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**Does corporate environmentalism affect corporate insolvency risk? The role of market
power and competitive intensity**

Running Head: Corporate environmentalism and insolvency risk

Saqib Aziz^{a*}, Mahabubur Rahman^a, Dildar Hussain^a, Duc K. Nguyen^{b,c}

^a Rennes School of Business, Rennes, France

^b IPAG Business School, Paris, France

^c International School, Vietnam National University, Hanoi, Vietnam

*Corresponding author: Saqib Aziz, Rennes School of Business, 2 Rue Robert d'Arbrissel 35065, Rennes, France.
Email : saqib.aziz@rennes-sb.com; Phone : +33 (0)2 99 39 46 87

Does corporate environmentalism affect corporate insolvency risk? The role of market power and competitive intensity

Abstract

Little is known about the effects of green performance on corporate insolvency risk. This study examines the relationship between green performance and firm insolvency risk from both theoretical and empirical perspectives. Using a panel of 179 US firms included in the Newsweek Green Rankings and a system generalised method of moments estimation which generates endogeneity-robust regression coefficients, we found that firms with higher green performance are at lower risk of insolvency. We further postulate and provide theory-based empirical evidence that the nexus between green performance and insolvency risk is contingent upon other internal and external boundary conditions. Specifically, this research documents that the nexus between green performance and firm insolvency risk is moderated by market power as well as industry competitive intensity. The results of this study are robust across several sensitivity analyses.

Keywords: Green performance; insolvency risk; market share; industry competitiveness; Z-score.

1. Introduction

The natural environment has been significantly degraded over the past few decades, which has become an important concern for modern society (Mariadoss et al., 2011; Sama et al., 2018; Rahman et al., 2021). Specifically, changes in the natural environment have significantly impacted national economic policies as well as corporate strategies (Perni et al., 2020; Trinks et al., 2020). The deterioration of the natural environment has engendered numerous challenges because firms in diverse array of industries rely on the natural environment for business-critical resources (Wagner, 2010; Trinks et al., 2020). The impact of environmental degradation and climate change poses significant financial risks and a threat to corporate survival (Gangi et al., 2020). Consequently, it is no longer regarded as a secondary issue: firms have begun to see it as a core socio-economic concern (Banerjee, 2002; Banerjee et al., 2003). To meet internal and external stakeholders' expectations and to address the threats posed by environmental degradation, an increasing number of organisations are adopting sustainable environmental practices and engaging in corporate environmentalism. Corporate environmentalism can be defined as recognising 'the importance of environmental issues facing the firm and the integration of those issues into the firm's strategic plans' (Banerjee et al., 2003). Firms which proactively adopt and integrate pro-environmental business practices into their strategic stance to lessen negative externalities strengthen their competitive advantage in the marketplace and ensure their long-term survival (Gonenc and Scholtens, 2017).

Corporate environmentalism has attracted the attention of researchers from several disciplines, including management, marketing and strategy (Gunningham, 2009; Amores-Salvadó et al., 2014; Martín-de Castro, 2020; Rahman et al., 2021). The significant amount of literature on corporate environmentalism can be divided into two categories. The first stream of

literature comprises investigations into the antecedents of corporate environmentalism (Banerjee et al., 2003), while the second focuses on the outcomes and consequences of corporate environmentalism (Rao and Holt, 2005; Chan et al., 2012b). The objective of the present study is to contribute to the literature on the consequences of corporate environmentalism with a focus on corporate insolvency risk, which provides a perspective on firm survival in the long term.

Most previous studies investigating the consequences of corporate environmentalism have focused on firms' financial performance (Iwata and Okada, 2011; Horváthová, 2012; Lucas and Noordewier, 2016; El Ouadghiri et al., 2021). The evidence of how corporate environmentalism may mitigate the financial risks posed by environmental challenges and constraints is meagre. Muhammad et al. (2015) found that Australian firms with a stronger corporate environmental performance were subject to less volatility and downside risk. In a more recent study on the relationship between US firms' corporate environmental responsibility (CER) and risk, Cai et al. (2016) documented that firms which improved their environmental performance reduced their financial risk. However, unlike the current study, such prior studies focussed mainly on market-based risk measures, such as the capital asset pricing model (CAPM) beta, the Fama-French market beta, and the standard deviation of daily equity returns; they did not address insolvency risk, which reflects a firm's long-term financial soundness. We have attempted to fill this important research gap by investigating the effect of corporate environmentalism on firm insolvency risk (alternatively called bankruptcy risk). To the best of our knowledge, no study to date has examined the nexus between corporate environmental performance and bankruptcy risk. Furthermore, this study enriches the germane body of literature by unearthing the effect of one internal boundary condition (market power) and one

external boundary condition (competitive intensity) on the nexus between green performance and insolvency risk.

This study employs the natural resource-based view (NRBV) to hypothesise the relationship between corporate environmentalism and the risk of insolvency. It further proposes that market power and competition intensity moderate the relationship between corporate environmentalism and the risk of insolvency. The main contributions of this study are twofold. First, we demonstrate that the effect of corporate environmentalism is not limited to revenues and profitability but is also related to a firm's risk profile. More precisely, we extend the link between corporate environmentalism and corporate performance to the risk of insolvency, as opposed to generally examined market-based measures of risk. Second, our findings contribute to the discussion of why not all firms experience the same consequences of corporate environmentalism.

We tested our theoretical predictions using a system generalised method of moments (GMM) estimation approach which is robust to endogeneity concerns (Arellano and Bover, 1995) and on a sample of 179 leading US-based green firms ranked in Newsweek's Green Rankings between 2010 and 2017 (Blundell and Bond, 1998). We found a negative association between the green performance of the sample firms and their insolvency risk. Moreover, a firm's market power and industry-competitive intensity tend to positively moderate the effect of green performance on its insolvency risk. However, the magnitude of the effect (i.e. the coefficient size) of market power is higher than that of industry competitive intensity. Our findings are also robust to (i) alternate measures of risk, including firm idiosyncratic risk and total risk using the CAPM model and the Fama-French three-factor model, as in Cai et al. (2016); (ii) alternate

measures of market power and industry competitive intensity; and (iii) alternative estimation methods, such as the fixed effects model and pooled probit regression analysis.

The rest of the paper is organised as follows. In Section 2 we present an overview of the relevant theoretical background and develop our hypotheses. In Section 3 we explain the methods and present the econometric model we used to test the hypotheses. We present our results in Section 4, and in Section 5 we conclude the paper by summarising our findings and suggesting directions for future research.

2. Theory and hypotheses

The results of previous studies presented mixed findings regarding the effects of a firm's environmental activities on its financial performance (Iwata and Okada, 2011; Horváthová, 2012; El Ouadghiri et al., 2021). Although most studies found that a firm's green and environmental practices had a positive effect (55 per cent), a significant number found that they had either no effect (30 per cent) or a negative effect (15 per cent) (Horváthová, 2010). Therefore, it is important to investigate the factors which may further the discussion on the consequences of corporate environmentalism beyond profitability and financial performance and enhance our understanding of the impact of corporate environmentalism on corporate survival.

