses to acknowledge the significance of their environmental, social, and governance (ESG) performance and to make use of it to influence public opinion and to benefit from it. An increase in the level of disclosures may assist a company in preventing or lessening the unfavourable impacts of considerable environmental damage (or similar occurrences) on its reputation and firm value, or in reinstating its legitimacy. This may be the case if a company chooses to provide more information (Campbell et al., 2003).

In addition, stakeholders place a significant amount of trust in business signals, despite the fact that these signals may not always accurately reflect the actual environmental, social, and governance performance of the companies (Marquis et al., 2016; Van Halderen et al., 2016). Greenwashing is more prevalent among businesses that have fewer financial resources, since these businesses are more likely to deceitfully declare an inaccurate ESG disclosure score (Zhang, 2022). Moreover, highly indebted enterprises may experience additional financial pressures in the short-run and long-run, which may exacerbate their greenwashing behaviour. According to Berrone, Fosfuri, and Gelabert (2017), corporations earn environmental legitimacy by complying with external environmental expectations.

Greenwashing has been shown to benefit firms with less volatility in their stock prices and with a comparatively high WACC. Greenwashing is especially advantageous for companies with strong pricing power and is more financially feasible for these companies due to the significant knowledge gap between the firms and stakeholders involved (Gregory, 2021). Companies with lower stock volatility favour greenwashing since the penalty for being caught engaging in greenwashing is less severe. Firms with a higher WACC are more likely to participate in greenwashing than firms with a lower WACC, since their potential penalty for being caught, the dead weight loss, is more heavily discounted. As a result, greenwashing becomes more enticing. It is possible that businesses that have a greater information asymmetry are more likely to participate in greenwashing. This is because these businesses are better able to disguise the fact that they are greenwashing for a longer period of time, which allows them to maintain the benefits of greenwashing.

Studies reveal that one rationale for employing trade credit is that, by offering and adopting trade credit, firms can reduce their financial constraints through this informal source of financing (e.g., Smith, 1987; Biais and Gollier, 1997; Aktas et al., 2012). Combining the views obtained in prior studies, we argue that greenwashing can be substituted for trade credit as a device for mitigating the financial constraints of firms in the market. Therefore, we expect that an increase in a firm's greenwashing activities is associated with a lower level of the adoption of trade credit by firms.

In addition, the trust view of greenwashing suggests that greenwashing damages the trust of stakeholders and firm reputation, which reduces the provision and adoption of trade credit. The empirical research indicates that trust between suppliers and customers and corporate reputation may offer an effective mechanism for maintaining the continuation of incomplete contracts, such as trade credit. People who have a keen awareness of the degree of honesty in their communities are more likely to lend money and pay it back, even when there are no disciplinary mechanisms in place, according to Karlan (2005). Prior studies find that greenwashing, instead of building trust in firms, can damage a firm's reputation and the trust between firms and their stakeholders (Hamann and Kapelus, 2004; Pomering and Johnson, 2009; Lyon and Maxwell, 2011; Chen and Chang, 2013b; Guo et al., 2017). It is reasonable to expect there to be a negative association between greenwashing and trade credit, since firms which undertake greenwashing activities are perceived as being untrustworthy. Hence, combining the above points of views, we propose the first hypothesis as:

H1: The adoption and provision of trade credit is negatively associated with greenwashing.

Shleifer and Vishny (1986, 1997), who characterise the monitoring stance of institutional investors, believe that the large amount of stock ownership of these shareholders provides them with more motivation than smaller investors to acquire information and to supervise management. In a similar vein, Monks and Minow (1995) argue that complex institutions with considerable share ownership have a tendency to monitor and discipline managers in order to ensure that the firm's investment strategy is consistent with the objective of maximising long-term value, rather than meeting short-term earnings goals. This is because sophisticated institutions are more concerned with maximising long-term value than with meeting short-term earnings goals.

A large number of empirical studies also provide evidence on the monitoring force of institutional investors. Callen et al. (2020) compare and contrast two competing theories on the monitoring of institutional investors and short-termism. The authors present evidence that is in line with the monitoring hypothesis of institutional investors, but not with the short-termism hypothesis, which states that the stability of institutional investors has a negative association with the risk of a crash in the stock market occurring one year in the future. By asking whether the incentive of institutional investors in supervising a company is positively connected to the relative significance of the firm's stock in their portfolios, Ward et al. (2018) further examine the role of institutional investors as guardians. They conclude that a higher level of active institutional ownership fulfilling their supervisory roles is connected with an increase in the marginal value of corporate cash holdings.

We argue that a stronger external monitoring force, which reduces information asymmetry between firm management and shareholders, reduces the cost of capital and improves a firm's ability to raise funds through loans and equity capital. The existing literature gives evidence that attention from institutional investors reduces the cost of capital. Saci and Jasimuddin (2021) find that an increase in institutional investor research on a firm reduces the cost of capital. They explain that institutional investor research reduces the risk borne by investors, since more comprehensive information is revealed. In this way, compensations to risk premiums decrease, leading to a lower cost of capital. Attig et al. (2013) also find that long-term dedicated institutional investor ownership is negatively associated with the cost of capital. The authors state that long-term institutional investors impose greater monitoring forces on firms, reducing information asymmetry. We expect that with a stronger external monitoring force imposed by institutional investors, the information asymmetry is reduced, and firms then have a reduced cost of capital and depend less on trade credit, since they are better able to source loans and equity capital. We consequently propose the second hypothesis as:

H2: The negative association between the adoption and provision of trade credit and greenwashing is less pronounced for firms with a higher level of institutional ownership.

Firms commit greenwashing intend to convey stakeholders in return for greater green trust and reputation, hence transmitting into higher profitability and lower costs (Laufer, 2003; Parguel et al., 2011b). The return on greenwashing highly depends on green trust (Chen and Chen, 2010) and negatively associated with green scepticism and perceived risk due to confusion (Chen and Chang, 2013). Green scepticism arises due to lack of trustworthy information provided to stakeholders, such as customers. Companies can't simply say their goods are "green," therefore they need to be more transparent about how they achieve it. Stakeholders may be sceptical of green marketers' promises if they are not convinced of the quality of their goods, which makes it difficult for green marketers to succeed(Chen and Chen, 2008). According to Turnbull et al. (2010), consumer confusion occurs when a buyer is unable to build a coherent mental picture of a product's many features after being presented with an information processing procedure. Misunderstanding or misreading of the market is the result of consumer confusion. Information, especially that is comparable, complicated, ambiguous, or abundant, may lead to customer confusion. Chen and Chang (2013) extend this notion to green information processing procedure of the audiences and argue that green scepticism increases because audiences are limited in their cognitive ability to in information processing. Mitchell (1999) state that confusion may arise due to unclarified information conveyed by the firms. The author claims that marketing communications that are muddled, deceptive, or just insufficient to be accountable for the resulting misunderstanding.

Chen and Chang (2013) and Chen et al. (2014) demonstrate that green trust is significantly related to green confusion and perceived risk associated with it. Therefore, we argue that firms with higher level of information asymmetry induce greater green confusion and greater perceived risk of stakeholders, dampening the return of greenwashing communication, and hence reduce the effect of greenwashing on trade credit. We then propose the following hypothesis:

H3: The negative association between the adoption and provision of trade credit and greenwashing is less pronounced for firms with higher information asymmetry.

4.3 Data and Methodology

4.3.1 Greenwashing measures and trade credit

We obtain data of greenwashing from Thomson Reuters ASSET4 ESG database. The accounting data is obtained from Compustat database. Data of analyst forecast is collected from I/B/E/S database. We also collect data of institutional investor ownership from Thomson Reuters F13 database. Our sample covers listed firms from the U.S. and a sample period ranges from 2002 to 2019. We distinguish firms' substantive CSR scores (e.g., total direct flaring or venting of natural gas emissions, percentage of women employees), from their symbolic CSR scores (e.g., does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx (sulfur oxides) or NOx (nitrogen oxides) emissions? Does the company have a policy to ensure the freedom of association of its employees?). ASSET4 claims that its ratings are able to measure firms' ''talk'' versus their ''walk'' in relation to corporate social activities. We construct the first measure of greenwashing, *GW_ratio*, by computing the ratio of symbolic to substantive CSR scores. The second measure of greenwashing, *GW_diff*, is constructed as being the difference between symbolic and substantive CSR scores.

Following Shang (2020), we use three measures of firms' trade credit policies. The first measure is Trade receivables (*TR*), measuring the willingness by a firm to offer trade credit to its customers, which is calculated as trade accounts receivable divided by total sales. The second measure is Trade payables (*TP*), measuring a firm's willingness to rely on trade credit provided by its suppliers. The second measure is calculated as accounts payable divided by the cost of goods sold. The third measure is Net Payables (*Net*), which is the difference between Trade receivables and Trade payables. We obtain firm accounting and stock data from the Compustat database.

