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The Value of Being Greener: Untangling the Relationship between Environmental Investment and Firms' Access to Trade Credit

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This study investigates the relationship between corporate environmental performance, as captured by environmental investment, and firms' access to trade credit. Using data from Chinese listed firms in heavy pollution industries, we find that corporate environmental performance significantly increases firms' access to trade credit. The positive effect of environmental investment appears more pronounced for firms with stronger internal incentives to conduct eco-friendly practices, lower external regulatory pressure and located in regions with higher economic growth rates. Two factors – namely, increased information transparency and reduced exposure to environmental risk – are found to be channels through which environmental investment affects trade credit. This paper provides a nuanced understanding of how a supplier as a stakeholder plays a significant role in financing environmental sustainability. The results are robust to alternative proxies, model specifications, sample compositions and endogeneity concerns.

Introduction

The issue of how environmental sustainability activities are financed is widely debated at every climate summit and has become a top challenge not only for policy-makers, non-governmental organizations (NGOs) and governments, but also for firms around the world. At the firm level, the challenge stems from uncertain outcomes associated with environmental investment, which has a profound effects on firms' financing choices, profitability and competitiveness (Mengze and Wei, 2015). Yet, prior studies, apart from the recent study by Tian and Tian (2022), have given little systematic attention to how environmental performance influences trade credit (i.e. informal finance) in a setting where institutions are underdeveloped and legal enforcement appears weak (see Cull, Xu and Zhu, 2009). However, trade credit constitutes the single most important source of informal financing for firms (Lin and Chou, 2015; Petersen and Rajan, 1997) and is argued to overcome the information asymmetry problem which limits firms' access to credit (Seifert, Seifert and Protopappa-Sieke, 2013; Smith, 1987). Moreover, the extant literature in strategy and environmental sustainability contends that suppliers and customers are the two most important stakeholders, and cooperation between them may foster better economic outcomes and corporate social responsibility (CSR) (Sharma *et al.*, 2023). Therefore, how environmental performance affects trade credit offered by suppliers to customers is important.

In this study, we ask whether environmental investment is associated with trade credit and, if so, through which channels. Departing from the recent study by Tian and Tian (2022), we employ the total cost of a firm's environmental protection activities scaled by the firm's total assets rather than ESG rating/disclosure, which is often susceptible to social desirability bias such as greenwashing (Aerts and Cormier, 2009; Ilinitch, Soderstrom and Thomas, 1998; Kim and Lyon, 2015). Indeed, the Framework of the International Integrated

Reporting Council (IIRC, 2021) recommends the use of financial costs of environmental activities as a reference point for investor's decision-making in that it is accurate, reliable and measures the actual environmental activities of a firm (Baboukardos, 2018; Peloza, 2009). We explore the above question from two theoretical standpoints, namely, information asymmetry and stakeholder theory. First, the supplier–customer relationship enhances information sharing and reduces information asymmetry (Pike *et al.*, 2005; Smith, 1987). Thus, suppliers have an information advantage over financial institutions in providing trade credit to their customers, serving as a counterexample to formal finance by banks. Second, suppliers as socially responsible stakeholders play a pivotal role in moving firms towards sustainability (Hart, 1995) because they are affected by societal demands and pressures for environmental protection and may use trade credit to finance environmentally friendly customers (Baron and Diermeier, 2007; Doh and Guay, 2006; Tang and Tang, 2018).

To test the relationship between environmental investment and trade credit, we collect data from all Chinese listed firms in heavy pollution industries from 2008 to 2022. The choice of China as an empirical setting is based on the following reasons. First, despite reforms over the past three decades, institutions in China appear weak and the state-dominated financial institutions tend to favour state-owned enterprises in credit allocation, giving rise to the increasing use of trade credit by the financially constrained private enterprises (Chen, Hua and Boateng, 2017; Cull, Xu and Zhu, 2009). Second, Chinese economic growth is largely fuelled by highly polluting manufacturing industries. Moreover, He, Wang and Zhang (2020) document differences in the industrial structure, legal enforcement and economic costs of environmental protection policies of Chinese firms compared to those in developed countries, where several studies on this subject have focused. Such differences may lead to different perceptions of how stakeholders view and report corporate environmental performance. For example, Lyon *et al.* (2013) find the relationship between privately owned enterprises, enterprises in low-pollution industries and financial markets in China to be negative when they win environmental awards, as these awards are perceived to be associated with high environmental abatement costs. In contrast, evidence in the US market indicates that comprehensive CSR scores are positively related to trade credit financing (Xu, Wu and Dao, 2020; Zhang, Lara and Tribó, 2020), highlighting different market perceptions about environmental investment between the United States and China. Shou *et al.* (2020) found the relationship between CSR scores and trade credit to be non-linear. To address the mixed findings documented in past empirical efforts, we use China in this study.

Our baseline results show that corporate environmental investment is positively associated with firms' access to trade credit. The positive effect of environmental investment is more pronounced for firms with stronger internal incentives to conduct eco-friendly practices, lower external regulatory pressure and located in regions with higher economic growth rates. We further document that improved information transparency and reduced firms' exposure to environmental risk are the main channels through which environmental performance affects trade credit.

Our study contributes to the existing literature in several ways. First, our study adds to the literature that explores the relationship between environmental performance and finance. Whilst some studies have investigated the relationship between ESG/CSR scores/disclosures and trade credit (Shou *et al.*, 2020; Tian and Tian, 2022; Xu, Wu and Dao, 2020; Zhang, Lara and Tribó, 2020), the ESG/CSR dimensions employed in measuring environmental performance have been inherently inconsistent (Du *et al.*, 2017). Moreover, prior studies have reported that ESG scores/disclosures are often susceptible to social desirability bias (Aerts and Cormier, 2009; Ilinitch, Soderstrom and Thomas, 1998; Kim and Lyon, 2015) due to firms' tendency to misrepresent their disclosures through self-deceptive enhancement and impression management (e.g. brownwashing and greenwashing), which may lead to unwarranted conclusions (Zerbe and Paulhus, 1987). To the best of our knowledge, our study is the first attempt to employ a firm's actual cost of environmental protection activities to explore the relationship between environmental performance and trade credit, thereby providing a nuanced understanding of a subject which has produced mixed results.

Second, our study highlights the important role of a supplier as a stakeholder in financing environmental investment. More specifically, we show that a one standard deviation increase in our environmental investment measure results in a 2.30% increase in the trade credit ratio, and that the relationship is more pronounced when the environmental behaviour is internally driven by the firm. We also show that increased information transparency and reduced exposure to environmental risk are important channels through which environmental investment influences access to trade credit, thereby contributing to information asymmetry and stakeholder theories.