2.1 The nexus between corporate environmentalism and insolvency risk

Firms are considered bundles of resources which are marshalled together to carry out value-adding tasks (Hart, 1995). The deployment and exploitation of these resources enable firms to create and maintain a competitive advantage in their industry (Barney et al., 2011; Wernerfelt, 2011). These resources, which can be categorised as internal and external resources, play a key role in helping a firm execute its strategies and achieve its objectives (Srivastava et al, 2001; Hart and Dowel, 2011). The physical environment is an important external resource, and firms

not only use natural resources to produce their products and services but also rely on the environment to sustain and grow their business operations (Hart, 1995; Wong et al., 2012). The external environment presents firms with both challenges and opportunities (Hart, 1995; Kotler, 2011). Resources extracted from the environment, such as water, minerals, and fossil fuels, are used in production, logistics and other value-adding processes. On the other hand, the deterioration of the natural environment and the scarcity and risk of depletion of natural resources present important challenges for firms (Fraj et al., 2013; Tate and Bals, 2018). Firms in many industries have begun looking for alternatives to natural raw materials and resources in order to reduce the negative impact of their business operations on the environment and to enhance their reputation as sustainable social entities (Franco et al. 2019). Increasing their focus on corporate environmentalism offers firms an important opportunity to create a competitive advantage.

The NRBV extends the discussion on firms' capability to manage environmental challenges (Hart, 1995; Tate and Bals, 2018) because it focuses on creating a competitive advantage based on resources and capabilities related to the natural environment. It explains how firms develop capabilities to achieve their environmental goals and ultimately translate these capabilities into inimitable competitive advantages (Rahman et al., 2021). The NRBV argues that firms competing in the same industry generally face the same or comparable levels of environmental constraints and challenges, which can be translated into an opportunity to build competitive advantage by implementing corporate environmentalism (Hart, 1995; Banerjee et al., 2003; Fraj et al., 2013; Kapitan et al., 2019; Pappas and Tran, 2019). Corporate environmentalism requires the adaptation of business strategies to effectively address environmental constraints and challenges (Kotler, 2011). Environmentally friendly practices are

thus an important element of a firm's overall business strategy, and firms must proactively pursue environmental goals (Banerjee et al., 2003; Kapitan et al., 2019) in order to turn challenges into opportunities.

A firm's engagement in corporate environmentalism may reduce its risk of insolvency in multiple ways, as it affects the firm's products and services, consumer purchase and brand engagement decisions, as well as stakeholders' perceptions (Rahman et al., 2021). The environmental consequences of the production and consumption of a product may have an important effect on consumers' purchase decisions (Paparoidamis and Tran, 2019). Consumers may have a more positive view of products offered by environmentally friendly brands and may believe that such products are of superior quality and more trustworthy than other products (McWilliams and Siegel, 2001; Rahman et al., 2021). This phenomenon attracts new customers and promotes the retention of existing customers (Lee and Lam, 2012); thus, it may make it easier to build long-lasting relationships with customers (Chan et al., 2012a; Fraj et al., 2013) and increase customers' engagement with the firm's brand(s). Consumers are also willing to pay premium prices for products they perceive as eco-friendly (Chen, 2010; Amato and Amato, 2012), which helps ensure a firm's future rents and long-term survival.

Awareness of environmental issues is increasing across the globe, and consumers are becoming more conscious about the environment; consequently, their purchase decisions are significantly influenced by the environmental effects of producing and consuming products (Banerjee, 2002; Barbarossa and De Pelsmacker, 2016; Sama et al., 2018; Takahashi, 2021). Corporate environmentalism may also enable firms to access new market segments (e.g. millennials) which are more sensitive to environmental issues (Baker and Sinkula, 2005; Jacobs et al, 2010; Martín-de Castro et al, 2016) to increase their growth and future revenues. Once a

firm builds its image as an eco-friendly company or brand, it may also be able to diversify to other product categories, thereby mitigating product segment risk.

Differentiation plays an important role in consumers' preference for specific brands, and a brand can achieve differentiation either by adopting innovative product features or by creating a unique image in consumers' minds (Sharp and Dawes, 2001). Environmentalism can improve a company's reputation and enable it to achieve differentiation by establishing the idea of a brand as being eco-friendly. Eco-innovation in product development has become a reliable way to achieve product differentiation against competing brands (Kotler, 2011; Du et al., 2016; Paparoidamis and Tran, 2019). Firms often utilise recycled, synthetic or man-made materials as alternatives to scarce natural raw materials, and such eco-friendly business practices also assist firms in attaining a differentiated image (Paparoidamis and Tran, 2019; Hussain et al., 2020; Takahashi, 2021). Dependency on natural resources and the risks created by the depletion of these resources can also be mitigated by shifting to more sustainable materials, recycling and other corporate environmental practices (Khojastehpour and Johns, 2014; Gupta, 2016), and firms may be able to reduce the risks associated with the depletion of natural resources. However, finding alternatives to natural raw materials may not be easy and may require additional expenditure. Firms with a greater focus on environmentalism may engage in actions which are initially more expensive but which can reduce costs significantly in the long run (Waddock and Graves, 1997) and contribute to long-term financial stability.

Environmentally friendly initiatives improve the reputations of firms in the eyes of their various stakeholders and may ultimately result in better financial risk tolerance (Bryant et al., 2020; El Ouadghiri et al., 2021). Corporate environmentalism also positively influences the perceptions of a firm's shareholders and investors (Flammer, 2013; Lyon, 2015) and enables it to

attract more investment and less costly financing. Moreover, corporate environmentalism reduces firms' reputational risk (Gasbarro et al., 2017), which is the single biggest risk firms face (Su et al., 2019). Environmentalism also affects human capital; green firms are more attractive to potential employees and have lower turnover rates than non-green firms (Banerjee 2002; Sen et al. 2006). Eco-friendly firms are better positioned to attract a more talented workforce and the skillsets necessary to create a competitive advantage. Employee satisfaction and commitment are positively related to a firm's corporate environmentalism (Kim et al., 2010; Spanjol et al., 2015). Furthermore, firms with better human resource capabilities are more likely to enjoy increased efficiency, better customer service and a more positive reputation in the job market (Rauyruen et al., 2009; Torres et al., 2012), which all contribute to enhancing brand image. Therefore, corporate environmentalism makes a good impression on consumers, shareholders, investors, financiers and other stakeholders alike, and increases brands' capabilities to differentiate, innovate and engage consumers. This leads to stronger competitiveness and reduces a firm's financial and reputational risks. Higher financial stability and lower reputational risk ultimately reduce a firm's risk of insolvency. Cai et al. (2016) recently investigated the relationship between firms' CER and their risk using a sample of US firms for the period 1990–2012 and found significant evidence to support the notion that improving environmental performance reduced a firm's financial risk. The authors further observed that the manufacturing sector tends to drive this inverse CER-risk relationship, while the CER activities of the service sector tend to increase firm risk. While Cai et al. (2016) focused on market-based risk measures such as the CAPM beta, the Fama-French market beta and the standard deviation of daily equity returns, we specifically addressed insolvency risk as measured by the Altman Z-score, which is constructed

using a firm's key financial ratios and is used to evaluate its bankruptcy risk. Based on the above argument, the following hypothesis is proposed:

H₁: The stronger a firm's environmental performance, the lower its risk of insolvency.