4.3.2 Baseline regressions

We adopt panel regression models to examine the impact of greenwashing activities on a firm's trade credit policies. We estimate the following models to examine the first hypothesis:

$$TradeCredit_{it+1} = \beta_0 + \beta_1 Greenwashing_{it} + \beta_2 FirmControl_{it} + \\ + \beta_3 Industry_i + \beta_4 Year_t + \varepsilon_{it} \quad (1)$$

where *TradeCredit* represents the three measures of trade credit: *TR*, *TP* and *Net*. *TR* is the trade receivable days measured as being a firm's accounts receivable scaled by total sales. *TP* is the

trade payable days measured as being a firm's accounts payable scaled by the cost of goods sold. *Net* is the net trade credit measured as being the difference between trade receivables and trade payables. *Greenwashing* represents the two measures of the level of greenwashing by the firms. *GW_ratio*, a greenwashing ratio, is computed as the symbolic CSR scores scaled by the substantive CSR scores. *GW_diff* is the difference between the suggested level of greenwashing and the actual level of greenwashing, computed as the symbolic CSR scores minus the substantive CSR scores.

We include firm-level control variables to control for their effects on trade credit. We control for firm size, since larger firms may have easier access to finance compared with smaller firms, and may therefore use or provide less trade credit (Shang, 2020). Xu et al. (2020) argue that smaller firms generally have higher information asymmetry and are, therefore, less trustworthy than larger firms. We use the natural logarithm of total assets to proxy for firm size. We also include firm age as one of our control variables, as older firms are more trustworthy and less dependent on trade credit (Ng et al., 1999). Molina and Preve (2012) find that firms with greater changes in sales are more like to alter their dependence on trade credit. We calculate the sales growth rate as being the difference between sales in the current period and sales in the previous period, scaled by the previous sales. We control for firm profitability by using ROA (return on assets), computed as a firm's net income scaled by total assets, since profitable firms are more likely to receive advanced trade credit settings (Zhang et al., 2014). Firm growth opportunity is proxied by the market-to-book ratio. This is because a firm experiences a higher demand for trade credit when it experiences high growth (Petersen and Rajan, 1997). We also incorporate the leverage ratio, which is computed as the total liabilities divided by total assets in the regression model, since trade credit is perceived to be a substitution for loan and equity finance. Firms with more current assets are more dependent on trade credit (Petersen and Rajan, 1997), and we therefore control for cash holdings and PPE. The two variables are scaled by total assets. We also control for capital expenditure, since firms that spend more on capital tend to be more dependent on trade credit (Carbo-Valverde, Rodriguez-Fernandez and Udell, 2016). We also control for the industry and year fixed effects.

4.3.3 Sample and data

Following Roulet and Touboul (2015), we collect the CSR performance score data of U.S. firms over the period between 2002 and 2019 from the Thomson Reuters ASSET4 ESG database. I look at the issue of greenwashing research on U.S. firms for two main reasons. U.S. consumers are increasingly concerned about environmental issues, and they are more likely to be influenced by green marketing claims (Berrone et al., 2017; Schmuck et al., 2018). As a result, U.S. firms may be more likely to engage in greenwashing practices to appeal to these consumers. In addition, research often focuses on U.S. firms because data on their environmental practices and marketing claims is readily available. The United States has strong disclosure requirements for public companies, which can make the related data available for researchers to access information on firms' environmental practices. Data used to compute trade credit and other accounting data are obtained from Datastream, and Compustat. Data of institutional investors are obtained from the Thomson Reuters 13F database and the analyst data are collected from the I/B/E/S database. We first construct greenwashing measures, GW_Diff and GW_Ratio. We then merge the trade credit measures with the greenwashing measures. We add in control variables, such as firm size, firm age, sales growth, ROA, PPE, market-to-book ratio, cash holdings, leverage and capital expenditure. After eliminating the missing values, we finally obtain a sample of 13,847 firm-year observations.

4.4 Empirical Results

4.4.1 Descriptive statistics

The descriptive statistics provide a summary of the variables employed for our empirical investigation. The table of descriptive statistics includes the number of observations, mean, median, standard deviation and 25% and 75% quantile of variables. Table 4-1 represents the descriptive statistics of the variables incorporated when analyzing the influence of greenwashing on a company's trade credit. As per the above findings, *GW_diff* has a mean of -17.391 and *GW_ratio* has a mean of 0.638. It is implied that a firm's symbolic CSR score is, on average, lower than the substantive CSR score. The dependent variables in our primary test (*TR* and *TP*) have means of 0.307 and 0.122, indicating that trade receivables accounts for, on average, 30.7% of a firm's total assets, and that trade payables accounts for 12.2% of the cost of goods sold. The average firm size and firm age of our sample are 8.595 and 27.652, respectively, with a market-to-book ratio of

2.119. On average, the firms are large in size and old in age. The average leverage ratio is 0.279, indicating that, on average, the firms depend more on long-term and short-term debt to fund their operating, whereas trade payables only account for 0.122. PPE and cash holdings are 0.234 and 0.152, on average. The average capital expenditure accounts for only 3.6% of the total assets, indicating that the sample firms have low capital expenditure. The sales growth rate and ROA are, on average, low at 3.8% and 10%, respectively.

[Insert Table 4-1 around here]

Table 4-2 represents the correlation coefficients between dependent variables and independent variables. High correlation between independent variables raises multicollinearity concerns, which may result in an inaccurate estimation of the coefficients of interest. The coefficients between independent variables and control variables are less than 0.5, which indicates that there is no multicollinearity concern within our models. We notice that the correlation coefficients between greenwashing measures, *GW_diff* and *GW_ratio*, and trade receivables are -0.031 and -0.033. The two correlation coefficients are significant at the 5% level. The correlation coefficients between the greenwashing variables, *GW_diff* and *GW_ratio*, and trade payables are -0.005 and -0.012, respectively. The negative coefficients provide primary evidence that greenwashing and trade credit are negatively related. This is consistent with our prediction in Hypothesis 1, as we argue that from both the financial constraints view and the social trust view, trade credit is negatively associated with the level of greenwashing.

[Insert Table 4-2 around here]

4.4.2 The impact of greenwashing activities on trade credit

Previous studies suggest that greenwashing activities bring positive externalities and induce firms to go green and improve their CSR performance, thus reducing the information asymmetry. Trade credit also serves as a device for reducing information asymmetry between management and buyers and external investors. In addition, analysts also serve to diffuse greenwashing information, since they please the management in order to obtain private firm information. Therefore, greenwashing acts as a substitution for trade credit and reduces the demand for trade credit.

Table 4-3 reports the regression results of the impact of trade credit on greenwashing measures when control variables are added to the regression models. The coefficients of *GW_diff* and *GW_ratio* are shown to be negative and significant at the 1% significance level, indicating that the results support the hypothesis H1 and provide evidence that greenwashing reduces the demand for trade credit and serves to reduce the information asymmetry of firms. The results show that with a one point increase in difference between firms' symbolic CSR scores and their substantive CSR scores, the trade receivable ratio decreases by 0.004 and the trade payables ratio decreases by 0.248. With a 1% increase in *GW_ratio*, the trade receivables ratio decreases by 0.22% and the trade payables ratio decreases by 11.695%. Moreover, the coefficient of net trade payables also shows negative significance.

There is a significant negative association between greenwashing and net payables. For *GW_diff (GW_ratio)*, the results indicate that a negative relationship is significant at the 10% (5%) level of significance level. Since net payables are computed as trade payables minus trade receivables. The results indicate that the effect of trade payables dominates the effect of trade receivables. The coefficient of *GW_diff* is -0.002, representing that net payables decrease by 0.002 when *GW_diff* increases by one. The coefficient of *GW_ratio* is -0.099, representing that net payables decrease by 0.099 when *GW_ratio* increases by one.

[Insert Table 4-3 around here]

Most of the control variables show significance and signs that are consistent with the existing literature. We find in Table 4-3 that the trade receivables and trade payables ratios are both positive and significantly related to firm size and are negative and significantly linked with firm age. These findings are consistent with the studies by Shang (2020) and Xu et al.(2020). Sales growth rate is significant and negatively related to TR and TP and this is in line with Xu et al. (2020). We find a significant and negative relationship between ROA and trade receivables, but an insignificant relationship between ROA and trade payables. PPE, cash holdings, leverage and capital expenditure are positive and significantly related to trade receivables. The trade payables ratio is positive and significantly related to PPE, which is consistent with Xu et al. (2020), and is negative and significantly related to market-to-book ratio, cash, and leverage.

4.4.3 The effect of institutional investors

Previous studies on institutional ownership concentration provide theoretical and empirical evidence on the monitoring function of institutional investors in reducing the agency problems between shareholders and managers (Hartzell and Starks, 2003; Khan et al., 2005; Janakiraman et al., 2010b). Due to the monitoring mechanism of institutional investors, firms are less likely to engage in greenwashing activities, demonstrating that there would be a moderating effect of institutional ownership concentration on the relationship between the two main variables. We measure institutional investor concentration by using the total proportion of institutional investor ownership.