Lastly, our study contributes to the literature by focusing on China, an emerging market whose economy growth is significantly driven by firms in polluting industries yet has underdeveloped institutions and legal enforcement mechanisms, with most of the privately owned enterprises being financially constrained (see Cull, Xu and Zhu, 2009). Our study therefore offers a nuanced understanding of the relationship between

environmental performance and trade credit in emerging countries, where institutions are underdeveloped, by showing that the supplier–customer relationship constitutes an important vehicle for a firm's access to trade credit to finance environmental protection activities. We also show that litigation risk (i.e. a proxy for no political connection) tends to increase access to trade credit to finance environmental protection activities, perhaps due to less political interference in environmental regulatory enforcement.

Theoretical background

Information asymmetry and environmental investment

The exchange relationship between suppliers and buyers is characterized by imperfect information regarding product quality and buyer's creditworthiness (Smith, 1987). This information problem leads to uncertainty, potential for opportunism, moral hazard problems and consequently high transaction costs for both parties involved in the exchange relationship (Pike *et al.*, 2005). Trade credit, which occurs when a buyer postpones payment for purchased goods or services (Seifert, Seifert and Protopappa-Sieke, 2013), ties firms together and increases information exchange between the supplier and buyer (Cunat, 2000). Smith (1987) argues that trade credit represents a contractual solution for information asymmetry.

In the context of environmental investment, due to the risky and uncertain nature of such investment, heightened by information asymmetry, accessing formal credit from banks is not only difficult but also costly (Boubaker *et al.*, 2020; Eccles, Ioannou and Serafein, 2014). For example, due to information asymmetry, a bank may suffer direct risk arising from borrowers' legal liability to clean up pollution and pay damages (Andersen, 2017; Mengze and Wei, 2015), thereby leading to loan default. Moreover, Tian and Lin (2019) document that investment in pollution abatement technology has lower returns and long payback periods, hence firms with higher pollution abatement investment tend to suffer from limited access to finance (Andersen, 2017). However, we argue that environmental investment is related to higher trade credit provided by suppliers, as the closer relationship between the supplier and the customer allows more high-quality information regarding a firm environmental activity to be exchanged between them. Thus, the high level of information sharing and disclosure lowers information risk and consequently fosters trade credit.

Stakeholder theory and environmental investment

The finance literature assumes that firms will undertake environmental investment only if these investments lead to shareholder wealth maximization. However, in the real world, stakeholders such as customers, regulators and NGOs have an interest in a firm (Freeman, 1984, 1994) and the physical impact of its activities on the environment. We employ the stakeholder theory, which theorizes that firms must look beyond merely shareholder value maximization and consider the interests of other stakeholders, which can affect or are affected by the firm's activities (Cordeiro and Tewari, 2015; Post, Preston and Sachs, 2002). According to Donaldson and Preston (1995), satisfying the legal and moral claims of all stakeholders is key to the total wealth maximization and competitive advantage of a firm. Indeed, Wood (1991) points out that the basic tenant of CSR is that society and business are intrinsically linked, and how firm activities impact firms is a central issue.

As firms are affected by stakeholder pressures (Tang and Tang, 2018; Wolf, 2014), we argue that suppliers/customers may consider the environmental sustainability element in their trade credit agreement due to stakeholder pressures that may lead to reputational damage and lower earnings. We therefore conjecture that firms' environmental investment influences access to trade credit in different directions. Firms with higher environmental investment are considered to have higher credit quality because they are more willing and more able to fulfil their obligations to the other stakeholders (Mengze and Wei, 2015). In addition, firms that invest more in the environment are less exposed to environmental risks, such as environmental accidents, lawsuits and fines, making them more attractive to their suppliers (Tian and Tian, 2022). From this perspective, corporate environmental investment promotes firms' access to trade credit.

Notwithstanding the above, Zhang, Yu and Kong (2019) document that environmental investment increases firms' operational costs and reduces profitability, thereby increasing the firms' probability of default. Consequently, corporate environmental investment reduces suppliers' willingness to provide trade credit. Therefore, whether environmental investment is positively or negatively related to trade credit remains an empirical question and this study fills this gap.

Hypothesis development

Grounded in the above, we propose two competing hypotheses regarding the relationship between a firm's environmental investment and its access to trade credit. In our first hypothesis, we expect firms with higher levels of environmental investment to receive more trade credit through two channels. First, stakeholder theory suggests that a firm's performance depends on its relationship with stakeholders – such as customers, suppliers, employees, investors, the government and the community (Freeman, 1984). Superior CSR perfor-

mance also helps a firm to obtain more support from stakeholders (Freeman, 1984). A firm's eco-friendly policies, as part of the environmental dimension of CSR activities, reflect the firm's strong willingness to undertake its social responsibility to the public. From this perspective, suppliers may view firms that invest more in the environment as more trustworthy, because these firms tend to undertake the responsibility by themselves and reduce the polluting costs borne by society. Researchers (e.g. Ng, Smith and Smith, 1999; Petersen and Rajan, 1997) argue that corporate environmental investment is also a good reflection of a firm's financial condition and facilitates assessing customers' credit quality. Thus, suppliers perceive customers with more socially responsible activities (e.g. environmental protection activities, occupational safety programmes and philanthropy) as having adequate financial sources to invest in these endeavours, and therefore as cash-rich firms (Goss and Roberts, 2011; Wang, Choi and Li, 2008). El Ghoul *et al.* (2011) and Kim, Surroca and Tribó (2014) highlight that socially responsible firms are documented to have a lower cost of capital and better access to external financing sources (Cheng, Ioannou and Serafeim, 2014). Therefore, suppliers are more likely to grant trade credit to customers with higher levels of environmental investment.

In the second channel, we propose that firms with higher levels of environmental investment face less environmental risk and hence are more attractive to suppliers. A survey by Thompson and Cowton (2004) suggests that banks carefully consider borrowers' environmental risk when making lending decisions. Such information is valuable to banks because, for example, a firm may default on its loan if it is shut down because it cannot afford to meet the requirements of increasingly stringent environmental regulations. Unlike bank loans, trade credit is a type of informal financing that does not require collateral (Fisman and Love, 2003; Lin and Chou, 2015; Tian and Tian, 2022). Therefore, environmental risk information should be more valuable to suppliers when deciding whether to lend to customers.

Over the past decade, the Chinese government's awareness of environmental protection has increased dramatically, especially in relation to business operations. For example, in 2015, the top leadership of the Communist Party took over regulatory environmental enforcement. Since then, reducing environmental pollution has become the policy of the 'New Normal'. Later, the Environmental Protection Tax Law of the People's Republic of China was enacted by legislature in 2016. Environmental courts have also been gradually established in various regions across China, since 2007. Having more environmental regulations means that corporate production processes are also under increased scrutiny. Enterprises that still neglect the significance of environmental protection may face severe environmental litigation risk. Because suppliers that offer more trade credit are more vulnerable to customer failure (Jacobson and Von Schedvin, 2015), we expect eco-friendly customers to be more attractive to suppliers as they are perceived as more trustworthy and tend to face less litigation risk. We therefore hypothesize:

H1a: Corporate environmental investment is positively associated with access to trade credit.