2.2 The moderating effect of market power and competitive intensity

The nexus between environmental performance and firm performance might be contingent upon several internal and external factors (Dixon-Fowler et al., 2013). It has been argued that the mixed findings of earlier studies might be due to the non-incorporation of internal and external contingencies (Dixon-Fowler et al., 2013). In this study, we therefore incorporated two important contextual factors: one internal contextual factor, market power, and one external contextual factor, competitive intensity. In the following section, we develop our arguments regarding how the level of market power and competitive intensity moderate the relationship between a firm's environmental performance and insolvency risk.

Market power is defined as the extent to which firms can exert influence over pertinent stakeholders, such as customers, distributors and suppliers. In other words, market power facilitates the execution of product-market-based strategies, which positively affect firms' financial performance. Previous research on market power has highlighted that higher market power leads to better profitability and ultimately enables a firm to improve its financial stability and long-term survival (see, for example, Ariss, 2010). A firm's market power and green performance both impact its cost structure and profitability. We argue that market power moderates the relationship between green performance and the risk of insolvency, as market power can mitigate some of the negative effects of green practices on a firm's cost structure.

Previous research has produced mixed results regarding the effect of a firm's green performance, and there are explanations for both the positive and negative effects of a firm's

green focus. On one hand, green practices may increase a firm's cost of doing business; on the other hand, a green focus may result in positive stakeholder perceptions and increased revenue. We argue that a firm's market power can help explain differences in the implications of green activities for firms' financial performance and stability.

Traditionally, managers have perceived environmental and green practices as a threat to cost efficiency and competitiveness (Stucki, 2019), as they can have a strong impact on a firm's cost structure (Classen and McLaughlin, 1996). Trumpp and Guenther (2017, p. 51) argued that 'it costs to be green'. Firms may need to invest in additional resources or equipment in order to implement green practices in production, logistics, channel management and other organisational functions, which may reduce cost efficiency. On the other hand, according to the NRBV, a firm's green activities may improve its reputation and better align it with the future business environment (Aragon-Correa and Sharma, 2013; Stucki, 2019). We argue that market power may play an important role in explaining whether a firm can benefit from green performance, as some green-activity-related cost inefficiencies can be mitigated by stronger market power. For instance, market power can enable a firm to procure raw materials from suppliers at a favourable price, which will consequently impact that firm's bottom line; it may also enable the firm to negotiate better margins and preferential rates with its distribution channels and logistics partners. Therefore, market power may offset the additional costs which may result from green practices. On the other hand, higher market power enables a firm to command premium pricing and to exert better control over its distribution channels and suppliers, thereby improving its financial stability. We argue that a firm can benefit more from an improved green performance if it has stronger market power. Market power thus moderates the relationship between green performance and insolvency risk, as stated in hypothesis 2 below:

H2: The greater a firm's market power, the greater the impact of green performance on its insolvency risk.

The analysis of competition is another important element to consider while studying organisational performance and financial stability. Competitive intensity denotes the magnitude of competition among the existing firms in a given industry. Firms which operate in a highly competitive market encounter more challenges in successfully executing their strategies than those in less competitive markets. In the former, it may be difficult to create brand differentiation based on product features and product innovation while maintaining a sustainable competitive advantage, as products and services are imitable. Firms need unique positioning and distinctive product features in order to build a long-term competitive advantage. However, in the presence of many competitors, a firm may find it difficult to achieve such unique positioning, as all possible niches may be occupied by competitors. Thus, firms must depend on more dynamic capabilities and intangible resources to create and maintain competitive advantage.

Aragon-Correa and Sharma (2003) regarded corporate green activities as a dynamic capability. Implementing a green environmental strategy requires a comprehensive set of managerial and organisational capabilities which are not only complex and organisation-specific but are also embedded in a firm's human resources and organisational routines. These capabilities are not imitable and cannot be easily replicated. Adopting a green focus thus offers a firm a competitive advantage over its competitors and enables it to successfully execute its business strategy. A sustainable strong competitive advantage is the bottom line for financial stability, which reduces the risk of insolvency. We argue that the effect of green performance is stronger in a highly competitive environment than in a less competitive environment, as it becomes more difficult to create differentiation through tangible factors. Firms must depend

more on intangible factors such as reputation and brand perception, which can be enhanced by stronger green performance and thereby foster long-term relationships with customers and other stakeholders.

It can be argued that firms with active corporate environmentalism programs will encounter few challenges in a competitive market because positive market-based reputation facilitates the execution of strategies for such firms. This leads us to formulate the following hypothesis:

H₃: The stronger the competitive intensity, the greater the impact of green performance on insolvency risk.

3. Sample, model estimation and descriptive statistics

3.1 Data and sample

To test our empirical predictions about corporate environmentalism and firms' insolvency risk, we constructed our sample by relying primarily on two databases, Newsweek's Green Rankings and Compustat. Many earlier studies (e.g., Clarkson et al., 2011; Wang and Sarkis 2013; Lyon and Shimshack, 2015; Rahman et al., 2020) have utilised these two databases and found them to be reliable and robust. Rahman et al. (2020) in particular provided a detailed explanation of Newsweek's Green Rankings database, particularly how it measures firms' green performance.

First, we extracted a list of leading US-based green firms using Newsweek's Top 500 Green Rankings yearly data from 2010 to 2017. The green scores of the firms, which were used to rank them, evaluated ranged from 1 per cent to 100 per cent. Several environment-related factors were taken into consideration to calculate the final green score. For example, in 2014 the green score captured energy productivity, water productivity, greenhouse gas emission, waste productivity, sustainability pay, sustainability board committee and reputation. These metrics

and the ultimate green score were based on audited data and thus are reliable. We filtered out financial firms, which were identified with Standard Industrial Classification (SIC) codes ranging from 6000 to 6999. Financial firms differ significantly from nonfinancial firms in their operating decisions, and the nature of accruals also differs between financial and industrial firms.

Using these yearly rankings, we compiled a unique sample of 238 firms which consistently remained part of the Green Rankings throughout the sample period. We then manually matched these firms with their ticker symbols, SIC codes, statuses and other identifiers, as this information was not available in the rankings. This step resulted in 25 firms being dropped from our initial sample due to missing information. Next, we used the firms' ticker symbols in order to construct our dependent variables for firm insolvency risk and the other control variables, and we collected the required financial data for our sample firms from variety of databases available through Wharton Research Data Services, including CRSP-Compustat, Beta Suite and other contributed data. We excluded firm-years if the data necessary for our empirical estimations were missing. This process yielded us a balanced panel of 1394 firm-year observations, for a final sample of 179 firms.

