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How environmental performance affects firms' access to credit: Evidence from EU countries

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ABSTRACT

In response to climate change and environmental degradation, the European Union has recently proposed a long-term strategy targeting a climate-neutral economy by 2050.

Sustainable finance plays a crucial role in reducing a country's production-generated emissions since limited access to credit hampers firms from investing in pollution abatement technology. Additionally, high collateral requirements may force firms to replace pollution abatement investment with tangible assets, which are often preferred as collateral in debt financing. Using survey data from firms in ten EU member states, this study investigates the impact of a firm's environmental performance on bank lending decisions and collateral requirements. Our empirical findings suggest that, for the sample countries as a whole, eco-friendly firms are more likely to receive a line of credit and less likely to be imposed collateral requirements. For collateralized loans, desirable environmental performance reduces the odds of high collateral value relative to loan size. Sustainable finance may depend on the levels of economic/financial market development. There are seven EU new member states (NMS) in our sample. Although financial institutions in the EU NMSs reward eco-friendly firms when they make lending decisions, they are less likely to consider environmental performance when imposing collateral requirements. These empirical findings hence provide insightful policy implications for improving the practices of sustainable finance.

1. Introduction

Climate change has become a top challenge for countries around the world, spurring researchers to explore determinants of environmental degradation and barriers to environmental protection activities. From a macro perspective, empirical studies indicate that high levels of financial development decrease environmental degradation at the country level (Tamazian et al., 2009; Shahbaz and Lean, 2012; Boutabba, 2014; Saud et al., 2019; Khan et al., 2019). One reason is that financial sectors, especially public investment banks, play a vital role in delivering the required resources for fostering environmental innovation diffusion (D'Orazio and Valente, 2019). Researchers further confirmed that firms' financial status affects their pollution protection activities and environmental performance (Earnhart and Segerson, 2012; Andersen, 2017; Tian and Lin, 2019; Zhang et al., 2019). Limited access to finance may increase production-generated emissions since credit-constrained firms tend to replace environmental protection activities with tangible assets, which are often preferred as collateral in debt financing (Andersen, 2017).

Based on the documented relationship between the environment and financing, researchers have recommended that financial institutions and governments remove financing barriers, reduce financial cost, and adopt green financial policies in order to avoid distorted investment decisions and support environmental benefits (Scholtens, 2006; Earnhart and Segerson, 2012; Andersen, 2017; Tian and Lin, 2019; Zhang et al., 2019). Financial institutions can work as drivers of corporate social responsibility to promote environmentally desirable activities (Scholtens, 2006). As such, financial institutions' environmental considerations influence the availability of financial support for environmental management and, consequently, firm environmental performance (Coulson and Monks, 1999).

Environmental performance usually refers to the level of emissions, third-party audits, or environmental performance indices (Tian and Lin, 2019). In general, desirable environmental performance is brought by pollution abatement investment, which directly raises production costs and influences capital flows (Henderson and Millimet, 2007). Banks in countries with strict environmental liability tend to adopt environmental credit risk management (Scholtens and Dam, 2007; Mengze and

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Wei, 2015). The empirical studies further indicate that sustainability criteria, including the environmental factors, are able to predict credit loss (Weber et al., 2015). However, few studies have empirically evaluated how a firm's environmental performance affects its loan applications.

Environmental performance may also affect contractual terms such as collateral requirements. Collateral is widely used by lenders to reduce credit risk (Altman and Saunders, 1998; Berger et al., 2011). High collateral requirements prevent firms from applying for bank loans. Pollution abatement equipment retains lower value in the event of bankruptcy than other tangible assets and is, therefore, less favorable to lenders (Braun, 2005; Manova, 2008; Andersen, 2017; Tian and Lin, 2019). Environmental considerations regarding collateral can further reveal banks' environmental credit risk assessment and the intensity of their sustainable finance practices.

In this study, we are to investigate the impact of firms' environmental performance on banks' lending decisions, collateral requirements, and collateral value. The empirical results are conducive to improving sustainable finance. The sample firms are from seven EU new member states (NMSs) located in Central and Eastern Europe and three other EU countries. The EU NMSs have a lower level of financial intermediation, which may influence their practices of sustainable finance. We focus on NMSs and compare the practices of sustainable finance for NMSs and their EU counterparts to see whether banks in NMSs are less likely to reward eco-friendly firms when making lending decisions.