Nevertheless, there is a possibility that suppliers may have different views regarding customers' environmental investment. First, it is worth noting that, unlike the voluntary and discretionary nature of donations (Carroll and Shabana, 2010), corporate environmental investment is usually carried out involuntarily under environmental regulations. Environmental investment greatly increases firms' burden, since abatement activities require considerable inputs of energy, labour, raw materials and other resources (Xu and Kim, 2022). For example, He, Wang and Zhang (2020) estimate that, between 2000 and 2007, water regulation work in China was associated with economic losses of more than 800 billion RMB. From this perspective, firms' higher levels of environmental investment could be perceived as excessive costs, which would reduce firms' profits and harm shareholders' benefits. Empirical evidence has demonstrated that non-state-owned enterprises and enterprises in low-pollution industries receive negative stock returns after winning environmental awards, as they are viewed as bearing unduly high costs (Lyon *et al.*, 2013). Based on this argument, it is reasonable to conjecture that suppliers may be less willing to use trade credit to build close ties with customers burdened with excessive costs, which do not directly generate profits.

Even if firms use their excess funds to voluntarily invest in the environment, it may not necessarily lead to higher use of trade credit. First, considering that the price of trade credit is generally more expensive than comparable bank loans (Cunat, 2007; Klapper, Laeven and Rajan, 2012; Ng, Smith and Smith, 1999), firms with sufficient internal funds are therefore more likely to reduce their demand for trade credit because of the higher price. Second, based on trade credit theories, one of the motives of providing trade credit by suppliers is to price discriminate between cash and credit customers (Brennan, Miksimovic and Zechner, 1988). Based on this argument, for financially sound firms, suppliers do not need to use trade credit to price discriminate to make additional sales. Thus, we propose an alternative hypothesis:

H1b: Corporate environmental investment is negatively associated with access to trade credit.

Research design

Data and sample

We construct our sample using all Chinese A-share listed firms in heavily polluting industries. We collect environmental investment information from firms' annual financial reports. Other firm characteristics are collected from the China Stock Market & Accounting Research Database (CSMAR). The sample time span is from 2008 to 2022. We exclude the following observations: (1) firms in the financial industry; (2) special treatment firms and delisted firms; and (3) firms with missing values for variables. Our final sample includes 6592 firm-year observations. We also winsorize all continuous variables at the 1% level in each tail to minimize the effects of outliers.

Variables and model

To examine the impact of environmental investment on firms' access to trade credit, we design our baseline regression model as follows:

$$\begin{aligned} AP_{it} = {} & \beta_0 + \beta_1 Invest_{it} + \beta_2 Control_{it} \\ & + Year + Industry + Province + \varepsilon_{it} \end{aligned} \quad (1)$$

where the dependent variable (AP_{it}) is calculated as the amount of accounts payable scaled by the costs of goods sold (Levine, Lin and Xie, 2018; Love, Preve and Sarria-Allende, 2007). Following the approach of prior studies (Xiao and Shen, 2022; Zhang, Yu and Kong, 2019), our key independent variable ($Invest_{it}$) is constructed using information extracted from the 'construction in progress' item in firms' financial reports. We identify investment items that belong to environmental investment projects if the name of an item contains at least one keyword related to environmental protection. The keyword list includes new energy, greening, waste gas, sewage treatment, desulphurization and denitrification. Next, we sum all costs of the projects related to environmental protection as the firm's total environmental investment in that year. We further scale the amount of investment by the firm's total assets.

As for controls, we introduce variables related to trade credit (see Abdulla, Dang and Khurshed, 2017; Kong *et al.*, 2020; Liu, Luo and Tian, 2016; Zhang, Lara and Tribó, 2020), to isolate the effect of environmental investment on trade credit. Thus, we control for firm size (FirmSize), firm age (FirmAge), cash holdings (Cash), leverage (Lev), return on assets (ROA), state ownership (SOE), CEO's age (CEOAge), CEO's gender (Gender) and GDP per capita (GDP). We also control for industry fixed effects, province fixed effects and year fixed effects. We cluster the standard errors by firms to account for heteroscedasticity. Details of the definitions of all variables are presented in Table 1.

Descriptive statistics

The descriptive statistics of our sample are reported in Table 2. In our sample, the listed firms in China, on average, receive trade credit that accounts for 32.7% of the costs of goods sold, with a standard deviation of 27.1%, and accounts for 15.5% of total assets, with a standard deviation of 10.6%. The average ratio of environmental investment is around 0.9%, with a standard deviation of 2.3%, which is consistent with the results obtained by Xiao and Shen (2022) using a similar approach to construct the measure.

Correlations

The correlation coefficients of the main variables are reported in Table 3. The results show that the absolute values of the correlation coefficients between each pair of control variables are all less than 0.5, which rules out multicollinearity concerns. More importantly, our main measure of environmental investment (Invest) is significantly positively associated with our main dependent variable (AP), which provides primary support for our expectations.

Empirical results and analysis

Environmental investment and firms' access to trade credit

The results of our baseline regressions are reported in Table 4. Since trade credit is typically short-term financing, it is usually affected by various determinants in the current year. Therefore, we use contemporaneous values of all variables in our baseline regressions, which is consistent with previous studies (Abdulla, Dang and Khurshed, 2017; Love, Preve and Sarria-Allende, 2007). We also conduct robustness checks using lagged values of all independent variables and obtain similar results.

The estimated coefficients on Invest remain statistically significant at the 1% level from column 1 to column 4, ranging from 1.554 to 1.017. The results indicate that firms' environmental investment significantly increases their access to trade credit, supporting H1. Using the estimated coefficient in column 4, a one standard deviation increase (0.023) in environmental investment leads to a 2.3% increase in our measure of trade credit, which is equivalent to 7% of the sample mean of the trade credit ratio. Our results support the findings of Xu, Wu and Dao (2020) and Zhang, Lara and Tribó (2020) in the US context, who documented a positive relationship between comprehensive CSR scores and trade credit, despite the expectation that institutional differences may

Table 1. Definitions of variables

Variable	Definition
AP	Accounts payable scaled by costs of goods sold
NetAP	Net amount of accounts payable and accounts receivable scaled by costs of goods sold
Invest	Total amount of environmental investment scaled by total assets
Invest_Cap	Total amount of environmental investment scaled by total capital expenditure
FirmSize	Natural logarithm of total assets
FirmAge	Natural logarithm of the observation year minus the year in which the firm is founded
Cash	Cash and cash equivalents scaled by total assets
Lev	Total liabilities scaled by total assets
ROA	Ratio of net earnings to total assets
SOE	Takes value 1 if a firm is state-owned, and 0 otherwise
CEOAge	Natural logarithm of CEO's age + 1
Gender	Takes value 1 if CEO is male, and 0 otherwise
GDP	Natural logarithm of per capita GDP
Ave_Industry	The average value of environmental investment scaled by total assets of other firms in the same industry
GI	Takes value 1 if a firm has green investors, and 0 otherwise