3.2 Model estimation and variables

We used a system GMM to estimate the empirical models. This estimation method is appropriate for the current study for several reasons. First, the models used in this study are particularly prone to endogeneity. Prevalent sources of endogeneity in models such as ours are reverse causality and simultaneity. It can be argued that firms with better financial performance will have more resources for investment in green initiatives. In other words, even though we argue in this study that better environmental performance will positively affect a firm's level of risk, the opposite may also be argued. Second, it can be argued that a firm's insolvency risk will

demonstrate persistence over the study period. That is, the firm's insolvency risk in the current year might be impacted by that in the preceding year. Such persistence of the firm performance variable requires the utilisation of an autoregressive model. Consequently, this study included the firm's insolvency risk of the previous year to control for this effect. The system GMM is specifically designed for an autoregressive model (Arellano and Bover, 1995; Blundell and Bond, 1998) and addresses endogeneity concerns by using suitable instruments.¹ However, it does not require instruments from external sources, unlike other instrumental variable analytical methods. Instrumental variables were gleaned from the lags of the firm-specific variables included in the model (Arellano and Bover, 1995; Rutz and Watson, 2019), which can be applied in differences or levels; furthermore, the model is specified as a system of equations (Arellano and Bover, 1995; Blundell and Bond, 1998). We confirmed the validity of the instruments using Hansen's J-test for overidentifying restrictions, asymptotically distributed as χ^2 under the null hypothesis of no correlation between the instruments and the error term. Finally, system GMM is robust to panel-specific heteroscedasticity and serial correlation (Capezio et al., 2011; Feng et al., 2015; Duru et al., 2016; Ullah et al., 2018; Rutz and Watson, 2019).

$$Insolvency_{it} = \delta Insolvency_{it-1} + \beta Green_{it} + \gamma Market\ share_{it} + \rho HHI_{it} + \theta X_{it} + c_i + \varepsilon_{it} \quad (1)$$

where *Green* is the Newsweek-based measure of environmental performance; market power is measured by the sales-based market share of firms (*Market share*); *HHI* represents the Herfindahl–Hirschman-based measure of industry concentration or competition; *X* is a vector of other control variables which are important for risk; $\delta, \beta, \gamma, \rho,$ and θ α are conformable

¹ In the appendix of this study, we also report our analysis of a two-stage least squares regression model (2SLS) with an instrumental variable approach (IV) as an alternate method to address the concerns of endogeneity in Appendix Table 1, while in Appendix Table 2, we perform Placebo test after randomly shuffling the green performance across the sample.

parameter vectors; and c_i and ε_{it} represent the unobservable heterogeneity and the idiosyncratic error term, respectively, for firm i in year t .

The dependent variable in our study is insolvency risk or the Altman Z-score, which was operationalised for firm i in year t as follows:

$$Z - score_{it} = 1.2 \left(\frac{WC}{TA} \right)_{it} + 1.4 \left(\frac{RE}{TA} \right)_{it} + 3.3 \left(\frac{EBIT}{TA} \right)_{it} + 0.6 \left(\frac{MVE}{BVL} \right)_{it} + 0.99 \left(\frac{Sales}{TA} \right)_{it} \quad (2)$$

where $\frac{WC}{TA}$ is the ratio of working capital to total assets; $\frac{RE}{TA}$ is the retained earnings over total assets; $\frac{EBIT}{TA}$ is the earnings before interest and taxes over total assets; $\frac{MVE}{BVL}$ is the market value of equity over the book value of liability; and $\frac{Sales}{TA}$ is the ratio of sales to total assets for firm i in year t .

3.3 Descriptive statistics

The descriptive statistics for the key variables in two panels are reported in Table 1. In panel A, we provided the variable definitions and summary statistics, including the means, medians and standard deviations, while in panel B of the table, we reported the correlation matrix between our main variable of interest and the control variables, with firm insolvency risk measured by the Altman Z-score. On average, sample firms demonstrated a Z-score of 3.123 and a green score of 46.8 per cent, while the average firm tended to capture 9.1 per cent of sales-based market power, with the industry concentration level remaining at approximately 21.4 per cent. The correlation analysis demonstrated that the relationship between insolvency risk and green performance was insignificant. Our analysis showed that market power was positively and significantly correlated with insolvency risk. The correlation analysis also showed that the relationship between competitive intensity and insolvency risk was insignificant. No conclusive decision pertaining to the relationships between the key variables of the study could

be made based on simple correlation analysis, as the relationships between the strategic variables were contingent upon other firm- and industry-level variables. Consequently, we drew conclusions regarding the relationship between the key variables based on the multivariate analysis discussed in the following sections.

[Table 1 near here]

Figure 1 plots the (in)solvency levels between firms categorised as high and low in terms of the median industry green score using 4-digit SIC codes. While the average high (in)solvency score for strong green performers was approximately 3.281 compared to an average low of 3.04 in the case of weak green performers, we observed a significant difference between the two averages at the 1 per cent level.

[Figure 1 near here]

4. Empirical analysis

This section reports the findings of our empirical models along with a robustness analysis of the results with respect to alternative moderating variables and estimation methods.

4.1 Main findings

The results of the system GMM estimation are reported in Table 2. While model 1 includes the key variables of theoretical interest and all the control variables of the study without the interaction terms, models 2 and 3 include the individual interaction terms. Model 4 is the complete model which incorporates all variables, including the interaction terms. It is noteworthy that, in order to measure the moderating effect of market power and competitive intensity, we created the interaction terms by multiplying the key explanatory variable ‘green performance’ with ‘market power’ and ‘competitive intensity’. Conclusions pertaining to the proposed hypotheses were drawn based on Model 4. As shown in Table 2, the coefficient of the key

theoretical variable of interest in this study, *green performance*, was positive and statistically significant at the 1 per cent confidence level. This finding supports the first hypothesis of this study. Specifically, it confirms our prediction that firms with high green performance will have a lower risk of insolvency as their Z-score increases. It is also consistent with past empirical evidence showing that risk is reduced when firms are more proactive in mitigating environmental risks and undertaking responsibilities (Muhammad et al., 2015; Cai et al., 2016).

[Table 2 near here]

Our results provide support for the second hypothesis, that the higher a firm's market power, the greater the positive impact of green performance on its insolvency risk. We can see that the coefficient of the interaction term between green performance and market power is positive and significant. Despite a slight decrease in the coefficient size of the interaction term in model 4 compared to model 2, the significance level remained unchanged across the two models.

The data reported in Table 2 also confirms our third hypothesis, that industry competitive intensity positively moderates the nexus between green performance and insolvency risk. Indeed, the coefficient of the interaction term between green performance and competitive intensity was positive and statistically significant at the 1 per cent (Model 3) and 10 per cent levels (Model 4).