This study contributes to the literature in several ways. Firstly, while researchers have broadly explored how a well-functioning financial system affects the environment at the country level (for example, Boutabba, 2014; Saud et al., 2019; Khan et al., 2019), empirical studies evaluating sustainable finance at the bank-firm levels are still lacking. This study uses bank-firm data and assesses sustainable finance practices, providing environmental implications for policymakers when they design financial market mechanisms for sustainable financing. Secondly, this study evaluates the impact of environmental performance on both lending decisions and collateral, one of the most important non-price contractual terms. Researchers have pointed out that banks should incorporate environmental criteria into pre-loan screening and the whole credit risk management (Herbohn et al., 2019). Thus, this study provides empirical evidence in a systematic way and could benefit the evaluation of sustainable finance practices. Thirdly, this study uses a large dataset with firms in various industries and from different countries. The revealed country differences in banks' sustainable finance practices complement previous empirical studies on financial development and the environment. For example, Saud et al. (2019) state that financial development is one of the main drivers behind high carbon dioxide emissions in five Central and Eastern European countries. Their macro evidence, accompanied by this study's micro evidence, strongly supports the proposition for sustainable finance when confronting environmental issues. Finally, regarding the research methods, this study's framework combines the data structure and the econometric methodology to systematically reveal the impact of environmental performance on bank lending decisions.

Based on our empirical findings, this study provides insightful implications for sustainable finance. For example, our empirical results suggest that banks reward eco-friendly firms when they make lending decisions. However, compared with their EU counterparts, the EU NMSs are less likely to consider environmental performance when imposing collateral requirements. Accordingly, decision-makers may encourage financial institutions to adopt voluntary codes on sustainable finance and relate contractual terms to firms' environmental performance.

The rest of the article is organized as follows. Section 2 addresses literature review and hypothesis development. Section 3 describes the data, variables, and methodology. Following a discussion of the empirical results in Section 4, concluding remarks and implications are provided in Section 5.

2. Context and hypotheses

The literature reviewed in this section includes studies on environmental and financial performance, environmental risk, and bank lending decisions and collateral requirements. From the literature review, we derived the hypotheses tested in this study. Besides, we briefly discussed sustainable financing in the sample countries.

2.1. Environmental risk and bank lending

The association between environmental risk and borrowers' failure to fulfill their contractual obligations forces banks to incorporate environmental criteria into credit risk management. Poorer environmental performance leads to direct legal liability to clean up pollution and damages firms' reputation, resulting in the uncertainty of a firm's capacity and earnings (Altman and Saunders, 1998; Mengze and Wei, 2015). From a bank's perspective, as summarized by Mengze and Wei (2015), a bank may suffer direct risk due to borrowers' legal liability to clean up pollution, indirect risk due to borrowers' cost escalation or revenue reduction resulted from stringent environmental policies, and reputational risk for its financing environmentally unfriendly firms or projects. In addition, credit risk can occur when the assets banks take as security for a loan are contaminated, resulting in a significant reduction in value (Thompson and Cowton, 2004). Accordingly, researchers have strongly recommended banks to subject corporate borrowers, especially those with potential environmental risk exposure (Coulson, 2009; Eisenbach et al., 2014; Weber et al., 2015). In addition to pre-loan screening, banks are also motivated to conduct ongoing monitoring regarding borrowers' environmental risk exposure (Herbohn et al., 2019).

Environmental risk affects banks' lending decisions because of its impact on firms' financial performance and then credit risk. Stringent environmental regulations indicate high pollution abatement costs, severely threatening country/firm competitiveness (Henderson and Millimet, 2007). Different environmental regulations alter the spatial distribution of capital and disincentivize the inflow of foreign direct investment. For instance, developing countries and transition economies have adopted lenient environmental regulations to attract foreign investment (Ben-David et al., 2019). However, investment in pollution abatement technology has lower returns or long payback periods, further holding firms back from vital productive investment. Additionally, firms with higher pollution abatement investments are more likely to experience credit shortages (Andersen, 2017; Tian and Lin, 2019).