Table 2. Descriptive statistics

Variable	N	Mean	SD	Min	Median	Max
AP	6592	0.327	0.271	0.011	0.250	1.924
NetAP	6592	0.088	0.285	−2.741	0.067	3.436
Invest	6592	0.009	0.023	0.000	0.001	0.146
FirmSize	6592	22.480	1.284	19.210	22.320	27.090
FirmAge	6592	2.924	0.328	1.609	2.944	3.526
Cash	6592	0.163	0.111	0.006	0.135	0.699
Lev	6592	0.453	0.200	0.051	0.453	1.066
ROA	6592	0.037	0.140	−4.782	0.037	7.446
SOE	6592	0.406	0.491	0.000	0.000	1.000
CEOAge	6592	3.927	0.134	3.296	3.951	4.344
Gender	6592	0.947	0.225	0.000	1.000	1.000
GDP	6592	11.370	0.550	8.881	11.460	12.460

Note: This table reports the descriptive statistics of the main variables.

affect China and the United States differently. One plausible explanation may be due to the nature of the sample (i.e. firms in polluting industries) in this study. Thus, firms in polluting industries may be influenced on moral grounds, with stakeholder pressures to improve their environmental practices by investing more in environmental protection activities to avoid reputational damage to the firms and their suppliers. Another potential explanation may be due to differences in the measurement of the dependent variable, that is, environmental performance. Whereas we used the total cost of a firm's environmental protection activities scaled by the firm's total assets, Shou *et al.* (2020) employed ESG rating/disclosure, which is often susceptible to social desirability bias, such as greenwashing (Aerts and Cormier, 2009; Ilinitch, Soderstrom and Thomas, 1998; Kim and Lyon, 2015).

The estimated coefficients on the control variables are also consistent with extant studies. The estimated coefficient on FirmSize is positive and significant, suggesting that larger firms receive more trade credit, possibly due to their higher bargaining power (Petersen and Rajan, 1997). The significant positive coefficients of Lev and Cash are consistent with Wu, Firth and Rui (2014), Liu, Luo and Tian (2016) and Kong *et al.* (2020). The significant negative sign of SOE indicates that non-state-owned enterprises depend more on trade credit to meet their financing needs.

Channels analysis

We propose two main mechanisms through which the effects of environmental investment occur. First, firms' environmental investment behaviour mitigates information asymmetry between suppliers and customers by signalling customers' ability to repay and thus their trustworthiness. Second, firms with higher levels of environmental investment suffer less from the risk of environmental litigation, making these firms more attractive to suppliers. In this section, we analyse the mechanisms through which environmental investment influences trade credit.

Information transparency. In the first mechanism, we propose that firms' environmental investment has positive effects on their access to trade credit by mitigating information asymmetry between the counterparties. Thus, the effects should be more pronounced in firms with lower levels of information transparency. Firms vary in the number of analysts who track and issue earnings forecasts for them. Existing studies show that firms with higher analyst coverage receive greater attention and scrutiny from investors (Jensen and Meckling, 1976; Johnson *et al.*, 2005). Thus, analyst coverage acts as an external monitoring function (Gentry and Shen, 2013). We use the amount of analyst coverage to measure a firm's information transparency. Specifically, we measure a firm's analyst coverage using the number of analysts who issued earnings forecasts for it during the

Table 3. Correlation matrix

Variable	1	2	3	4	5	6	7	8	9	10	11
AP	1										
Invest	0.128***	1									
FirmSize	0.207***	−0.043***	1								
FirmAge	−0.033***	−0.031**	0.217***	1							
Cash	−0.042***	−0.034***	−0.170***	−0.129***	1						
Lev	0.336***	0.005	0.452***	0.111***	−0.327***	1					
ROA	−0.057***	−0.001	0.003	−0.019	0.138***	−0.201***	1				
SOE	0.041***	−0.055***	0.320***	0.131***	−0.089***	0.280***	−0.045***	1			
CEOAge	−0.013	0.011	0.142***	0.111***	−0.007	0.015	0.017	0.075***	1		
Gender	−0.030**	−0.008	0.009	−0.003	−0.012	0.015	0.003	0.045***	0.022*	1	
GDP	0.082***	0.058***	0.119***	0.187***	0.012	−0.037***	0.010	−0.144***	0.103***	−0.028**	1

Note: This table reports variable correlation coefficients. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 4. Baseline regression: environmental investment and trade credit

Variable	(1)	(2)	(3)	(4)
Invest	1.554***	1.528***	1.487***	1.017***
	(0.323)	(0.313)	(0.318)	(0.252)
FirmSize		0.021***	0.020***	0.011**
		(0.006)	(0.006)	(0.005)
FirmAge		−0.075***	−0.072***	−0.080***
		(0.022)	(0.022)	(0.020)
Cash		0.217***	0.206***	0.211***
		(0.043)	(0.043)	(0.038)
Lev		0.473***	0.473***	0.443***
		(0.036)	(0.036)	(0.033)
ROA		0.002	0.002	0.011
		(0.025)	(0.025)	(0.025)
SOE		−0.027**	−0.024*	−0.024*
		(0.014)	(0.014)	(0.013)
CEOAge		−0.052	−0.057	−0.040
		(0.038)	(0.037)	(0.033)
Gender		−0.037	−0.035	−0.033
		(0.024)	(0.024)	(0.021)
GDP			0.039***	0.005
			(0.013)	(0.015)
Constant	0.313***	0.068	−0.342	0.201
	(0.007)	(0.189)	(0.242)	(0.231)
Industry	N	N	N	Y
Province	N	N	N	Y
Year	Y	Y	Y	Y
Adj. R^2	0.023	0.158	0.163	0.303
N	6592	6592	6592	6592

Note: This table reports the regression results for the relationship between environmental investment and trade credit. The dependent variable is AP, defined as accounts payable scaled by costs of goods sold. The independent variable is Invest, defined as environmental investment scaled by total assets. Detailed variable definitions are presented in Table 1. Standard errors are reported in parentheses and are clustered by industry. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

year. We classify firms with analyst coverage equal to or above the sample mean as firms with high transparency. Those with values below the sample mean are firms with low transparency. The subsample regression results are reported in columns 1 and 2 of Table 5. The results show that the coefficient on Invest is positive and statistically significant for the low-transparency group, and insignificant for the high-transparency group. These results confirm our expectation that the positive impact of environmental investment on firms' access to trade credit exists only when firms lack sufficient transparency.