4.2 Robustness analysis

4.2.1 Alternative firm risk measures

As explained previously, in this study we explored the effect of green performance on firms' insolvency risk, so our findings are not directly comparable to those of prior studies which predominantly used stock-market-based risk measures. To ensure that our results could be compared to those of previous studies, we conducted additional analyses. In keeping with earlier studies, we used firm idiosyncratic risk and total risk as two additional measures of risk.

Accordingly, we used both the CAPM, introduced by Sharpe (1964), and the Fama-French three-factor model (Carhart, 1997; Fama and French, 1993, 2006) to gauge idiosyncratic risk and total risk, following Cai et al. (2016). We describe the Fama-French three-factor model as follows:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{i,mkt}MKTRF_t + \beta_{i,smb}SMB_t + \beta_{i,hml}HML_t + \varepsilon_{i,t} \quad (3)$$

where

- $r_{i,t}$ = stock i return during period t
- $MKTRF_t$ = Fama – French Excess Return on the Market during period t
- SMB_t = Fama – French Small Minus Big (Size) factor during period t
- HML_t = Fama – French High Minus Low (Value) factor during period t

In order to check the sensitivity of the main results in terms of the measurement of the *market power* moderating variable, we operationalised market power based on the total assets of the sample firms.

[Table 3 near here]

The results of the additional analysis, reported in Table 3, show that the key variable of the study - green performance - is negative and significant across all four models. This confirms that our theoretical reasoning, beyond the insolvency risk established in the preceding section, also holds with respect to the firm-specific and total risk measures of the firm. Furthermore, the interaction term between green performance and the two moderating variables (market power and competitive intensity, is negative and significant across all models. These results for total risk are broadly in line with the findings of Cai et al. (2016), who also documented risk reduction for US firms with better CER. This additional analysis confirmed the robustness of the main findings

and further corroborated the conclusions pertaining to the three hypotheses of the study with regard to previously investigated dimensions of risk in the literature.

4.2.2 Alternate measures of moderators

Next, we assessed the consistency of the main results of this study by calculating the moderators used in the main analysis, market power and intensity of industry competition (HHI), in a different way. More specifically, the alternate market power moderator is based on total assets of the firm, while the industry HHI or competitive intensity moderator is calculated using industry sales figures. The results, which are reported in Table 4, were in line with those of the main analysis of insolvency risk and those of the abovementioned robustness check of the idiosyncratic and total risk of the sample firms. These results, therefore, further substantiate our theoretical prior on firms' environmentalism, risk and the moderating effects of market power and industry competitiveness.

[Table 4 near here]

4.2.2 Alternate estimation methods

Finally, we examined whether the results of the main analysis were sensitive to alternative estimation methods by reperforming the analysis using a fixed effect model and a pooled probit regression analysis. In the pooled probit regression model we employed a Z-score-based dummy as the dependent variable. This dummy variable was calculated based on the bankruptcy threshold provided by Altman in his seminal work and was assigned a value of 1 if a firm's Z-score was ≤ 1.80 (i.e. firms which are highly prone to bankruptcy); firms with Z-scores ≥ 1.80 were assigned a value of 0. The results of these alternate estimations are reported in Table 5 and were consistent with the findings of the main analysis.

[Table 5 near here]

5. Concluding remarks

In this study we demonstrated that corporate environmentalism pays off by reducing the risk of corporate insolvency. Our results also show that market power positively moderates the nexus between green performance and firm insolvency risk, as measured by the Altman Z-score. This study contributes to the literature on the performance implications of firms' green activities and helps illustrate why some firms may not experience the same effect of higher green performance on their financial stability and insolvency risk. Our analysis indicates that market power and competitive intensity accentuate the relationship between corporate environmentalism and firm risk. Firms which have a higher market power and operate in highly competitive environments are more likely to benefit from stronger green performance and thereby reduce their risk of insolvency. These results are robust to alternative firm risk measures, alternative ways of computing moderating variables and alternative estimation approaches.

This study makes two significant theoretical contributions. First, it documents that the effect of corporate environmentalism is not limited to revenue and profitability but also relates to a firm's insolvency risk. Specifically, this research extends the link between corporate environmentalism and corporate performance to the risk of insolvency, which is an indicator of corporate financial health in the long term, as opposed to generally examined market-based measures of risk (Muhammad et al., 2015; Cai et al., 2016). This finding has significant theoretical implications in that the general postulation of NRBV theory is that incorporating pro-environmental activities into a firm's corporate strategy engenders positive financial performance. This study documents that corporate environmentalism has far-reaching positive effects (particularly the reduction of the risk of insolvency) above and beyond contemporaneous financial performance and risk. Second, the findings contribute to the discussion of why some

firms do not experience the same consequences of corporate environmentalism. This has important theoretical implications in that it shows the boundary conditions of NRBV by documenting the internal and external contextual conditions under which corporate environmentalism is more effective in influencing a firm's survival.

The findings of this study have important implications for corporate management. Based on the results, it is recommended that managers proactively incorporate pro-environmental initiatives into their overall corporate strategy so as to lessen their firms' insolvency risk. Implementing corporate environmentalist practices will support corporate survival by reducing the risk of insolvency. Managers should also endeavour to strengthen the market power of their firms to further augment the positive impact of environmental activities. Finally, managers of firms which operate in highly competitive marketplaces can reap even greater rewards by engaging in eco-friendly initiatives.

This research has some limitations. The results of our research may not be generalisable to firms based in other countries, as we focused on a sample of US-based companies. Furthermore, our sample comprised only very large firms, so the results may not be applicable to smaller firms with relatively low capability levels. In the future researchers should evaluate firms of different sizes and larger sample populations; they should also consider investigating other factors which may explain why a firm's green activities may not have a straightforward and linear relationship with its financial performance and stability. Another interesting research direction include investigating the moderating effect of market power and competitive intensity on the relationship between green activities and revenue growth and profitability. It would also be of value to investigate the moderating effect of market power on the relationship between green performance and corporate reputation, to the extent that the latter is recognised as an

important intangible asset affecting corporate stakeholders' perceptions of firm performance and corporate competitive advantage (Fombrun and Shanley, 1990).