A firm's environmental and financial performance may also be positively linked due to the increased demand from eco-friendly customers (Li et al., 2021).[1] Financial institutions may pursue green income by granting credit to firms with environmental technology and green business opportunities generated from eco-friendly clients (Russo and Fouts, 1997). In addition, industry growth accelerates the depreciation of long-live technology investments, such as pollution prevention capital, resulting in a highly prospective return (Russo and Fouts, 1997). For pollution protection measures, the question "When does it pay to be green?" is probably a more important line of inquiry than "Does it pay to be green?" (King and Lenox, 2001). This indicates the essential role that the technology life cycle plays when evaluating the relationship between environmental and financial performance.

Despite the ambiguous relationship between environmental and

[1] In the original sample used in this study, about 14.7% of firms answered "Yes" to the survey question, " …, did any of the establishment's customers require environmental certifications or adherence to certain environmental standards as a condition to do business with the establishment?" At the economic sector level, Falk and Hagsten (2019) confirmed that every third European citizen considered environmentally friendly practices when they chose tourism destinations or accommodations.

financial performance, financial institutions may still incorporate the environmental element to evaluate loan applications due to the reputational risk. Environmental performance is a vital element of the Corporate Social Performance (CSP) indicator for various establishments, including banks. Financing environmentally unfriendly projects would destroy banks' reputations (Mengze and Wei, 2015). Evidence over the last decades indicates that many financial institutions have added environmental criteria when they make lending decisions (Mengze and Wei, 2015; Weber et al., 2015). Some financial institutions have adopted voluntary codes on sustainable finance, such as the Equator Principles and the United Nations Environmental Programme Finance Initiative (UNEP FI) (Scholtens and Dam, 2007; Weber et al., 2015). As signatories of these voluntary codes, financial institutions transfer information to the public about their efforts to ensure sustainable development.

Above all, we posit the following hypothesis (stated as an alternative to its null):

Hypothesis 1. When applying for bank loans, environmentally friendly firms have a higher probability of getting their applications approved than conventional firms.

2.2. Environmental risk and collateral requirements

Environmental risk affects all assessment processes of bank loans, such as rating, costing, pricing, and monitoring (Weber et al., 2008). Firms facing environmental risk may have high loan rates, short loan maturity, and restrictive collateral requirements. For example, Erragragui (2018) confirmed that environmental strengths reduce debt costs, while environmental concerns increase debt costs. Collateral requirements increase recovery rates in the event of defaults and are widely used by lenders to control credit risk (Altman and Saunders, 1998; Berger et al., 2011; Li et al., 2011). Even though banks take firm environmental performance into account when making lending decisions, they may further evaluate environmental risk when designing the contractual terms, such as collateral requirements.

Firms prioritizing intangible assets such as environmental protection measures may face borrowing difficulties due to asymmetrical information and a lack of collateral value (Arrow, 1972; Brown et al., 2012).[2] As such, financial institutions may increase the credit rating assigned to the loan by requiring high-value collateral relative to loan size to reduce credit risk. Compared to other tangible assets, pollution abatement equipment retains lower value in the event of bankruptcy and is, therefore, less favorable to lenders (Braun, 2005; Manova, 2008; Andersen, 2017; Tian and Lin, 2019).[3] In response, firms could replace pollution abatement investment with tangible assets, which can be pledged as collateral to the bank. However, these tangible assets can be contaminated, resulting in a dramatic reduction in value (Coulson and Monks, 1999). Therefore, the collateral value may depend on banks' evaluation of the value of the pollution abatement equipment in the event of bankruptcy and the potential value reduction of the tangible assets due to environmentally destructive activities.

Above all, we derive the second and third hypotheses as follows (stated as an alternative to their null).

Hypothesis 2. For the approved loan applications, the probability of being granted uncollateralized loans is higher for environmentally friendly firms than for conventional firms.

Hypothesis 3. For the issued collateralized loans, the probability of a greater value of collateral relative to the loan size is lower for environmentally friendly firms than for conventional firms.