Table 4-4 reports the regression of trade credit measures on greenwashing measures when the interaction terms of greenwashing (*GW_diff* and *GW_ratio*) and total institutional investor ownership are added to the baseline regression models. The coefficients of *GW_diff* and *GW_ratio* remain negative and significant at the 1% significance level, reinforcing that the results support hypothesis H1 and providing evidence that greenwashing reduces the demand for trade credit and serves to reduce the information asymmetry of firms. The results show that with a one point increase in the difference between a firm's symbolic CSR score and its substantive CSR score, the trade receivable ratio decreases by 0.009 and the trade payables ratio decreases by 0.516. With a 1% increase in the *GW_ratio*, the trade receivables ratio decreases by 0.444% and the trade payables ratio decreases by 25.643%. The coefficients of the interaction term show positive significance for the regression with the trade payables ratio. It is implied that institutional investor concentration has a moderating effect on the adoption of trade credit due to its monitoring function. However, the coefficients of the interaction terms are not significant for the trade receivables ratio, indicating no effect of the institutional investor concentration on the relationship between greenwashing and trade receivables.

[Insert Table 4-4 around here]

4.4.4 The effect of information asymmetry

Many pieces of literature based on analysts reveal that analysts work as an information intermediary to enhance firms' corporate governance and to reduce agency problems (Dhaliwal et

al., 2012b; Chen et al., 2015, 2017b). Chen et al. (2017) reveal that, through information intermediary and monitoring channels, the analyst forecast quality, measured by analyst forecast accuracy and dispersion, affects firms' investment decisions. The authors provide evidence of the effect of analysts' information intermediary functions on firm value and corporate governance. We use analyst forecast dispersion, which measures the difference between analyst estimations on future earnings per share, to proxy the information asymmetry of the firms. We argue that, through firms exhibit higher level of information asymmetry (measured by analyst forecast dispersion) have the reduced return on greenwashing activities, implying a moderating effect of information asymmetry on the relationship between greenwashing and trade credit.

Table 4-5 presents the regression results when we add in the interaction term of greenwashing measures and analyst forecast dispersion. The results show that the coefficients of *GW_diff* and *GW_ratio* for both trade receivables and trade payables remain negative and significant at the 1% significance level. However, the coefficients of interaction terms are shown to be positive and significant only for the trade payables ratio. This indicates that the moderating effect of analyst forecast dispersion is only effective on the reduction of trade payables. The regression results show that for firms with different level of information asymmetry, the impact of greenwashing on trade receivables are indifference among them. However, in terms of trade payables, firms with greater information asymmetry exhibit stronger negative impact of greenwashing on trade payables. The test results are consistent with our expectation in Hypothesis 3. We argue that information asymmetry induces greater level of green scepticism among stakeholders, causing damage of green trust of firms. The effect of greenwashing on trade payables therefore is less pronounced in firms of higher information asymmetry.

[Insert Table 4-5 around here]

4.4.5 Extended study: the channel effects

We then examine whether greenwashing affects trade credit through the channel of financial constraints. We use three measures of financial constraints, these being the KZ index, no-dividend payer dummy and the short-term debt holdings of the firms. According to previous research, firms

have an incentive to engage in greenwashing activities to reduce cost of funding and for the relief of financial constraints (Attig et al., 2021; Zhang, 2021; Zhang, 2022). We expect that firms which are faced with severer financial constraints are more likely to engage in greenwashing activities, and, thus, have a reduced tendency to adopt trade credit. Firms that do not pay dividends are often perceived to be more financial constrained (Schiantarelli, 1996; Farre-mensa, 2016; Campello et al., 2010). We compute the KZ index by following Kaplan and Zingales (1997) and the measure of short term debt according to Shang (2020). A higher ratio in the KZ index represents more severe financial constraints confronted by those firms. ST1 and ST3 of short-term debts refer to the ratio of current liabilities over total debt and the ratio of current liabilities plus liabilities due within three years over total debt.

Table 4-6 presents the test results when the interaction term of the greenwashing measures and the KZ index and no-dividend payer are added to the models. We notice that the coefficients of the interaction terms, *KZ*GW_diff* and *KZ*GW_ratio,* are both negatively significant at the 5% significance level when trade payables is the dependent variable (Columns (3) and (4)). The coefficients of the interaction terms, *Non_Div*GW_diff* and *Non_Div*GW_ratio,* are both negatively significant at the 5% significance level and 10% significance level, respectively, when trade payables is the dependent variable (Columns (7) and (8)). This demonstrates that, with a higher level of financial constraint, the negative association between greenwashing and the adoption of trade credit is more pronounced. This proves that greenwashing influences trade credit through the channel of financial constraints. However, the coefficients of the interaction terms are insignificant when trade receivables are used as the dependent variable (Columns (1), (2), (5) and (6)), indicating financial constraints channel does not explain the negative association between greenwashing and trade receivables.

[Insert Table 4-6 around here]

We then demonstrate that the results are robust when alternative measures of financial constraints are employed. Following Shang (2020), we apply short-term debt to measure financial constraints. We use two measures of financial constraints, these being the short-term debt due within one year, ST1, and the short-term debt due within three years, ST3. The existing literature provides evidence that a higher level of short-term debt is associated with lower liquidity, higher refinancing risk,

more cash holdings and a lower ability to invest (Almeida et al., 2004; Harford et al., 2014; Fu and Tang, 2016). Table 4-7 shows that the coefficients of the interaction terms of both *ST1* and *ST3* with greenwashing are negatively significant when trade payables is used as a dependent variable, except for *ST1*GW_ratio*. In general, the results show that the negative association between greenwashing and trade payables is more pronounced in firms facing greater financial constraints.

[Insert Table 4-7 around here]

We then test the channel of social trust. We argue that, if greenwashing activities result in damage to the green reputation of a firm and it reduces the social trust between the suppliers and customers, trade credit and greenwashing should be negatively associated with one another. Trade credit is an informal form of unsecured debt which is highly dependent on trust and reputation. We then test the channel effects on social trust. Following Deng et al. (2013), we construct a social trust measure by using an social capital index (SCI), computed from community relations, diversity, human rights and environmental dimensions of the KLD ratings. The concern scores are subtracted from the strength scores for each dimension assigned to a firm. The overall index is equal to the sum of the four dimensions scores. We obtain the data from the MSCI KLD ESG database. The adjusted index is computed by using standardized dimension scores and an unadjusted index is computed by using non-standardized dimension scores.

Table 4-8 reports the results when the interaction terms of the adjusted SCI index and greenwashing are added to the regression model. The coefficients of the interaction terms are insignificant, which shows that social trust does not serve as a channel for explaining the association between greenwashing and trade credit. We then repeat the test using an alternative measure of SCI index, this being the unadjusted SCI index. The results are presented in Table 4-9. The coefficients of the interaction terms remain insignificant, confirming that there is no channel effect through social trust.

[Insert Table 4-8 and Table 4-9 around here]

4.5 Robustness Tests

We measure the level of greenwashing by using CSR performance indicators obtained from the Thomson Reuters ASSET4 ESG database. A firm's CSR performance may affect its financial performance, the firm value and other firm characteristics, thus, influencing the supply and provision of trade credit. However, we expect that the supply and provision of trade credit can also affect the firm performance and firm characteristics, thus, directly affecting a firm's adoption of CSR and its greenwashing activities. To alleviate the endogeneity problem caused by reverse causality, we adopt instrumental variables 2SLS tests and GMM tests.

Previous studies show that investments in CSR activities may lead to a reduction in a firm's financial performance and could damage firm value, based on the over-investment theory. Barnea and Rubin (2010) argue that CSR engagements, instead of serving to maximize shareholder wealth, are only used as a tool to fulfill managers' self-interests and to advance their careers. Di Giuli and Kostovetsky (2014) suggest that some managers believe that additional resource expenditure is a diversion from the main aim of the firm and that investments in CSR activities do not serve to maximize the profit of shareholders. The enhancement in a firm's future sales induced by CSR engagements cannot withstand the direct damage of such investments to the firm value. Gillan et al. (2021) also state that over-investment in CSR activities can cause damage to firm value due to agency problems between managers and shareholders. In addition, Dai et al. (2019) argue that CSR reporting is used by managers as a tool for the pursual of self-interests, instead of being used to disclose useful information about a firm's CSR performance, thus, magnifying the problem of greenwashing.

However, other researchers provide an abundance of theoretical and empirical evidence that CSR activities can enhance a firm's financial performance and other firm characteristics. Jensen (2001) suggests that firms who engage in CSR activities consider the interests of all stakeholders, as opposed to only the interests of shareholders, in order to establish their corporate reputation and to maintain the long-term goals of profit maximization This approach results in better long-term profitability and efficiency. Firms also build up a better relationship with their stakeholders, such as customers, suppliers and employees, in order to obtain their support by engaging in CSR activities. Simultaneously, CSR activities help to reduce the information asymmetry between stakeholders and firms (Cui et al., 2018). CSR engagement also serves as a tool for risk

management, especially when firms are faced with negative circumstances, such as a financial crisis and an economic downturn (Lins et al., 2017). Previous studies reveal that CSR activities help to reduce firm risks (Tang and Shum, 2003; Harjoto and Laksmana, 2018). Firms with higher CSR performances are also able to obtain capital and debt with lower costs (El Ghoul et al., 2011a; Cooper and Uzun, 2015).