Environmental litigation risk. Next, we examine whether the relationship between firms' environmental investment and access to trade credit is affected by the risk of environmental litigation that firms face. If customers with higher levels of environmental investment are more attractive to suppliers due to a lower litigation risk, the effect should be more pronounced in firms that are more likely to be sued for environmental issues. We consider a firm's political connections to be an important factor that influences the firm's litigation risk in China. Correia (2014) finds that firms with political connections are less likely to be subject to enforcement actions and receive lower sanction costs if they are sued. Liu, Cheong and Zurbruegg (2020) also point out that firms can use their involvement in political lobbying to reduce their environmental exposure. Following Liu, Luo and Tian (2016), we define a firm as politically connected if its chair or CEO works or used to work in the government or is/was a delegate to the National/Provincial People's Congress or the People's Political Consultative Conference. Since the political power of officials at or below the county level (*chuji*) is relatively limited (Xiao and Shen, 2022), we only consider that a firm is politically connected if the chairperson or CEO's administrative level is above the county level. We classify firms into two subsamples based on whether they are politically connected or not. The subsample regression results are reported in columns 3 and 4 of Table 5. The results show that the coefficient on Invest is only significant for firms with no political connections, corroborating the environmental litigation channel.

Table 5. Tests of channels

Variable	Low transparency (1)	High transparency (2)	No political connection (3)	With political connection (4)
Invest	1.318***	0.495	1.072**	0.732
	(0.411)	(0.300)	(0.397)	(0.540)
FirmSize	0.020***	−0.010	0.010**	0.016**
	(0.006)	(0.006)	(0.004)	(0.007)
FirmAge	−0.071***	−0.071***	−0.091***	−0.046
	(0.017)	(0.020)	(0.015)	(0.045)
Cash	0.133***	0.329***	0.228***	0.159***
	(0.022)	(0.027)	(0.028)	(0.046)
Lev	0.377***	0.602***	0.438***	0.453***
	(0.025)	(0.030)	(0.021)	(0.039)
ROA	0.014	−0.054	0.013	0.031
	(0.029)	(0.068)	(0.025)	(0.073)
SOE	−0.030**	−0.009	−0.016	−0.054***
	(0.013)	(0.013)	(0.009)	(0.012)
CEOAge	−0.075***	0.024	−0.045	−0.036
	(0.014)	(0.026)	(0.027)	(0.050)
Gender	−0.027	−0.026	−0.039**	−0.026
	(0.026)	(0.023)	(0.014)	(0.036)
GDP	0.012	−0.010	0.000	0.012
	(0.014)	(0.007)	(0.010)	(0.015)
Constant	0.089	0.480**	0.338	−0.092
	(0.245)	(0.168)	(0.220)	(0.192)
Industry	Y	Y	Y	Y
Province	Y	Y	Y	Y
Year	Y	Y	Y	Y
Test of difference	0.823***		0.340*	
Adj. R^2	0.297	0.358	0.301	0.337
N	4019	2573	4812	1780

Note: This table reports the regression results of channel tests. The dependent variable is AP, defined as accounts payable scaled by costs of goods sold. The independent variable is Invest, defined as environmental investment scaled by total assets. Columns 1 and 2 report the results of the effect of information transparency on the relationship between environmental investment and trade credit. Columns 3 and 4 report the results of the effect of political connection on the relationship between environmental investment and trade credit. Detailed variable definitions are presented in Table 1. Standard errors are clustered by industry and are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Robustness test

Alternative measures and model specification. We construct a variable, Invest_Cap, using the ratio of total amount of environmental investment to total capital expenditure, as an alternative key independent variable. We test the robustness of our conclusion with this alternative independent variable and report the result in column 1 of Table 6. We construct another two dependent variables (NetAP and NetAP_Assets) that equal the net value of accounts payable and accounts receivable scaled by costs of goods sold and total assets, respectively. The results of using these alternative dependent variables are reported in columns 2 and 3 of Table 6. We also use an alternative model specification by replacing all explanatory variables with the values lagged by 1 year. By doing so, our key independent variable – environmental investment – occurs before the firm receives its trade credit for the current year, which mitigates concerns about reverse causality to some extent. All coefficients on the key independent variable in Table 6 are statistically significantly positive, further corroborating the robustness of our conclusion.

Instrumental variable approach. In addition to using lagged independent variables, we adopt an instrumental variable approach to further alleviate concerns about reverse causality and omitted variable bias. We employ two instrumental variables for firms' environmental investment. The first instrumental variable adopted is the average environmental investment level of other firms in the same industry and the same year (El Ghoul *et al.*, 2011; Zhang, Lara and Tribó, 2020). Firms in the same industry have similar production processes; thus, the average environmental investment of peer firms in the same industry is expected to be correlated with each firm's environmental investment, satisfying the correlation restriction. In addition, there is no evidence that the industry average environmental investment directly influences firms' access to trade credit, other than by influencing their environmental policies, satisfying the exclusion restriction.

Table 6. Robustness tests: alternative measures and model specification

Variable	(1)	(2)	(3)	(4)
Invest_Cap	0.069***			
	(0.013)			
Invest		0.817***	0.151**	1.070***
		(0.310)	(0.072)	(0.298)
FirmSize	0.011**	0.036***	0.015***	0.011*
	(0.005)	(0.005)	(0.002)	(0.006)
FirmAge	−0.082***	0.027	0.025***	−0.085***
	(0.020)	(0.022)	(0.009)	(0.023)
Cash	0.207***	0.260***	0.185***	0.246***
	(0.038)	(0.043)	(0.019)	(0.046)
Lev	0.438***	0.407***	0.192***	0.376***
	(0.033)	(0.033)	(0.015)	(0.038)
ROA	0.011	0.063***	0.013	0.008
	(0.027)	(0.023)	(0.015)	(0.016)
SOE	−0.024*	0.032**	0.024***	−0.012
	(0.013)	(0.013)	(0.005)	(0.016)
CEOAge	−0.038	−0.005	−0.001	−0.037
	(0.032)	(0.035)	(0.015)	(0.039)
Gender	−0.034	0.019	0.003	−0.041
	(0.021)	(0.025)	(0.009)	(0.026)
GDP	0.004	−0.038**	−0.010	−0.008
	(0.015)	(0.018)	(0.007)	(0.017)
Constant	0.204	−0.625**	−0.434***	0.376
	(0.231)	(0.261)	(0.102)	(0.270)
Industry	Y	Y	Y	Y
Province	Y	Y	Y	Y
Year	Y	Y	Y	Y
Adj. R^2	0.307	0.258	0.253	0.282
N	6592	6592	6592	4472

Note: This table reports the regression results of robustness tests. Column 1 reports the regression results using InvestCap as the dependent variable, measured as total amount of environmental investment scaled by capital expenditure. Column 2 reports the regression using NetAP as the key independent variable, measured as the net value of accounts payable and accounts receivable scaled by costs of goods sold. Column 3 reports the regression using NetAP_Assets as the key independent variable, measured as the net value of accounts payable and accounts receivable scaled by total assets. Column 4 reports the results with all independent variables lagged by 1 year. Detailed variable definitions are presented in Table 1. Standard errors are clustered by industry and are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

The second instrumental variable that we adopt is whether a firm has green investors. We define a firm as having green investors if its institutional investors' investment scope contains environmental related terms. The underlying rationale for this instrumental variable is that having green investors serves as a credible signal of a firm's commitment towards the environment (Flammer, 2021). Therefore, having green investors is logically correlated with a firm's environmental investment, satisfying the correlation restriction. At the same time, there is no evidence that having green investors directly influences a firm's access to trade credit, satisfying the exclusion restriction.