2.3. Credit market in EU new member states (NMSs)

The EU recently released its commitment to be climate neutral by 2050 (the Green Deal) (European Union, 2020). Member states are now required to implement adaptation strategies to fulfill the 2050 target, with the involvement of all social and economic sectors (Pablo-Romero et al., 2019). This makes it necessary to consider the role of financial institutions in environmental protection. The impacts of financial development on the environment may depend on economic development (Seetanah et al., 2019; Rao and Yan, 2020). Existing literature has widely documented that firms in developing and less-developed countries are more likely to face limited access to credit (Zhang, 2020).

Our sample from the World Bank Enterprise Surveys is comprised of firms from ten EU countries. Except for Greece, Italy, and Portugal, the sample countries are the EU new member states from Central and Eastern Europe, the EU periphery.[4] The EU new member states have been in the process of transitioning from a non-market economy towards a market-based economy. They have experienced dramatic changes in capital investment and growing international competition (Leider and Webber, 2004; Cerqueira et al., 2018). Compared to old EU member states, the EU NMSs rely heavily on bank financing, which, accompanied by lower levels of financial intermediation, reduces firms' credit availability (Mamatzakis et al., 2008). Consequently, the EU NMSs used outdated and polluting technologies, which triggered essential environmental issues (Hatmanu et al., 2019).

We also observed that financial institutions in EU NMSs are less likely to adopt the voluntary codes on sustainable finance. At present, five financial institutions in Italy, four in Greece, and one in Portugal have adopted the Equator Principles or UNEP FI. However, for the EU NMSs, only three financial institutions (from Estonia, Poland, Republic of Cyprus, respectively) have adopted the voluntary codes on sustainable finance. The empirical studies indicate that the adopters of Equator Principles differ from other financial institutions regarding their social, ethical, and environmental policies (Scholtens and Dam, 2007; Eisenbach et al., 2014).

Accordingly, we derive sub-hypotheses for the above three hypotheses: Financial institutions in NMSs are overall less inclined to incorporate environmental performance in their assessment processes of loan applications and tend to impose more restrictive collateral requirements on loans.

2.4. Conceptual framework

Using Fig. 1, we summarized the conceptual framework regarding the hypotheses. Fig. 1 classifies firms into different groups according to whether they apply for bank loans, the outcome of their applications, collateral requirements, and collateral value.

Firms may choose not to apply for a line of credit for reasons such as high interest rates and insufficient loan size or maturity, indicating potential credit rationing. Firms that do not apply for a line of credit for not needing a loan may hold open lines of credit. Accordingly, we put firms being rejected by a bank and firms facing potential bank rationing together, which are compared with firms that have received a line of credit and firms without a need for a loan. These two firm groups are used to test the hypothesis about the impact of environmental

[2] In the original sample used in this study, about 14% of firms with a need for credit did not apply for a line of credit because "Collateral requirements were too high."

[3] Unlike Andersen (2017) and Tian and Lin (2019) who focused on the impact of limited access to credit on pollution abatement investments or environmental performance, the present study primarily concentrates on the impact of previous environmental performance on bank lending decisions.

[4] The World Bank Enterprise Surveys mainly collect firm-level data for developing countries and those that have been in the process of transition economies such as NMSs. The Enterprise Surveys also collect data for developed countries for comparison studies. For the survey wave used in this study, only those three old EU countries are available.