At the same time, firms adopt CSR as a business strategy based on the condition of their current firm performance and firm characteristics, which also are affected by the supply and provision of trade credit. Martínez-Sola et al. (2013) find a non-linear relationship between the firm provision of accounts receivable and firm value in Spanish firms. The results obtained show a positive relationship between firm value and trade credit at low levels of receivables, and a negative relationship at high levels. Trade credit also helps to reduce the cost of financing for firms without close relationships with banks, and helps to diffuse information from firms to the suppliers (Biais and Gollier, 1997). Alex Yang et al. (2021) identify three roles of trade credit: first, trade credit provides cash flow to firms when they are financially constrained; second, trade credit helps to smooth a supplier's cash flow; third, trade credit serves as a tool for risk management for protecting against the default risk by customers. We expect that trade credit affects a firm's financial conditions and, thus, has an influence on the decisions made around CSR activities and greenwashing strategies.

To alleviate the endogeneity concerns, we adopted instrumental variables and performed 2SLS and GMM estimations. Following Leszczensky and Wolbring (2019) and Hu (2021), we use the first lagged values of the independent variables as the instrumental variables. The first stage includes the regression of original *GW_diff* and *GW_ratio* regressed on the first lagged *GW_diff* and *GW_ratio* (instrumental variable) and a set of control variables. In the second stage, we regress TR and TP on predicted values obtained from the first stage. Table 4-10 reports the results using the 2SLS estimations and our results remain robust when using the first lag of the dependent variables. The coefficients of greenwashing are significantly negative at 1% significance level.

[Insert Table 4-10 around here]

We also perform GMM estimations and the results are shown in Tables 4-11 and 4-12. The results remain robust and are in line with those of the baseline regression models. We then repeat the estimations by using the second lag of the dependent variables. The results are shown in Table 4-11 and Table 4-12 and they remain robust. We then use the industry-mean value of greenwashing as the instrumental variable. The results still remain negative and significant. The results are shown in Table 4-13. The above tests show that greenwashing reduces the supply and provision of trade credit after addressing the reverse causality.

[Insert Table 4-11 to 4-13 around here]

4.6 Conclusion

This paper aims to investigate how greenwashing by firms can affect the supply and use of trade credit. Firms often use trade credit for several reasons. First, trade credit is adopted for financing purpose when firms are faced with financial constraints or have difficulty in obtaining loans from banks. Second, trade credit is used to insure against the credit risk of customers. Third, trade credit works as a tool to facilitate the information transfer from customers to suppliers, a tool which is even suggested to be more effective than banks.

Our results show that firms' provision and adoption of trade credit have significant and negative associations with greenwashing activities. To be more specific, we find financial constraints channel can explain the negative association between greenwashing and trade payables. We also find that, due to the external monitoring effects of institutional investors, firms with stronger external monitoring forces have less incentive to adopt greenwashing. Therefore, for firms with greater ownership of institutional investors, the negative association between greenwashing and trade credit is less pronounced. We also find that the negative association between greenwashing and trade payables are less pronounced with higher information asymmetry. Our results suggest that information asymmetry reduce return a firm can pursue from greenwashing activities, hence reduce impact of greenwashing on trade payables.

Our study contributes to the literature in several ways. First, to our best knowledge, this is the first study on the impact of greenwashing activities on firms' trade credit policies. Previous literature has focused on how greenwashing affects the market outcome and the information environment of

a firm. Less attention has been paid to the role of greenwashing in the field of corporate governance. As the use of trade credit between suppliers and customers account for large part of firms' short-term financing activities, our study provides vital empirical evidence on the rationale for the adoption of trade credit as an alternative financing source, besides traditional explanations such as the financing motives. Second, this study contributes to the literature on greenwashing and supports the theory that firms commit greenwashing activities in order to improves their financing situations. With higher tendency to greenwashing, firms adopt less trade credit. Therefore, we conclude firms use greenwashing as a substitute to trade credit to seek for relief from financial distress.

Table 4- 1: Summary Statistics

Variables	Count	Mean	Median	Standard Deviation	25%	75%
TR	13847	0.307	0.139	0.865	0.086	0.199
TP	13847	0.122	0.048	0.199	0.048	0.105
GW_Diff	13847	-17.391	-20.202	13.056	-26.818	-9.927
GW_Ratio	13847	0.638	0.557	0.271	0.441	0.780
Size	13847	8.595	8.544	1.663	7.517	9.654
Firm age	13847	27.652	24.000	17.064	13.000	44.000
Sale growth	13847	0.038	0.057	0.297	-0.011	0.131
ROA	13847	0.100	0.107	0.129	0.051	0.162
PPE	13847	0.234	0.140	0.242	0.045	0.356
Market-to-book ratio	13847	2.119	1.566	1.576	1.137	2.425
Cash	13847	0.152	0.081	0.184	0.030	0.197
Leverage	13847	0.279	0.253	0.211	0.106	0.406
CAPEX	13847	0.036	0.023	0.042	0.007	0.049

This table reports the descriptive statistics. The sample period is from 2002 to 2019. The definitions of all variables are given in Appendix C.

Table 4- 2: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1)TR	1.000													
(2)TP	**0.444**	1.000												
(3)Net	**0.121**	**-0.814**	1.000											
(4)GW_Diff	**-0.031**	-0.005	-0.014	1.000										
(5)GW_ratio	**-0.033**	-0.012	-0.007	**0.985**	1.000									
(6)Size	**0.151**	**-0.030**	**0.134**	**0.369**	**0.391**	1.000								
(7)PPE	**-0.170**	**-0.063**	**-0.038**	**0.087**	**0.098**	**0.149**	1.000							
(8)ROA	**-0.034**	**-0.279**	**0.280**	**0.023**	**0.032**	**0.289**	**0.038**	1.000						
(9)MTBR	**-0.037**	**0.167**	**-0.189**	**-0.030**	**-0.035**	**-0.244**	**-0.065**	**-0.507**	1.000					
(10)EBIT	**-0.020**	**-0.271**	**0.280**	**0.021**	**0.030**	**0.293**	0.001	**0.997**	**-0.506**	1.000				
(11)Cash	**-0.008**	**0.132**	**-0.163**	**-0.073**	**-0.092**	**-0.388**	**-0.367**	**-0.189**	**0.184**	**-0.174**	1.000			
(12)Cash flows	**-0.017**	**-0.270**	**0.277**	**0.020**	**0.029**	**0.278**	**0.037**	**0.971**	**-0.526**	**0.969**	**-0.151**	1.000		
(13)Leverage	**0.040**	**0.096**	**-0.069**	**0.045**	**0.042**	0.015	**0.147**	**-0.374**	**0.285**	**-0.381**	**-0.198**	**-0.451**	1.000	
(14)CAPEX	**-0.127**	**-0.031**	**-0.044**	-0.015	-0.012	**0.025**	**0.650**	0.014	**0.022**	**-0.025**	**-0.191**	0.013	**0.059**	1.000

This table reports the correlation matrix of the variables. The sample period is from 2002 to 2019. A correlation in bold indicates the statistically significance at 5 percent level or above. The definitions of all variables are given in Appendix C.

Table 4- 3: The impact of greenwashing on trade credit

	(1)	(2)	(3)	(4)	(5)	(6)
	TR	TR	TP	TP	Net	Net
GW_diff	-0.004***		-0.203***		-0.002*	
	(-3.237)		(-3.928)		(-1.912)	
GW_ratio		-0.227***		-9.332***		-0.099**
		(-3.301)		(-3.525)		(-2.102)
Size	0.102***	0.104***	2.573***	2.560***	0.057***	0.059***
	(4.503)	(4.529)	(5.360)	(5.329)	(3.620)	(3.669)
Age	-0.509***	-0.502***	-7.376***	-7.227***	0.099*	0.103**
	(-7.263)	(-7.125)	(-3.468)	(-3.368)	(1.878)	(1.962)
Sales growth	-2.321***	-2.331***	-76.045***	-77.614***	0.474	0.478
	(-5.328)	(-5.329)	(-5.992)	(-6.111)	(1.452)	(1.464)
ROA	-0.018**	-0.018**	-0.361	-0.362	0.007	0.008
	(-2.467)	(-2.449)	(-1.623)	(-1.611)	(1.136)	(1.180)
PPE	1.511***	1.526***	60.542***	62.078***	-0.312	-0.312
	(3.737)	(3.762)	(4.860)	(4.982)	(-1.029)	(-1.029)
MTB	0.091	0.090	-20.668***	-20.858***	0.350***	0.351***
	(0.701)	(0.695)	(-5.141)	(-5.204)	(3.570)	(3.574)
Cash	0.197*	0.195*	-12.170***	-11.911***	-0.327***	-0.330***
	(1.849)	(1.822)	(-3.832)	(-3.744)	(-3.539)	(-3.543)
Leverage	0.258**	0.253**	-28.749***	-28.936***	-0.141	-0.144*
	(2.238)	(2.199)	(-10.504)	(-10.536)	(-1.635)	(-1.652)
Capex	1.333***	1.316***	7.711	7.814	0.409	0.395
	(4.622)	(4.564)	(1.193)	(1.190)	(1.641)	(1.586)
Constant	-0.527***	-0.345**	-20.394***	-11.199***	-0.608***	-0.543***
	(-2.668)	(-2.106)	(-4.225)	(-2.867)	(-4.566)	(-4.807)
Industry dummy	-0.527***	-0.345**	-20.394***	-11.199***	-0.608***	-0.543***
Year dummy	(-2.668)	(-2.106)	(-4.225)	(-2.867)	(-4.566)	(-4.807)
R^2	0.234	0.234	0.335	0.335	0.035	0.035
Obs.	13847	13847	13847	13847	13847	13847