We create our first instrumental variable (Ave_Industry) as the average value of environmental investment of other firms in the same industry. Our second instrumental variable (GI) is a dummy variable that takes the value 1 if a firm has green investors. Columns 1 and 3 of Table 7 report the first-stage results using Ave_Industry and GI as the instrumental variables, respectively. The estimated coefficients on Ave_Industry and GI are both positive and statistically significant at the 1% level, suggesting a positive correlation between the two instrumental variables and the endogenous variable of interest. The second-stage results in columns 2 and 4 of Table 7 show that the coefficients for Invest predicted by each instrumental variable are positive and statistically significant at the 1% level, which is consistent with our baseline results. We include the two instrumental variables in the estimation and report the results in columns 5 and 6 of Table 7. The results still hold. The F statistics of excluded instruments in the first stage across the three estimations are all larger than 10, mitigating the concern of weak identification. In the third estimation, the p-value of the Hansen J statistic is 0.239, mitigating the concern of over-identification.

Changing analysis. To further identify the causal relationship between environmental investment and trade credit, we conduct the tests of changing analysis. The results are reported in column 1 of Table 8. The coefficient on ΔInvest remains significantly positive, further corroborating the relationship between environmental investment and firms' access to trade credit.

Fixed effects at different dimensions. We include industry and province fixed effects to control for factors that do not change over time and year fixed effects to control for time-varying factors that are homogenous across firms. However, one concern is that our results could be influenced by heterogeneous trends among specific industries and regions. Our results may be biased if, for example, industries with a higher use of trade credit are more sensitive to the increasing intensity of environmental regulations, and, as a result, increase investment in environmental protection. To alleviate this concern, we add the fixed effects at different dimensions into the baseline specification and report the results in column 2 to column 4 of Table 8. The positive coefficient on Invest remains statistically significant at the 1% level, which is consistent with our baseline results.

Heterogeneity test

Internal incentive perspective. A firm's eco-friendly practices signal its ability and willingness to internalize negative externalities, thus making it more trustworthy to stakeholders. The signal is more credible if a firm has a strong internal incentive to conduct environmental investment. The first incentive that we consider is corporate board diversity. Eagly and Crowley (1986) argue that women are more community conscious and care

Table 7. Robustness tests: instrumental variable approach

Variable	Ave_Industry		GI		Ave_Industry & GI	
	(1)	(2)	(3)	(4)	(5)	(6)
Ave_Industry	0.285***				0.281***	
	(0.071)				(0.072)	
GI			0.002***		0.002**	
			(0.001)		(0.001)	
Invest		6.876***		11.231***		7.037***
		(1.593)		(3.406)		(1.596)
FirmSize	−0.001***	0.017***	−0.001***	0.020***	−0.001***	0.016**
	(0.000)	(0.006)	(0.000)	(0.006)	(0.000)	(0.006)
FirmAge	−0.003*	−0.062***	−0.004**	−0.040*	−0.003*	−0.065***
	(0.002)	(0.023)	(0.002)	(0.021)	(0.002)	(0.024)
Cash	−0.005	0.249***	−0.006***	0.277***	−0.005*	0.260***
	(0.003)	(0.045)	(0.002)	(0.037)	(0.003)	(0.046)
Lev	0.003	0.430***	0.004**	0.411***	0.004	0.429***
	(0.002)	(0.035)	(0.002)	(0.033)	(0.002)	(0.035)
ROA	0.000	0.011	0.000	0.003	−0.000	0.010
	(0.002)	(0.029)	(0.001)	(0.032)	(0.002)	(0.030)
SOE	−0.000	−0.021	−0.000	−0.016	−0.000	−0.020
	(0.001)	(0.014)	(0.001)	(0.014)	(0.001)	(0.014)
CEOAge	0.003	−0.060	0.003***	−0.061***	0.003	−0.048
	(0.002)	(0.038)	(0.001)	(0.020)	(0.003)	(0.037)
Gender	−0.000	−0.031	−0.001	−0.028	−0.000	−0.034
	(0.002)	(0.026)	(0.002)	(0.019)	(0.002)	(0.026)
GDP	0.002*	−0.010	0.002***	−0.020**	0.002	−0.010
	(0.001)	(0.015)	(0.001)	(0.009)	(0.001)	(0.015)
Industry	Y	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y	Y
Year	Y	Y	Y	Y	Y	Y
N	6592	6592	6592	6592	6592	6592
F statistic	15.95		11.00		11.10	
Hansen J p-value					0.239	

Note: This table reports the results of instrumental variable regressions. The dependent variable is AP, defined as accounts payable scaled by costs of goods sold. The independent variable is Invest, defined as environmental investment scaled by total assets. Columns 1, 3 and 5 report the results of the first-stage regressions. The two instruments are Ave_Industry, defined as the industry average of environmental investment, and GI, defined as whether a firm has green investors. Columns 2, 4 and 6 report the results of the second-stage regressions. Detailed variable definitions are presented in Table 1. Standard errors are clustered by industry and are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

more about others. For example, Liao, Luo and Tang (2015) find that board gender diversity increases the possibility of disclosing greenhouse gas emissions. Liu (2018) finds that greater board gender diversity reduces the probability of corporate environmental violations. Voluntary CSR disclosures made by firms with female directors are also more valued by the market (Dutta and Mallick, 2023). Thus, we expect a more significant relationship between environmental investment and trade credit in firms with a high degree of corporate gender diversity. We split our sample based on critical mass theory (Kanter, 1977), that is, the influence of corporate gender diversity on corporate decisions can only be observed when the number of female leaders reaches a certain threshold. Specifically, we define a firm as having high gender diversity if it has at least one female director as well as one female executive. The results of subgroup regressions are reported in columns 1 and 2 of Table 9. As expected, the relationship between environmental investment and trade credit is significant only in the subgroup with high gender diversity but is insignificant in the subgroup with low gender diversity.