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TABLES

Table 1. Descriptive statistics

Panel A: Variables, definitions and summary statistics

Variable	Definition and source	Observations	Mean	Median	Std. Dev.
<i>Insolvency risk (Altman Z)</i>	Altman z-score (1968) calculated using five accounting ratios*	1394	3.123	2.939	1.553
<i>Green performance</i>	Newsweek Green score (Rahman et al. 2020)	1394	0.468	0.488	0.203
<i>Market power</i>	Sales based market share of firm	1310	0.091	0.029	0.158
<i>Competitive intensity (Herfindahl-Hirschman Index)</i>	Herfindahl-Hirschman index based on total assets computed using 4-digit SIC codes	1392	0.214	0.172	0.177
<i>Total assets</i>	Firm total assets (Bil. US\$)	1394	36.063	20.599	48.351
<i>Firm size (log of assets)</i>	Natural log of firm total assets	1394	9.963	9.933	0.981
<i>Return on assets</i>	Net income divided by total average assets	1394	0.078	0.074	0.059
<i>Market to book</i>	Market-to-book ratio	1394	5.716	3.408	61.07
<i>Efficiency</i>	Inverse ratio of Opex over total assets	1394	0.895	0.624	0.805
<i>Leverage</i>	Debt over total assets	1385	0.265	0.243	0.157
<i>Industry median sales</i>	Dummy taking a value of 1 if the firm has above industry median sales, and 0 otherwise	1394	0.661	1	0.474

*Ratios used include working capital over total assets, retained earnings over total assets, EBIT over total assets, the MV of equity over the BV of liabilities, and the sales turnover ratio.

Panel B: Correlation matrix

Variable	Altman z-score	Green performance	Market share	HHI	Firm size	Return on assets	Market to book	Efficiency	Leverage
<i>Green performance</i>	0.031								
<i>Market power</i>	0.063**	-0.025							
<i>HHI (competitive intensity)</i>	0.003	0.047*	0.510***						
<i>Firm size</i>	-0.368***	0.105***	-0.100***	-0.081*					
<i>Return on assets</i>	0.626***	0.108***	0.025	0.036	-0.214*				
<i>Market to book</i>	-0.001	-0.008	0.005	-0.008	0.008	0.026			
<i>Efficiency</i>	0.606***	-0.087***	0.077*	-0.083*	-0.234**	0.097*	0.017		
<i>Leverage</i>	-0.199***	-0.128***	0.008	0.024	-0.005	-0.059**	-0.005	-0.198*	
<i>Industry median sales</i>	-0.073**	-0.02	-0.107***	-0.293*	-0.023	-0.116*	0.021	0.016	0.021

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2. Green performance and firm insolvency risk: the moderating role of market power and competitive intensity

Dependent variable:	<i>Z-score based Insolvency</i>			
	(M1)	(M2)	(M3)	(M4)
<i>Lag of insolvency (Z-score)</i>	0.887*** (0.000)	0.886*** (0.000)	0.902*** (0.000)	0.893*** (0.000)
<i>Green performance</i>	0.313*** (0.000)	0.087*** (0.000)	-0.040 (0.469)	0.192*** (0.000)
<i>Market power</i>	-0.132*** (0.000)	-0.676*** (0.000)		-0.793*** (0.000)
<i>Competitive intensity (HHI assets)</i>	0.214*** (0.000)		-0.587*** (0.000)	-0.397*** (0.001)
<i>Market power x Green performance</i>		1.518*** (0.000)		1.489*** (0.000)
<i>Competitive intensity x Green performance</i>			1.284*** (0.000)	0.376* (0.090)
<i>Firm size</i>	-0.053*** (0.000)	-0.005** (0.049)	-0.006 (0.104)	-0.005* (0.086)
<i>Market to book</i>	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.001)	0.000*** (0.000)
<i>Efficiency ratio</i>	0.091*** (0.000)	0.097*** (0.000)	0.084*** (0.000)	0.094*** (0.000)
<i>ROA</i>	2.955*** (0.000)	3.190*** (0.000)	2.939*** (0.000)	2.964*** (0.000)
<i>Leverage</i>	-0.326*** (0.000)	-0.292*** (0.000)	-0.228*** (0.000)	-0.284*** (0.000)
<i>Industry median sales</i>	0.026*** (0.000)	0.003 (0.696)	0.017* (0.087)	0.029*** (0.001)
<i>Firm-year observations</i>	1130	1130	1130	1130
<i>N. firms</i>	174.000	174.000	174.000	174.000
<i>F-stat</i>	2902572.422	23199.916	11179.650	9854928.580
<i>Hansen p-value</i>	0.376	0.150	0.253	0.310
<i>Difference-in-Hansen test of exogeneity (p-value)</i>	0.423	0.171	0.230	0.327
<i>AR (1) p-value</i>	0.000	0.000	0.000	0.000
<i>AR (2) p-value</i>	0.883	0.819	0.668	0.851
<i>Industry effects</i>	Yes	Yes	Yes	Yes
<i>Year effects</i>	Yes	Yes	Yes	Yes

Notes: This regression table presents the results of the system GMM estimation for the dynamic panel models of insolvency risk for the sample firms. The dependent variable *Insolvency risk* is the Altman (1978) based *Z-score* of sample firms (definition in section 3.2). The main variable of interest are Newsweek based *Green performance*, *market power*, and *competitive intensity*. Definitions of the main variables of interest and the control variables are given in Table 1. *P-values* for the Hansen test, the difference-in-Hansen exogeneity test, AR(1), and AR(2) are provided at the end of table, while *P-values* for the covariates are reported in parentheses at the following significance levels: *** $p < .01$, ** $p < .05$, and * $p < .10$.

Table 3. Alternate measures of firm risk and green performance

Dependent variables:	<i>Idiosyncratic risk</i>		<i>Total risk</i>	
	(M1) Fama-French 3-factor model	(M2) CAPM model	(M1) Fama-French 3-factor model	(M2) CAPM model
<i>Lag of Volatility</i>	0.886*** (0.000)	0.881*** (0.000)	0.866*** (0.000)	0.864*** (0.000)
<i>Market power</i>	0.004*** (0.000)	0.005*** (0.000)	0.010*** (0.000)	0.010*** (0.000)
<i>Green performance</i>	-0.004*** (0.000)	-0.004*** (0.000)	-0.008*** (0.000)	-0.009*** (0.000)
<i>Market power x Green performance</i>	-0.016*** (0.000)	-0.017*** (0.000)	-0.027*** (0.000)	-0.026*** (0.000)
<i>Competitive intensity (HHI assets)</i>	-0.010*** (0.000)	-0.009*** (0.000)	-0.017*** (0.000)	-0.019*** (0.000)
<i>Competitive intensity x Green performance</i>	-0.026*** (0.000)	-0.024*** (0.000)	-0.040*** (0.000)	-0.044*** (0.000)
<i>Firm size</i>	-0.000*** (0.000)	-0.000*** (0.000)	0.000 (0.944)	-0.000 (0.316)
<i>Market to book</i>	0.000*** (0.000)	0.000** (0.018)	0.000* (0.087)	0.000** (0.032)
<i>Efficiency ratio</i>	0.000*** (0.000)	0.000*** (0.000)	0.000 (0.189)	0.000 (0.226)
<i>ROA</i>	-0.010*** (0.000)	-0.011*** (0.000)	-0.011*** (0.000)	-0.012*** (0.000)
<i>Leverage</i>	-0.001 (0.243)	-0.001* (0.052)	-0.000 (0.882)	-0.000 (0.815)
<i>Industry median sales</i>	-0.000* (0.061)	-0.000 (0.134)	0.000* (0.081)	0.000 (0.130)
<i>Firm-year observations</i>	1120	1120	1120	1120
<i>N. firms</i>	174.000	174.000	174.000	174.000
<i>F-stat</i>	28070.297	96204.981	111937.251	24011861.478
<i>Hansen p-value</i>	0.183	0.303	0.182	0.209
<i>Difference-in-Hansen exogeneity test (p-value)</i>	0.272	0.255	0.158	0.214
<i>AR (1) p-value</i>	0.023	0.015	0.024	0.007
<i>AR (2) p-value</i>	0.032	0.025	0.013	0.010
<i>Industry effects</i>	Yes	Yes	Yes	Yes
<i>Year effects</i>	Yes	Yes	Yes	Yes