The table presents regression results of the provision and adoption of trade credit on greenwashing measures. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 4: The moderating effect of total institutional ownership

	(1)	(2)	(3)	(4)
	TR	TR	TP	TP
GW_diff	-0.009***		-0.004***	
	(-3.157)		(-5.040)	
GW_diff *Total_IO	0.005		0.004***	
	(1.439)		(3.395)	
GW_ratio		-0.444***		-0.213***
		(-3.335)		(-5.354)
GW_ratio*Total_IO		0.236		0.185***
		(1.474)		(3.786)
Total_IO	0.103	-0.132	0.022	-0.158***
	(1.222)	(-1.156)	(1.172)	(-4.068)
Size	0.136***	0.139***	0.023***	0.023***
	(4.807)	(4.846)	(6.498)	(6.374)
Age	-0.003**	-0.003**	0.001***	0.001***
	(-2.481)	(-2.349)	(2.713)	(2.783)
Sale_growth	-0.169***	-0.170***	0.011*	0.011*
	(-2.653)	(-2.660)	(1.815)	(1.890)
PPE	-0.488***	-0.483***	-0.118***	-0.118***
	(-6.299)	(-6.161)	(-6.102)	(-6.039)
MTB	-0.030***	-0.029***	-0.010***	-0.010***
	(-3.522)	(-3.488)	(-4.574)	(-4.533)
Cash	0.312**	0.313**	-0.076***	-0.078***
	(2.034)	(2.036)	(-3.121)	(-3.163)
Leverage	0.318**	0.314**	-0.202***	-0.204***
	(2.353)	(2.328)	(-10.138)	(-10.195)
Capex	0.787***	0.772***	0.136**	0.136**
	(2.974)	(2.912)	(2.195)	(2.185)
Constant	-0.848***	-0.457**	-0.179***	0.027
	(-3.301)	(-2.123)	(-4.475)	(0.718)
Industry dummy	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y
R^2	0.241	0.242	0.415	0.414
Obs.	10379	10379	10379	10379

The table presents regression results of the moderating effect of total institutional investor on relationship between trade credit and greenwashing. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 5: The moderating effect of analyst forecast dispersion

	(1) TR	(2) TR	(3) TP	(4) TP
GW_diff	-0.005***		-0.002***	
			(-5.221)	
GW_diff *Analyst_FD	(-3.692)		0.048**	
	(1.759)		(2.189)	
GW_ratio		-0.282***		-0.080***
		(-3.686)		(-5.038)
GW_ratio* Analyst_FD		9.756*		1.994*
		(1.702)		(1.876)
Analyst_FD	4.993**	-4.670	1.371***	-0.741
	(2.077)	(-1.269)	(3.054)	(-0.885)
Size	0.149***	0.151***	0.024***	0.024***
	(4.715)	(4.749)	(6.053)	(6.035)
Age	-0.003**	-0.002**	0.001***	0.001***
	(-2.078)	(-1.963)	(4.033)	(4.106)
Sale_growth	-0.188**	-0.188**	0.020**	0.020**
	(-2.266)	(-2.281)	(2.312)	(2.345)
PPE	-0.475***	-0.468***	-0.121***	-0.120***
	(-5.365)	(-5.235)	(-5.822)	(-5.719)
MTB	-0.029***	-0.029***	-0.011***	-0.011***
	(-2.689)	(-2.660)	(-4.401)	(-4.351)
Cash	0.318*	0.320*	-0.048	-0.049
	(1.680)	(1.684)	(-1.602)	(-1.612)
Leverage	0.306**	0.302**	-0.176***	-0.177***
	(2.024)	(1.999)	(-8.158)	(-8.207)
Capex	0.757***	0.733**	0.148**	0.144**
	(2.595)	(2.504)	(2.187)	(2.104)
Constant	-1.135***	-0.892***	-0.164***	-0.086***
	(-4.423)	(-3.946)	(-4.577)	(-2.976)
Industry dummy	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y
R^2	0.247	0.248	0.420	0.420
Obs.	8358	8358	8358	8358

The table presents regression results of the moderating effect of analyst forecast dispersion on relationship between trade credit and greenwashing. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 6: The channel effect of financial constraints

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TR	TR	TP	TP	TR	TR	TP	TP
GW Diff	-0.004**		-0.231***		-0.004***		-0.147***	
	(-2.419)		(-4.201)		(-3.638)		(-3.572)	
GW_Diff* KZ_Index	0.001		-0.033**					
	(0.728)		(-2.385)					
GW_Diff* Non_Div					-0.001		-0.159**	
					(-0.770)		(-2.514)	
GW_Ratio		-0.192**		-10.977***		-0.235***		-8.221***
		(-2.447)		(-3.881)		(-3.868)		(-4.108)
GW_Ratio*KZ_Index		0.029		-1.516**				
		(0.824)		(-2.273)				
GW_Ratio* Non_Div						-0.044		-5.959*
						(-0.615)		(-1.949)
KZ_Index	0.037**	0.009	1.022***	2.540***				
	(2.200)	(0.432)	(2.869)	(5.414)				
Non_Div					-0.005	0.046	-2.883**	3.793*
					(-0.141)	(0.849)	(-2.406)	(1.662)
Constant	-0.586***	-0.429**	-24.321***	-14.200***	-0.686***	-0.503***	-27.405***	-20.526***
	(-2.914)	(-2.376)	(-4.923)	(-3.423)	(-3.230)	(-2.790)	(-5.378)	(-4.908)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.229	0.229	0.336	0.335	0.228	0.229	0.340	0.339
Obs.	13729	13729	13729	13729	13847	13847	13847	13847

The table presents regression results of the channel effect of financial constraints on relationship between trade credit and greenwashing. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 7: The channel effect of financial constraints

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TR	TR	TP	TP	TR	TR	TP	TP
GW Diff	-0.007***		-0.138***		-0.007***		-0.152***	
	(-4.518)		(-3.028)		(-4.357)		(-2.723)	
GW_Diff*ST1	0.010		-0.536*					
	(1.051)		(-1.749)					
GW_Diff*ST3					0.006		-0.333**	
					(1.035)		(-2.453)	
GW_Ratio		-0.313***		-7.421***		-0.337***		-7.762***
		(-4.596)		(-3.315)		(-4.424)		(-2.843)
GW_Ratio*ST1		0.362		-22.117				
		(0.703)		(-1.381)				
GW_Ratio*ST3						0.216		-14.900**
						(0.778)		(-2.145)
ST1	0.799***	0.380	21.005***	44.847***				
	(2.892)	(1.310)	(2.978)	(4.676)				
ST3					0.483***	0.247	3.300	18.717***
					(3.225)	(1.530)	(1.126)	(4.049)
Constant	-0.892***	-0.627***	-30.983***	-24.962***	-1.019***	-0.727***	-31.273***	-24.946***
	(-3.742)	(-3.101)	(-4.789)	(-4.390)	(-3.898)	(-3.344)	(-5.205)	(-4.986)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.269	0.269	0.396	0.396	0.263	0.263	0.358	0.357
Obs.	12772	12772	12772	12772	12772	12772	12772	12772

The table presents regression results of the channel effect of financial constraints on relationship between trade credit and greenwashing. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 8: The channel effect of social capital