The second internal incentive that we consider is the level of firms' operating cash flow. Environmental investment will bring additional operating costs to firms, leading to the reduction of firm profits. Firms with higher levels of operational cash flow are less likely to suffer financial distress, thus sending a signal to stakeholders that their environmental investment behaviour is more voluntary than mandatory. We split our sample into two subsamples based on the annual median of operating cash flow and reconduct our baseline specification separately. The results reported in columns 3 and 4 are consistent with our expectation that the positive relationship between environmental investment and trade credit is significant only in firms with higher levels of operating cash flow. The overall results in Table 9 indicate that stronger internal incentives to implement

Table 8. Robustness tests: changing analysis and fixed effects of different dimensions

Variable	(1)	(2)	(3)	(4)
(Δ)Invest	0.364**	1.027***	0.966***	0.840***
	(0.169)	(0.257)	(0.260)	(0.260)
(Δ)FirmSize	0.103***	0.012**	0.010*	0.007
	(0.008)	(0.005)	(0.005)	(0.006)
(Δ)FirmAge	−0.032	−0.074***	−0.080***	−0.074***
	(0.091)	(0.020)	(0.021)	(0.022)
(Δ)Cash	−0.004	0.223***	0.211***	0.227***
	(0.028)	(0.039)	(0.039)	(0.041)
(Δ)Lev	0.284***	0.439***	0.451***	0.450***
	(0.025)	(0.033)	(0.034)	(0.035)
(Δ)ROA	−0.005	0.011	0.009	−0.010
	(0.009)	(0.025)	(0.025)	(0.023)
(Δ)SOE	0.009	−0.023*	−0.023*	−0.019
	(0.020)	(0.013)	(0.013)	(0.014)
(Δ)CEOAge	−0.047***	−0.043	−0.044	−0.066*
	(0.011)	(0.033)	(0.033)	(0.034)
(Δ)Gender	0.017	−0.024	−0.036*	−0.028
	(0.027)	(0.021)	(0.022)	(0.021)
(Δ)GDP	0.022	0.003	0.009	0.014
	(0.018)	(0.015)	(0.016)	(0.015)
Constant	−0.015**	0.209	0.205	0.268
	(0.005)	(0.232)	(0.236)	(0.243)
Industry	Y	N	Y	N
Province	Y	Y	N	N
Year	Y	N	N	N
Industry × Year	N	Y	N	N
Province × Year	N	N	Y	N
Industry × Province × Year	N	N	N	Y
Adj. R^2	0.075	0.323	0.303	0.321
N	4472	6592	6592	6592

Note: This table reports the results of robustness tests using changing analysis and fixed effects of different dimensions. The dependent variable is AP, defined as accounts payable scaled by costs of goods sold. The independent variable is Invest, defined as environmental investment scaled by total assets. Column 1 reports the results of changing analysis regression. Columns 2–4 report regression results with fixed effects of different dimensions. Detailed variable definitions are presented in Table 1. Standard errors are reported in parentheses and are clustered by industry. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

eco-friendly practices enhance suppliers' recognition of firms' environmental investment.

Regulatory pressure perspective. Unlike the voluntary and discretionary nature of donations, corporate environmental investment is usually carried out involuntarily under environmental regulations. The pressure of strict environmental regulations forces firms to invest heavily in the environment. For example, by investigating several policy documents, He, Wang and Zhang (2020) find that many officials threaten firms with 'suspension of production' to coerce them to make large investment in the environment. Moreover, to establish good relationships with the government, corporate managers tend to cater to the government's preferences. Such over-investment imposes additional burdens on a firm and damages its value. The risk caused by increased costs may propagate through the supply chain, reducing suppliers' confidence in the firm. Therefore, we predict that increased intensity of environmental regulation weakens the positive relation between environmental investment and trade credit. We first focus on the environmental tax reform that came into force in 2018, and its implementation has greatly increased firms' costs of pollution. Existing empirical work has demonstrated that the implementation of the reform significantly increases firms' environmental investment (Liu *et al.*, 2022). We reconduct the baseline regression using pre- and post-reform subsamples, respectively, and report the results in columns 1 and 2 of Table 10. The results show that the positive association between environmental investment and trade credit decreases with the increase of external regulatory pressure.

In China, environmental governance relies on environmental administrative enforcement and environmental justice (Zhang, Yu and Kong, 2019). Therefore, the quality of the local legal environment greatly affects firms' fulfilment of their legal obligations. We expect that firms located in regions with strong law enforcement are under more strict supervision, thus are more likely to over-invest in the environment beyond their willingness and capacity. To address the issue that the degree of local enforcement cannot be directly observed,

Table 9. Heterogeneity test: internal incentive perspective

Variable	High gender diversity (1)	Low gender diversity (2)	Large operating cash flow (3)	Small operating cash flow (4)
Invest	0.946***	1.124	1.415*	0.639
	(0.302)	(0.798)	(0.788)	(0.370)
FirmSize	0.010**	0.015**	0.008	0.020***
	(0.005)	(0.005)	(0.005)	(0.005)
FirmAge	−0.095***	−0.063***	−0.069***	−0.088***
	(0.017)	(0.017)	(0.011)	(0.024)
Cash	0.235***	0.196***	0.263***	0.193***
	(0.038)	(0.046)	(0.025)	(0.040)
Lev	0.454***	0.439***	0.436***	0.410***
	(0.030)	(0.020)	(0.025)	(0.028)
ROA	−0.001	0.002	0.095**	0.025
	(0.041)	(0.024)	(0.033)	(0.036)
SOE	−0.014	−0.044***	−0.019**	−0.016*
	(0.011)	(0.008)	(0.008)	(0.008)
CEOAge	−0.015	−0.069	−0.037	−0.048
	(0.043)	(0.044)	(0.023)	(0.029)
Gender	−0.029	−0.193*	−0.031	−0.028
	(0.019)	(0.092)	(0.023)	(0.026)
GDP	0.013	−0.001	−0.014	0.025
	(0.017)	(0.022)	(0.011)	(0.014)
Constant	0.079	0.412	0.398*	−0.125
	(0.381)	(0.493)	(0.189)	(0.243)
Industry	Y	Y	Y	Y
Province	Y	Y	Y	Y
Year	Y	Y	Y	Y
Test of difference	−0.178*		0.776***	
Adj. R^2	0.329	0.295	0.261	0.319
N	3452	3140	3294	3298

Note: This table reports the results of how firms' internal incentive affects the relationship between environmental investment and trade credit. Columns 1 and 2 report the results of the effect of corporate gender diversity. Columns 3 and 4 report the results of the effect of operating cash flow. The dependent variable is AP, defined as accounts payable scaled by costs of goods sold. The independent variable is Invest, defined as environmental investment scaled by total assets. Detailed variable definitions are presented in Table 1. Standard errors are clustered by industry and are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

we use the number of lawyers per 10,000 people as a proxy for the local legal environment. The subsample regression results are reported in columns 3 and 4 of Table 10. The results are consistent with our expectation that the positive relationship between environmental investment and trade credit is weakened when administrative law enforcement is stronger.