Notes: This regression table shows the robustness analysis of the system GMM estimation for the dynamic panel models of alternate levels of risk for the sample firms. The tested levels include idiosyncratic or firm-specific volatility and total volatility. The regression results are reported for idiosyncratic risk (columns 1 & 2), and total risk (columns 3 & 4) for the sample of U.S. firms. Dependent variables are idiosyncratic and total volatility risk measures based, respectively, on the Fama-French 3-factor model (columns 1 & 2) and the CAPM model (columns 2 & 3). The main variable of interest are Newsweek based *Green performance*, *market power*, and *competitive intensity*. Definitions of the main variables of interest and the control variables are given in Table 1. *P-values* for the Hansen test, the difference-in-Hansen exogeneity test, AR(1), and AR(2) are provided at the end of table, while *P-values* for the covariates are reported in parentheses at the following significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Table 4. Alternative measures of moderators (market power and competitive intensity)

Dependent variable:	<i>Insolvency risk</i>	<i>Idiosyncratic risk</i>		<i>Total risk</i>	
	(M1) Z-score model	(M2) Fama- French 3- factor model	(M3) CAPM model	(M4) Fama- French 3- factor model	(M5) CAPM model
<i>Lag of risk</i>	0.876*** (0.000)	0.893*** (0.000)	0.887*** (0.000)	0.874*** (0.000)	0.871*** (0.000)
<i>Market power</i>	-0.594*** (0.000)	0.001 (0.441)	0.001 (0.187)	0.004*** (0.000)	0.003** (0.017)
<i>Green performance</i>	0.090* (0.083)	-0.004*** (0.000)	-0.006*** (0.000)	-0.009*** (0.000)	-0.010*** (0.000)
<i>Market power x Green preformance</i>	1.036*** (0.000)	-0.008*** (0.002)	-0.010*** (0.000)	-0.014*** (0.000)	-0.011*** (0.000)
<i>Competitive intensity (HHI sales)</i>	-0.081** (0.533)	-0.008*** (0.000)	-0.011*** (0.000)	-0.015*** (0.000)	-0.016*** (0.000)
<i>Competitive intensity x Green performance</i>	0.242* (0.082)	-0.021** (0.021)	-0.029*** (0.001)	-0.037* (0.071)	-0.038** (0.031)
<i>Firm size</i>	-0.052*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.229)	-0.000 (0.331)
<i>Market to book</i>	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.007)	0.000** (0.021)	0.000* (0.054)
<i>Efficiency ratio</i>	0.099*** (0.000)	0.000*** (0.000)	0.000*** (0.001)	0.000** (0.023)	0.000** (0.013)
<i>ROA</i>	3.165*** (0.000)	-0.009*** (0.000)	-0.011*** (0.000)	-0.011*** (0.000)	-0.013*** (0.000)
<i>Leverage</i>	-0.314*** (0.000)	-0.001*** (0.006)	-0.001* (0.061)	-0.000 (0.761)	0.000 (0.831)
<i>Industry median sales</i>	0.021** (0.032)	-0.000* (0.083)	-0.000* (0.078)	0.000 (0.477)	0.000 (0.339)
<i>Firm-year observations</i>	1186	1178	1178	1178	1178
<i>N. firms</i>	174.000	174.000	174.000	174.000	174.000
<i>F-stat</i>	68246.296	13333431.317	51055.448	695456793.33	105108010.55
<i>Hansen p-value</i>	0.200	0.240	0.275	0.287	0.216
<i>Difference-in-Hansen exogeneity test (p-value)</i>	0.203	0.292	0.244	0.244	0.226
<i>AR (1) p-value</i>	0.000	0.019	0.008	0.020	0.004
<i>AR (2) p-value</i>	0.572	0.128	0.123	0.108	0.119
<i>Industry effects</i>	Yes	Yes	Yes	Yes	Yes
<i>Year effects</i>	Yes	Yes	Yes	Yes	Yes

Notes: This regression table provides a robustness analysis of the system GMM estimation for the dynamic panel models with alternative measurements for firms' *market power* and *competitive intensity* based on sales revenue (HHI) to investigate the effects of green performance on firm risk. The regression results are reported for insolvency risk (column 1), idiosyncratic risk (columns 2 & 3), and total risk (columns 4 & 5) for the sample firms. The dependent variables are the Altman z-score (column 1), volatility based on the Fama-French 3-factor model (columns 2 & 4) and volatility based on the CAPM model (columns 3 & 5) at corresponding levels. Firms' market share is calculated based on the firm's total assets over industry assets. Industry competitive intensity (HHI) is calculated using industry sales figures. Definitions of other variables are given in Table 1. P-values for the Hansen test, difference-in-Hansen exogeneity test, AR(1), and AR(2) are provided at the end of the table, while P-values for the covariates are reported in parentheses at the following significance levels: *** p<.01, ** p<.05, and * p<.10.