	(1) TR	(2) TR	(3) TP	(4) TP
GW_Diff	-0.005***		-0.064**	
	(-2.752)		(-1.979)	
GW_Diff*Adj_ SCI	-0.001		0.062	
	(-0.732)		(1.074)	
GW_Ratio		-0.238***		-3.501**
		(-2.759)		(-2.052)
GW_Ratio*Adj_SCI		-0.050		3.066
		(-0.624)		(1.089)
Adj_SCI	-0.021	0.034	1.416	-1.581
	(-0.981)	(0.384)	(1.268)	(-0.774)
Size	0.163***	0.165***	0.980***	1.018***
	(4.093)	(4.086)	(3.200)	(3.238)
Age	-0.003**	-0.003**	0.093***	0.095***
	(-2.304)	(-2.223)	(3.348)	(3.397)
Sale_growth	-0.124*	-0.125*	-0.033	-0.039
	(-1.888)	(-1.888)	(-0.072)	(-0.086)
PPE	-0.400***	-0.393***	-4.739***	-4.602***
	(-3.880)	(-3.811)	(-3.147)	(-2.977)
MTB	-0.031**	-0.031**	-0.536**	-0.520**
	(-2.261)	(-2.215)	(-2.175)	(-2.087)
Cash	0.594**	0.592**	1.426	1.429
	(2.380)	(2.373)	(0.424)	(0.428)
Leverage	0.634**	0.631**	-6.754***	-6.810***
	(2.163)	(2.154)	(-3.406)	(-3.425)
Capex	0.802*	0.773*	2.842	2.423
	(1.948)	(1.873)	(0.654)	(0.540)
Constant	-0.681***	-0.500**	-12.623***	-10.244***
	(-2.703)	(-2.336)	(-3.687)	(-3.920)
Controls	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y
R^2	0.287	0.287	0.224	0.224
Obs.	4274	4274	4274	4274

The table presents regression results of the channel effect of social trust on relationship between trade credit and greenwashing. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 9: The channel effect of social capital

	(1) TR	(2) TR	(3) TP	(4) TP
GW_Diff	-0.005***		-0.075**	
	(-3.075)		(-2.348)	
GW_Diff*Unadj_SCI	-0.000		0.019	
	(-0.803)		(1.298)	
GW_Ratio		-0.257***		-4.087**
		(-3.049)		(-2.448)
GW_Ratio*Unadj_SCI		-0.018		0.935
		(-0.777)		(1.309)
Unadj_SCI	0.002	0.022	0.400	-0.516
	(0.354)	(0.810)	(1.440)	(-1.020)
Size	0.160***	0.162***	0.998***	1.042***
	(4.080)	(4.079)	(3.282)	(3.342)
Age	-0.003**	-0.003**	0.091***	0.093***
	(-2.326)	(-2.241)	(3.329)	(3.381)
Sale_growth	-0.121*	-0.122*	-0.068	-0.078
	(-1.847)	(-1.848)	(-0.150)	(-0.171)
PPE	-0.378***	-0.369***	-4.550***	-4.381***
	(-3.816)	(-3.715)	(-3.028)	(-2.845)
MTB	-0.033**	-0.032**	-0.536**	-0.518**
	(-2.423)	(-2.377)	(-2.183)	(-2.094)
Cash	0.592**	0.591**	1.379	1.365
	(2.371)	(2.367)	(0.411)	(0.411)
Leverage	0.635**	0.631**	-6.983***	-7.069***
	(2.169)	(2.157)	(-3.540)	(-3.570)
Capex	0.763*	0.729*	1.676	1.056
	(1.852)	(1.760)	(0.413)	(0.255)
Constant	-0.671***	-0.481**	-13.083***	-10.298***
	(-2.710)	(-2.297)	(-3.796)	(-3.956)
Controls	Y	Y	Y	Y
Industry dummy	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y
R^2	0.287	0.287	0.225	0.225
Obs.	4274	4274	4274	4274

The table presents regression results of the channel effect of social trust on relationship between trade credit and greenwashing. The sample period is from 2002 to 2019. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 10: Greenwashing and trade credit by 2SLS approach and instrument variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
	GW_diff	TR	GW_ratio	TR	GW_diff	TP	GW_ratio	TP
GW_diff_{t-1}	0.776***				0.785***			
	(58.116)				(62.803)			
GW_diff (Instrumented)		-0.006***				-0.294***		
		(-3.363)				(-4.032)		
GW_ratio_{t-1}			0.814***				0.824***	
			(62.399)				(67.352)	
GW_ratio (Instrumented)				-0.301***				-13.556***
				(-3.395)				(-3.740)
Size	1.205***	0.133***	0.022***	0.135***	1.159***	2.904***	0.022***	2.887***
	(15.347)	(4.911)	(14.376)	(4.941)	(15.829)	(5.622)	(14.787)	(5.600)
Age	0.020***	-0.002**	0.001***	-0.002**	0.020***	0.152***	0.000***	0.155***
	(4.308)	(-2.197)	(3.802)	(-2.095)	(4.631)	(3.736)	(4.001)	(3.782)
Sale_growth	-0.910***	-0.170***	-0.0142***	-0.170***	-0.931***	1.462**	-0.015***	1.527**
	(-4.845)	(-3.191)	(-4.176)	(-3.183)	(-5.072)	(2.344)	(-4.402)	(2.457)
PPE	2.405***	-0.483***	0.046***	-0.478***	2.738***	-7.012***	0.052***	-6.890***
	(5.512)	(-6.594)	(5.569)	(-6.476)	(6.413)	(-3.046)	(6.487)	(-2.959)
MTB	0.152***	-0.031***	0.003***	-0.031***	0.165***	-1.077***	0.003***	-1.068***
	(3.294)	(-3.889)	(3.646)	(-3.869)	(3.658)	(-4.243)	(4.047)	(-4.151)
Cash	1.373***	0.317**	0.018**	0.314**	1.893***	-5.794	0.028***	-6.058
	(3.117)	(2.216)	(2.287)	(2.195)	(4.459)	(-1.300)	(3.619)	(-1.363)
Leverage	-0.383	0.284**	-0.010*	0.280**	0.087	-27.757***	-0.001	-28.015***
	(-1.276)	(2.354)	(-1.813)	(2.320)	(0.313)	(-10.388)	(-0.268)	(-10.432)
Capex	-7.862***	0.698***	-0.148***	0.686***	-8.908***	-15.122**	-0.168***	-15.207**
	(-3.896)	(2.763)	(-3.917)	(2.705)	(-4.541)	(-2.087)	(-4.536)	(-2.072)
Constant	-10.273***	-0.688***	-0.017	-0.417**	-10.157***	-16.491***	-0.022	-3.467
	(-7.175)	(-3.109)	(-0.717)	(-2.202)	(-7.341)	(-3.433)	(-1.027)	(-0.835)
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.761	0.232	0.796	0.232	0.774	0.328	0.808	0.327
Obs.	11925	11925	11925	11925	11925	11925	11925	11925

The table presents regression results of 2SLS approach and instrument variables. The sample period is from 2002 to 2019. The first lagged *GW_diff* and *GW_ratio* are used as instrument variables. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 11: Greenwashing and trade credit by GMM approach and instrumental variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
	GW_diff	TR	GW_ratio	TR	GW_diff	TP	GW_ratio	TP
GW_diff_{t-1}	0.824***				0.736***			
	(67.346)				(55.331)			
GW_diff (Instrumented)		-0.006***				-0.294***		
		(-3.363)				(-4.032)		
GW_ratio_{t-1}			0.775***				0.785***	
			(55.277)				(59.041)	
GW_ratio (Instrumented)				-0.301***				-13.556***
				(-3.395)				(-3.740)
Size	0.021***	0.133***	0.030	0.135***	1.533***	2.904***	1.534***	2.887***
	(14.787)	(4.911)	(14.912)	(4.941)	(16.193)	(5.622)	(16.188)	(5.600)
Age	0.000***	-0.002**	0.000**	-0.002**	0.022***	0.152***	0.021***	0.155***
	(4.001)	(-2.197)	(2.078)	(-2.095)	(3.322)	(3.736)	(3.322)	(3.782)
Sale_growth	-0.015***	-0.170***	-0.019***	-0.170***	-1.150***	1.462**	-1.150***	1.527**
	(-4.398)	(-3.191)	(-3.221)	(-3.183)	(-3.953)	(2.344)	(-3.946)	(2.457)
PPE	0.052***	-0.483***	0.073***	-0.478***	4.301***	-7.012***	4.301***	-6.890***
	(6.486)	(-6.594)	(5.631)	(-6.476)	(6.604)	(-3.046)	(6.602)	(-2.959)
MTB	0.003***	-0.031***	0.005***	-0.031***	0.273***	-1.077***	0.274***	-1.068***
	(4.049)	(-3.889)	(3.687)	(-3.869)	(3.781)	(-4.243)	(3.781)	(-4.151)
Cash	0.028***	0.317**	0.020	0.314**	2.435***	-5.794	2.435	-6.058
	(3.621)	(2.216)	(1.491)	(2.195)	(3.592)	(-1.300)	(3.587)	(-1.363)
Leverage	-0.001	0.284**	-0.009	0.280**	0.216	-27.757***	0.217	-28.015***
	(-0.268)	(2.354)	(-1.081)	(2.320)	(0.493)	(-10.388)	(0.492)	(-10.432)
Capex	-0.167***	0.698***	-0.230***	0.686***	-14.029***	-15.122**	-14.029***	-15.207**
	(-4.542)	(2.763)	(-3.821)	(2.705)	(-4.613)	(-2.087)	(-4.587)	(-2.072)
Constant	-0.022	-0.688***	-0.008	-0.417**	-11.702***	-16.491***	-11.702***	-3.467
	(-1.031)	(-3.109)	(-0.363)	(-2.202)	(-8.484)	(-3.433)	(-8.476)	(-0.835)
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.739	0.232	0.808	0.232	0.739	0.328	0.715	0.327
Obs.	11925	11925	11925	11925	11925	11925	11925	11925