Economic development perspective. Chinese economic growth is largely fuelled by highly polluting manufacturing industries. High-polluting firms are often major contributors to local economies. Since economic growth remains a crucial criterion in evaluating the performance of local government leaders, firms' environmental investment is not as highly valued by local governments in regions that need to accelerate economic development. As an important external stakeholder of a firm, the attitude of local governments will have a great impact on the attitude of other external stakeholders, such as suppliers. Therefore, we expect that the positive attitude of suppliers towards environmental investment is weakened in firms located in regions with low economic growth.

We use the year-on-year growth rate of GDP to measure the demand for economic growth in a certain region. We divide the sample into two subgroups based on the median GDP growth rate in the province during the same year. We use the provincial median to classify the sample, since the economic growth pressure of a city usually comes from other cities within the province. We re-analyse the baseline regressions using the two subsamples and report the results in Table 11. The coefficient on the key independent variable remains significantly positive for firms located in high-growth regions but is insignificant for firms located in low-growth regions. The overall results indicate that the positive attitude of suppliers towards firms' environmental investment mainly exists in firms located in regions with less pressure on economic growth.

Table 10. Heterogeneity test: external pressure perspective

Variable	After reform (1)	Before reform (2)	High pressure (3)	Low pressure (4)
Invest	1.017	0.987***	0.433	1.709***
	(0.672)	(0.172)	(0.263)	(0.472)
FirmSize	0.005	0.018***	0.001	0.020***
	(0.004)	(0.005)	(0.003)	(0.005)
FirmAge	−0.090***	−0.060***	−0.090***	−0.080***
	(0.023)	(0.014)	(0.017)	(0.014)
Cash	0.155***	0.267***	0.157***	0.268***
	(0.042)	(0.026)	(0.023)	(0.024)
Lev	0.455***	0.439***	0.446***	0.444***
	(0.029)	(0.017)	(0.032)	(0.022)
ROA	−0.006	0.124	−0.005	0.064
	(0.016)	(0.070)	(0.016)	(0.055)
SOE	−0.021**	−0.021**	−0.023*	−0.018*
	(0.008)	(0.009)	(0.012)	(0.009)
CEOAge	−0.034	−0.060	−0.005	−0.086**
	(0.022)	(0.040)	(0.047)	(0.033)
Gender	−0.040***	−0.019	−0.040	−0.027
	(0.013)	(0.032)	(0.028)	(0.029)
GDP	−0.002	0.016**	−0.006	0.014
	(0.009)	(0.007)	(0.020)	(0.009)
Constant	0.449*	−0.078	0.477*	0.062
	(0.212)	(0.203)	(0.263)	(0.181)
Industry	Y	Y	Y	Y
Province	Y	Y	Y	Y
Year	Y	Y	Y	Y
Test of difference	0.029		−1.276***	
Adj. R^2	0.299	0.348	0.343	0.267
N	3566	3026	3395	3197

Note: This table reports the results of how firms' external regulatory pressure affects the relationship between environmental investment and trade credit. Columns 1 and 2 report the regression results using subsamples after and before the implementation of the Environmental Tax Reform, respectively. Columns 3 and 4 report the results of the effect of local legal environment. The dependent variable is AP, defined as accounts payable scaled by costs of goods sold. The independent variable is Invest, defined as environmental investment scaled by total assets. Detailed variable definitions are presented in Table 1. Standard errors are clustered by industry and are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Conclusions

This paper investigates the relationship between corporate environmental performance and firms' access to trade credit and the channels through which environmental investment influences firms' access to trade credit in China. Whilst environmental investment and how to finance it has provoked an extensive public debate, little systematic research has been carried out on whether and how environmental investment influences access to trade credit. This paper therefore contributes to the environmental sustainability literature by showing how a firm's environmental performance influences its access to trade credit, suggesting that the customer–supplier relationship provides an important means for financing a firm's environmental investment.

The results of this study have significant implications for firm managers, regulators and policymakers. First, the positive relationship between environmental investment and trade credit calls into question the notion that trade credit only serves as short-term finance to meet working capital needs. Our results demonstrate to managers that trade credit can also be used to meet the grand challenges associated with financing environmental sustainability. Consequently, firms should endeavour to engage suppliers and use trade credits provided by suppliers in their sustainability practices. Second, the results show that increased information transparency and reduced firms' exposure to environmental litigation risk are important channels through which investment performance affects trade credit, implying that managers should pay attention to these factors in their quest to finance environmental sustainability.

Given that a firm's performance depends crucially on its relationship with stakeholders (Freeman, 1984), the study provides insights for firm managers to improve their supplier–customer relationships. Thus, our results imply that information transparency and stakeholder engagement matter for a firm's access to trade credit as informal finance for environmental investment. The result that corporate gender diversity positively moderates the relationship between environmental investment and

Table 11. Heterogeneity test: economic development perspective

Variable	High economic growth (1)	Low economic growth (2)
Invest	1.150***	0.883
	(0.287)	(0.504)
FirmSize	0.016***	0.005
	(0.005)	(0.004)
FirmAge	−0.054***	−0.110***
	(0.014)	(0.019)
Cash	0.212***	0.208***
	(0.020)	(0.042)
Lev	0.412***	0.484***
	(0.019)	(0.027)
ROA	0.125**	−0.017**
	(0.053)	(0.007)
SOE	−0.025***	−0.022**
	(0.007)	(0.009)
CEOAge	−0.042	−0.038
	(0.038)	(0.028)
Gender	−0.045	−0.023
	(0.029)	(0.025)
GDP	0.015*	−0.004
	(0.008)	(0.012)
Constant	−0.073	0.514*
	(0.189)	(0.241)
Industry	Y	Y
Province	Y	Y
Year	Y	Y
Test of difference	0.267**	
Adj. R^2	0.310	0.306
N	3265	3327

Note: This table reports the results of how local economic development affects the relationship between environmental investment and trade credit. Columns 1 and 2 report the results of the effect of local GDP growth rate. The dependent variable is AP, defined as accounts payable scaled by costs of goods sold. The independent variable is Invest, defined as environmental investment scaled by total assets. Detailed variable definitions are presented in Table 1. Standard errors are clustered by industry and are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

access to trade credit calls for greater gender diversity in business; firms should be encouraged to recruit more female leaders. Finally, the study provides additional insights for regulators and policymakers about the costs of tighter environmental regulation.

Despite the interesting and significant findings of this study, it is important to point out that the study focuses only on a single country's data, that is, China, limiting its generalizability to countries that have different institutional environments and legal enforcement mechanisms. We suggest that future research could explore the relationship between environmental investment and informal sources of finance using cross-country data.

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