Table 5. Alternate estimation models

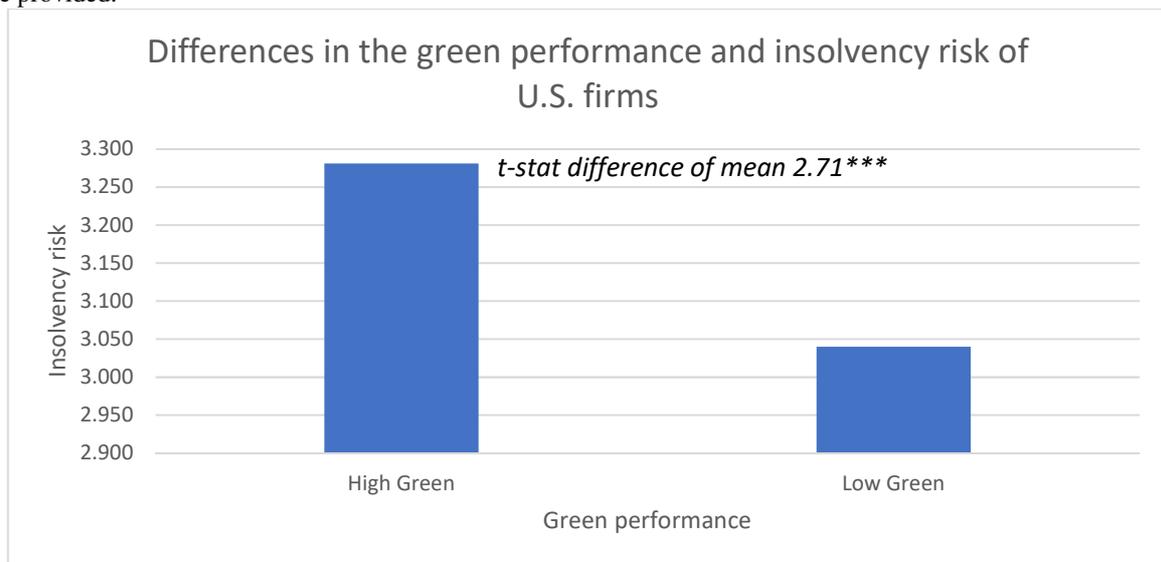
Dependent variable	<i>Z-score based Insolvency</i>	<i>Z-score dummy</i>
	(M1) Fixed effects model	(M2) Pooled probit model
<i>Market power x Green performance</i>	2.028*** (0.003)	-3.217* (0.054)
<i>Competitive intensity (asset based) x Green performance</i>	0.455* (0.084)	-0.215 (0.813)
<i>Green performance</i>	0.219* (0.098)	0.217 (0.571)
<i>Market power</i>	-0.991** (0.033)	1.434** (0.050)
<i>Competitive intensity (asset based)</i>	-0.059 (0.738)	0.364 (0.539)
Firm controls	Yes	Yes
Industry controls	Yes	Yes
Year effects	Yes	-
Firm effects	Yes	-
Industry effects	Yes	-
State effects	Yes	-
Firm-year observations	1301	1181
N. firms	174.000	151.000
R-squared	0.93	0.43

Notes: This regression table provides robustness results for the alternate estimation models, including a classic fixed effect model with a dense set of fixed effects at the year, firm, and industry levels (column 1) and a population-averaged (pooled) probit model (column 2). The dependent variables are the Altman z-score (column 1) and a z-score-based dummy (column 2) calculated based on the bankruptcy threshold provided by Altman; the *Z-score dummy* takes the value 1 if a firm's *z-score* ≤ 1.80 , and 0 otherwise. The main variables of interest are Newsweek based *Green performance*, *market power*, and *competitive intensity*. Definitions of the main variables of interest and other control variables are given in Table 1. *P-values* are in parentheses at the following significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

FIGURE

Figure 1. Differences in the green performance and insolvency risk of U.S. firms

This figure describes the differences in the green performance and insolvency risk of U.S. firms. On the x-axis, the firms in the sample are divided into groups of high or low green performance according to the sample median green score. On the y-axis, the average values of firm insolvency risk operationalized through the Altman z-score (1968) are provided.



Appendix Table 1: 2SLS Instrument Variable Regression Alternate estimations for endogeneity

Dependent variable:	<i>Z-score based Insolvency</i>	
	(M1) Instrument(s): Air quality and US voting patterns	(M2) Instrument(s): Lagged Green Performance
<i>Market power x Green</i>	1.338** (2.052)	1.1461* (0.090)
<i>Competitive intensity x Green</i>	2.202*** (-2.607)	4.0095** (0.030)
<i>Green performance</i>	0.418** (2.025)	1.5092 (0.101)
<i>Market power</i>	-0.607** (-1.988)	-0.5675* (0.080)
<i>Competitive intensity (HHI assets)</i>	0.708* (1.908)	1.4729* (0.070)
<i>Firm specific variables</i>	Yes	Yes
<i>Firm-year observations</i>	1301	975
<i>N. firms</i>	174.000	174.000
<i>LR stat (weak instrument test)</i>	25.427***	16.587***
<i>Sargan p-value (test of overidentification)</i>	0.174	0.236
<i>Wald p-value (test of exogeneity)</i>	-	-
<i>R-squared</i>	0.674	0.931
<i>Wald Chi²</i>	-	-
<i>Industry effects</i>	Yes	Yes
<i>Year effects</i>	Yes	Yes
<i>Firm effects</i>	Yes	Yes

Notes : This regression table presents the second stage results on a two-stage least squares regression model (2SLS) with instrumental variable analysis (IV). In Model 1, firm green performance is instrumented with US state-level air quality and US state color where the sample firms are headquartered (Cahan, Chen, Chen, & Nguyen (2015)).² In Model 2, green performance is instrumented by 2 years lagged green performance of sample firms. The dependent variable is Z-score based Insolvency (Altman, 1978). The main variable of interest are Newsweek based *Green performance*, *market power*, and *competitive intensity*. Definitions of the main variables of interest and other control variables are given in Table 1. For Model 1 and 2, LR stat on weak instrument test and Sargan p-values on validity of instruments are reported and *p-value* for Wald test of exogeneity under the null hypothesis that variables are not endogenous. *P-values* are in parentheses at the following significance levels: *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

² State level air quality data is collected from <https://www.epa.gov/outdoor-air-quality-data>, while data from www.electoral-vote.com is used to construct state color instrument. The states in the USA are divided into blue or red states depending on the ideological-leaning of each state. For instance, New York is considered as a blue state due to its inclination towards the Democratic party while Texas is viewed as a red state due to its inclination towards the Republican party. Di Giuli & Kostovetsky (2014) contend that firms headquartered in blue states (i.e., democratic-leaning) tend to be more socially responsible compared to firms headquartered in red states (republican-leaning).

Appendix Table 2: Placebo test

Dependent variable:	Z-score based Insolvency (M1)	Z-score based Dummy (M2)
<i>Market power x Green</i>	-1.685 (0.473)	-0.603 (0.518)
<i>Competitive intensity x Green</i>	4.143 (0.168)	0.664 (0.577)
<i>Green performance</i>	-0.479 (0.533)	0.182 (0.674)
<i>Market power</i>	1.252 (0.373)	0.580 (0.518)
<i>Competitive intensity (HHI assets)</i>	-2.115 (0.221)	0.165 (0.564)
<i>Firm specific variables</i>	Yes	Yes
<i>Firm-year observations</i>	1130	1181
<i>N. firms</i>	174.000	151
<i>Hansen p-value</i>	25.427***	-
<i>Difference-in-Hansen exogeneity test (p-value)</i>	0.791	-
<i>AR (1) p-value</i>	0.022	-
<i>AR (2) p-value</i>	0.585	-
<i>Industry effects</i>	Yes	Yes
<i>Year effects</i>	Yes	Yes

Notes : This regression table presents results of Placebo analysis after randomly shuffling the green performance across sample firms. The dependent variable is Z-score based Insolvency in Model 1 (GMM dynamic panel regression model) and Z-score based Dummy in Model 2 (probit model). The main variable of interest are Newsweek based scrambled *Green performance*, *market power*, and *competitive intensity*. Definitions of the main variables of interest and other control variables are given in Table 1. P-values for the covariates are reported in parentheses at the following significance levels: *** p<.01, ** p<.05, and * p<.10.