The table presents regression results of GMM approach and instrument variables. The sample period is from 2002 to 2019. The first lagged *GW_diff* and *GW_ratio* are used as instrument variables. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 12: Greenwashing and trade credit by GMM approach and instrumental variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
	GW_diff	TR	GW_ratio	TR	GW_diff	TP	GW_ratio	TP
GW_diff_{t-2}	0.728***				0.736***			
	(51.968)				(55.331)			
GW_diff (Instrumented)		-0.007***				-0.278***		
		(-3.406)				(-3.222)		
GW_ratio_{t-2}			0.775***				0.785***	
			(55.276)				(59.042)	
GW_ratio (Instrumented)				-0.324***				-12.574***
				(-3.401)				(-2.990)
Size	1.560***	0.147***	0.030***	0.148***	1.534***	2.999***	0.029***	2.964***
	(15.676)	(4.975)	(14.916)	(4.997)	(16.187)	(5.297)	(15.401)	(5.272)
Age	0.019***	-0.002*	0.000**	-0.002*	0.021***	0.185***	0.000**	0.187***
	(2.869)	(-1.925)	(2.078)	(-1.854)	(3.318)	(4.072)	(2.383)	(4.080)
Sale_growth	-1.115***	-0.151***	-0.019***	-0.150***	-1.150***	0.867	-0.019***	0.951
	(-3.751)	(-3.414)	(-3.219)	(-3.382)	(-3.947)	(1.211)	(-3.411)	(1.337)
PPE	3.767***	-0.459***	0.072***	-0.456***	4.301***	-7.069***	0.083***	-7.016***
	(5.733)	(-5.939)	(5.625)	(-5.839)	(6.602)	(-2.952)	(6.478)	(-2.892)
MTB	0.252***	-0.033***	0.005***	-0.033***	0.273***	-1.126***	0.005***	-1.122***
	(3.428)	(-3.655)	(3.689)	(-3.635)	(3.786)	(-3.828)	(4.026)	(-3.753)
Cash	1.549**	0.290*	0.019	0.286*	2.435***	-2.664	0.036***	-2.944
	(2.223)	(1.761)	(1.487)	(1.734)	(3.588)	(-0.494)	(2.824)	(-0.547)
Leverage	-0.370	0.270**	-0.009	0.266**	0.216	-24.748***	0.001	-24.982***
	(-0.805)	(2.113)	(-1.078)	(2.080)	(0.481)	(-8.875)	(0.107)	(-8.911)
Capex	-12.109***	0.672**	-0.230***	0.663**	-14.029***	-11.305	-0.266***	-11.323
	(-3.916)	(2.472)	(-3.826)	(2.422)	(-4.598)	(-1.486)	(-4.489)	(-1.467)
Constant	-11.363***	-0.765***	-0.008	-0.463**	-11.702***	-17.996***	-0.023	-5.679
	(-7.932)	(-3.316)	(-0.362)	(-2.372)	(-8.479)	(-3.418)	(-1.048)	(-1.269)
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.701	0.236	0.739	0.236	0.715	0.313	0.752	0.312
Obs.	10046	10046	10046	10046	10046	10046	10046	10046

The table presents regression results of GMM approach and instrument variables. The sample period is from 2002 to 2019. The second lagged *GW_diff* and *GW_ratio* are used as instrument variables. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Table 4- 13: Greenwashing and trade credit by 2SLS approach and instrumental varaibles

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
	GW_diff	TR	GW_ratio	TR	GW_diff	TP	GW_ratio	TP
GW_diff_mean	0.986***				0.986***			
	(53.058)				(57.932)			
GW_diff (Instrumented)		-0.005***				-0.249***		
		(-3.723)				(-4.687)		
GW_ratio_mean			0.986***				0.986***	
			(48.103)				(51.03)	
GW_ratio (Instrumented)				-0.273***				-12.075***
				(-3.816)				(-4.416)
Size	0.042***	0.120***	0.001***	0.122***	0.042***	2.463***	0.001***	2.505***
	(3.526)	(4.857)	(3.754)	(4.922)	(3.842)	(5.306)	(4.087)	(5.399)
Age	0.001	-0.003**	0.000*	-0.002**	0.001*	0.117***	0.000**	0.122***
	(1.324)	(-2.455)	(1.961)	(-2.318)	(1.934)	(3.162)	(2.338)	(3.272)
Sale_growth	-0.169***	-0.120***	-0.003***	-0.120***	-0.149***	2.081***	-0.002***	2.106***
	(-5.013)	(-2.737)	(-3.969)	(-2.745)	(-4.613)	(3.479)	(-3.278)	(3.519)
PPE	-0.008	-0.494***	-0.001	-0.487***	0.015	-7.358***	-0.000	-7.128***
	(-0.104)	(-7.072)	(-0.416)	(-6.949)	(0.189)	(-3.218)	(-0.224)	(-3.091)
MTB	0.011	-0.030***	0.000	-0.029***	0.010	-1.070***	0.000	-1.056***
	(1.539)	(-4.071)	(1.111)	(-4.038)	(1.478)	(-4.666)	(0.829)	(-4.556)
Cash	-0.135*	0.304**	-0.004**	0.304**	-0.108	-9.544**	-0.004**	-9.641**
	(-1.729)	(2.420)	(-2.349)	(2.420)	(-1.429)	(-2.505)	(-2.483)	(-2.539)
Leverage	0.088	0.279**	0.002	0.275**	0.153**	-30.915***	0.002	-31.130***
	(1.248)	(2.424)	(1.074)	(2.393)	(2.333)	(-11.639)	(1.492)	(-11.679)
Capex	-1.029**	0.717***	-0.015*	0.702***	-1.080**	-16.617**	-0.017*	-16.957**
	(-2.312)	(2.939)	(-1.669)	(2.875)	(-2.442)	(-2.356)	(-1.868)	(-2.381)
Constant	-30.212***	-0.703***	0.314***	-0.485***	-30.371***	-27.739***	0.312***	-17.013***
	(-23.564)	(-3.274)	11.324	(-2.682)	(-23.702)	(-5.379)	(11.228)	(-4.043)
Industry dummy	Y	Y	Y	Y	Y	Y	Y	Y
Year dummy	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.991	0.228	0.992	0.228	0.992	0.339	0.992	0.338
Obs.	13847	13847	13847	13847	13847	13847	13847	13847

The table presents regression results of 2SLS approach and instrument variables. The sample period is from 2002 to 2019. The industrial mean of greenwashing measures are used as instrument variables. Estimates are based on panel data regressions with standard errors adjusted for heteroskedasticity and firm-level clustering. T-statistics, in parentheses, are based on two-sided tests. Significance at the 10%, 5%, and 1% level is indicated by*, **, and ***, respectively. The definitions of all variables are given in Appendix C.

Appendix C: Variable Definitions

Variables	Description
GW_diff	The ratio of symbolic to substantive CSR scores based on Thomson Reuters Asset4 ESG ratings for year *t-1*. CSR KPI scores are separated into firms substantive CSR scores (e.g., amount of CO_2 emissions reduced in the past year, number of injuries and fatalities at work) and the symbolic CSR scores (e.g., does the firm claim to have a policy for reducing environmental emissions? Does it claim to strive to improve its employee health and safety?).
GW_ratio	The difference between symbolic to substantive CSR scores based on Thomson Reuters Asset4 ESG ratings for year *t-1*. CSR KPI scores are separated into firms substantive CSR scores (e.g., amount of CO_2 emissions reduced in the past year, number of injuries and fatalities at work) and the symbolic CSR scores (e.g., does the firm claim to have a policy for reducing environmental emissions? Does it claim to strive to improve its employee health and safety?).
TR	The ratio of account receivables scaled by total sales.
TP	The ratio of account payables scaled by the cost of goods sold.
NET	The difference between Trade receivables and Trade payables.
Firm size	The natural logarithm of a firm's total assets in U.S. dollars at the end of the previous year.
Firm age	Age is computed as the natural logarithm of one plus the difference between the year under investigation and the firm's year of birth. The year of birth is computed as the minimum value of: (a) the first year the firm appears in the COMPUSTAT database.
Leverage	The firm's total debt scaled by total assets.
MTB	Market-to-book ratio, computed as the market value divided by the book value of equity
Cash	The ratio of cash and cash equivalent to the book value of total assets
Sales growth	The difference between the previous and current year annual sales revenue, divided by previous annual sales revenue
PPE	The value of property, plant and equipment scaled by total assets.
Capex	Capital expenditure scaled by total assets.
Total_IO	Total institutional investor ownership, computed as the fraction of shares of the firm owned by all institutional investors.
Analyst_FD	The dispersion of earning forecasts made in year t for each firm for earnings of current year t. It is computed as the standard deviation of analyst forecasts for the year, scaled by the firm's share price at the beginning of the year.
KZ_Index	Measure of financial constraints, computed as the linear combination of five accounting ratios: (1) cash flow to total capital; (2) the market to book ratio; (3) debt to total capital; (4) dividends to total capital; and (5) cash holdings to capital. Higher values of the KZ index imply that the firm is more capital constrained

Variables	Description
Non_Div	The dummy variable which takes a value of 1 of the firm pays dividend in fiscal year t, otherwise 0.
ST1	Short-term debt due within one year scaled by the book value of total assets.
ST3	Short-term debt due within three years scaled by the book value of total assets.
Adj_SCI	The adjusted SCI score is determined by the sum of the differences by subtracting the standardized total concern scores from the standardized total strength scores across the community relations, diversity, environment, and human rights dimensions of KLD's ratings. A higher adjusted SCI score indicates greater social capital commitment by the firm.
Unadj_SCI	The unadjusted SCI score is determined by the sum of the differences by subtracting the total concern scores from the total strength scores across the community relations, diversity, environment, and human rights dimensions of KLD's ratings. A higher unadjusted SCI score indicates greater social capital commitment by the firm.
YEAR	Indicator dummy variables of fiscal year
INDUSTRY	Indicator dummy variables for industry based on SIC code

CHAPTER FIVE: CONCLUSION

5.1 Findings and Implications

In Chapter two of the thesis, the effect of CEO inside debt measures on firms' issuance and usage of trade credit is investigated. Early research on agency difficulties indicates that extreme risk aversion and risk-taking by managers are two forms of behaviour that can result in large agency expenses (Jensen and Meckling, 1976; Fama, 1980). Generally, equity-based compensations are seen as incentives to encourage risk-averse managers to adopt value-added risk strategies, as noted in Jensen and Meckling (1976), Myers (1977), Smith and Stulz (1985) and Smith and Watts (1992). For decades, equity-based remuneration has been the focus of both the corporate and academic communities. Numerous recent studies give theoretical and empirical support for the notion that equity-based pay encourages management risk-taking behaviours. Rogers, 2002; Broussard et al., 2004; Coles et al., 2006; Bergstresser and Philippon, 2006; Tong, 2010; Gormley et al., 2012; Kini and Williams, 2012; Nguyen, 2018). Jensen and Meckling (1976) suggest that equity holders and debtholders in a firm face the agency problem. Plenty of literature provides empirical evidence that CEO debt-like compensations (CEO inside debt) help align the interests of debtholders and managers, inducing them to give decisions benefit to debtholders and promoting them to be more conservative in terms of firm risks (Cassell et al., 2012; Tung and Wang, 2012; Anantharaman et al., 2014; Phan, 2014; Brisker and Wang, 2017; Chi et al., 2017; Dang and Phan, 2016).

On the other hand, literature on firm trade credit provides evidence to show that firms, especially firms that face financial constraints, adopt trade credit as a source of financing. Therefore, firms with higher trade credit face higher liquidity and default risks. Motivated by the risk reduction channel of CEO inside debt, it is necessary to investigate how CEO inside debt affects the issuance and use of trade credit by enterprises. As institutional investors and outside analysts are two main monitoring variables of agency costs to enterprises, the impact

of CEO inside debt on trade credit is examined in the presence of institutional investors and outside analysts.

In the empirical studies, it has been determined that the companies' usage of trade credit (*TP*) is negatively related to CEO inside debt measures, providing evidence that CEO inside debt induces managers to consider the interests of debtholders, hence reducing the cost of debt and equity overall. However, it is found that CEO inside debt has no significant effect on the issuance of trade credit (*TR*). The interaction term of CEO inside debt and institutional investors is then incorporated into the panel regression model. Significantly positive coefficients are found for the interaction terms, indicating that institutional investors substitute for the CEO inside the debt market. This proves that when there exists a strong effect of institutional investors on the trade credit, the effect of the CEO inside debt is reduced. Incorporating the interaction terms of CEO inside debt and analyst forecast error into the panel regression model reveals that analyst forecast quality has no meaningful influence on the association between CEO inside debt and trade credit.

Chapter three of the thesis focus on the relationship between greenwashing and analyst forecast accuracy. Prior research has mostly focused on the causes and effects of corporate social responsibility performance. Very few studies, especially in the field of finance, investigate the impact of greenwashing on corporate finance aspects. In this research, it is proposed to evaluate how corporations' greenwashing tactics impact analyst prediction accuracy by using a large database of foreign settings, calculating the difference between symbolic CSR performance and substantive CSR performance, and the ratio of the two. This research also tests how the impact of greenwashing varies for firms with different levels of cash holdings and firms located in countries with different national cultural characteristics.

The findings of this study indicate that analyst forecast mistakes are strongly and adversely related to greenwashing. This provides evidence that analysts may collude with firm managers

to help reputation and image creation. In exchange, analysts can obtain confidential data to enhance their estimates. The findings also indicate that the impact of greenwashing on analyst prediction inaccuracy is less significant in companies with greater financial reserves. This reveals that organisations with more cash reserves display greater idiosyncratic and systemic risk, making analyst estimates more challenging. Shareholders and stakeholders request more transparency and impose higher financing costs on these firms, leading to less change for firms engaging in greenwashing activities. The agency theory further indicates that bigger financial reserves may be the result of entrenched managers' greater influence. Managers devote less focus to satisfying stakeholder interests and community welfare, which reduces the need for greenwashing.

Additionally, this research finds that among four national culture dimensions, Masculinity (MAS) has a significant influence on the relationship between greenwashing and analyst forecast error. In nations with more masculinity, the negative correlation between greenwashing and analyst prediction inaccuracy is less apparent. In contrast, this study finds no significant effect of the other three culture dimensions: Power Distance (PWD), Individualism (IND), and Uncertainty Avoidance (UAI).

Chapter four of the thesis investigates how greenwashing is adopted as a risk reduction tool and affects firms' financing activities. This chapter aims to determine if greenwashing businesses, as suppliers, supply more (or less) trade credit and whether greenwashing firms, as buyers, accept more (or less) trade credit.

In this chapter of the thesis, how firms' greenwashing can affect the supply and provision of trade credit are investigated. Two channels are proposed where greenwashing can affect trade credit. The degree to which companies issue and embrace trade credit is dependent on their availability to formal external financings, such as loans and equity capital, according to previous studies. Financially constrained firms depend more on trade credit and provide less

trade credit to their customers. At the same time, greenwashing is adopted as a risk management tool used to increase a firm financing capability. Previous research shows that enhanced ESG practises can decrease company risk and boost access to finance sources with reduced capital and financial institution loan fees (Goss and Roberts, 2011; Hoepner et al., 2016; Nandy and Lodh, 2012; Sharfman and Fernando, 2008). It is plausible that corporations know the significance of ESG performance and uses it to influence public opinion and benefit from it. Prior studies indicate that a firm could increase the level of disclosure of their ESG performance to avoid or mitigate the negative impact of their environmental damage (or similar occurrences) on corporate reputation and market value (Brown & Deegan, 1998; Cho and Patten, 2007), or to reclaim its legitimacy (Campbell et al., 2003). This research contends that the utilisation of trade credit and greenwashing are negatively correlated due to their substitutive nature. Second, greenwashing negatively affects firm social trust between firms and other stakeholders. Informal finance, such as trade credit, relies significantly on the relationship of trust between consumers and vendors. Thus, greenwashing and trade credit are related adversely.

The results show that firms' provision and adoption of trade credit have significant negative associations with greenwashing activities. Both financial restrictions and social trust channels are evaluated. The results support the financial constraints channel for adopting trade credit but not the trusted channel. This research also finds that due to the external monitoring effects of institutional investors, firms with stronger external monitoring forces have less chance to adopt greenwashing. Therefore, for firms with a higher level of institutional investors monitoring, the negative association between greenwashing and trade credit are less pronounced. The findings also suggest with higher level of information asymmetry, the impact of greenwashing on trade credit decreases.

5.2 Limitations and Future Research

There are a few limitations observed in this thesis. It is hard to give a precise definition of "greenwashing" since it covers many different aspects and is often ambiguous. This study adopts Walker and Wan's (2012) and Roulet and Touboul's (2015) definitions of greenwashing, where greenwashing refers to corporations' claims of symbolic CSR efforts that are not supported by real actions. Nevertheless, previous literature, including Ramus and Montiel (2005), defines greenwashing as the dissemination of incorrect facts regarding a company's commitment to environmental and social responsibility. In this study, only one measure of greenwashing is adopted and follows Walker and Wan (2012) and Roulet and Touboul (2015) by looking at the distance between what is claimed by firms and what has been done by these firms instead of focusing on misleading green communication released by firms, because it is hard to determine whether assertions made by companies are deceptive and to what degree they are deceptive. Future research may find a way to address this alternative definition of greenwashing and look into it more closely by giving a more precise approach to identifying misleading green messages.

A further limitation stems from the first topic of this thesis. The research explores the relationship between CEO inside debt and trade credit in U.S. market only. However, the impact of CEO inside debt on trade credit in other markets, especially in emerging markets, has been explored due to the unavailability of data of CEO inside debt in these markets. Further studies may be extended once the data become available.

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