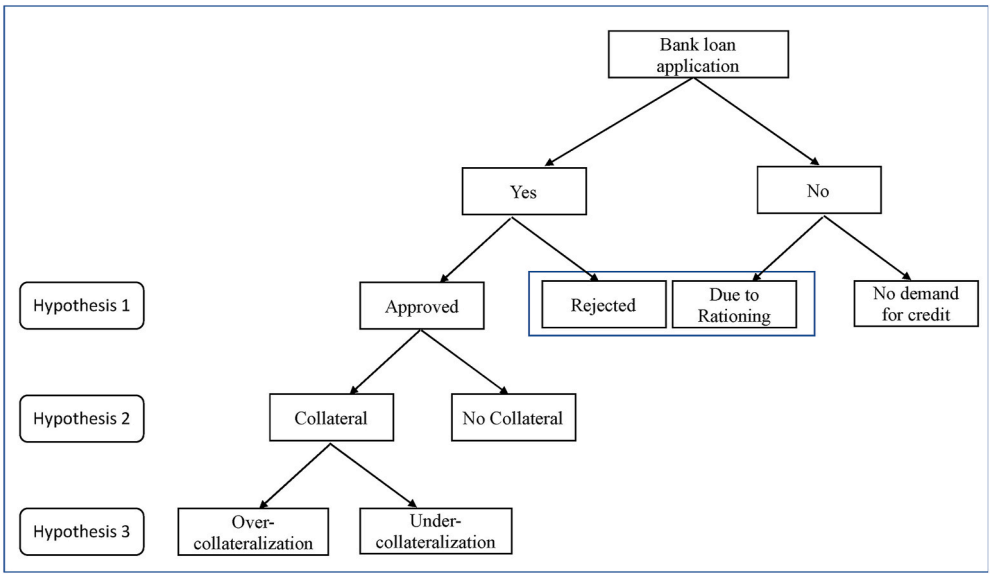

Fig. 1. The conceptual framework.

performance on loan applications' outcome (Hypothesis 1). For firms with approved loans, we are further to test the impact of environmental performance on the type of loans (collateralized versus non-collateralized loans, Hypothesis 2) and the value of the collateral required (Hypothesis 3).

3. Data and methodology

3.1. Data and sample countries

The World Bank Enterprise Surveys employ a stratified-sampling methodology (with variables of geographic region, industry, and firm size) to choose sample firms randomly within each stratum. The standardized stratified-sampling methodology ensures good representativeness of the survey data. The current enterprise survey includes a module on the green economy for countries in Central and Eastern Europe (Enterprise Surveys, 2020), which are used in this study. The available sample countries include seven EU new member states (NMSs) (the Czech Republic, Estonia, Latvia, Poland, Republic of Cyprus, Hungary, and Slovenia) and three other EU states (Greece, Italy, and Portugal).

The entire sample consists of 6466 observations (firms). Table A1 in the Appendix presents sample distributions by country and industry. Poland, Portugal, Hungary, and Italy are the top four countries regarding the number of sample firms. This reflects the size of these economies as well as their industry distribution. Regarding economic sectors, fabricated metal products, food, and machinery and equipment are the top three manufacturing subsectors, while the retail sector is the dominant one among the service sectors. According to the Pearson chi-squared test results, we rejected the null hypothesis that the industry distributions for the sample and population are different for each sample country. This further verifies the representativeness of the sample firms.

3.2. Dependent variables and relevant survey questions

In response to the three hypotheses, there are three models, namely, Model A for Hypothesis 1, Model B for Hypothesis 2, and Model C for Hypothesis 3. In this subsection, we describe the dependent variables for the three models.

For Model A, the dependent variable refers to the result of a firm's loan application ("*Loan-Application*"). Firms are organized into four groups according to their loan applications in the current fiscal year:

(1) Firms applied for loans and the application was approved;
(2) Firms applied for loans and the application was rejected;
(3) Firms did not apply for a loan for the reason of "No need for a loan – establishment had sufficient capital; "
(4) Firms did not apply for any line of credit for reasons such as "Interest rates were not favorable", "Collateral requirements were too high", and "Size of loan and maturity were insufficient."

Firms in category (3) generally held a line of credit or loans from previous years. Firms in category (4) may choose not to apply for a bank loan according to their early communication with a bank or perceived credit rationing. Thus, we set the dummy variable *Loan-Application* to 1 for firms in categories (1) and (3) and 0 for firms in categories (2) and (4).

In the survey, there are several questions about the most recent line of credit or loans, which firms borrowed from banks in the current fiscal year or in previous years. We chose firms with a line of credit approved in the last three years for Models B and C in order to match the measure of environmental performance (see more below). The type of loans (*Collateral* for Model B) is based on the survey question, "Referring only to this most recent line of credit or loans, what type of collateral was required?" We define *Over-Collateralization* (for Model C) according to the question of whether the granted loan is fully secured by collateral, which reflects banks' assessment of credit risk.[5]

3.3. Measuring environmental performance

In the survey, firms were asked whether they adopted energy efficiency measures and other pollution prevention measures over the last three years (see Table A2 in the Appendix for further details). Firms with investent in pollution abatement capital target positive disclosure statements and high environmental performance indices (Tian and Lin,

[5] The extent to which debt is secured by collateral further affects how firms allocate the collateralized capital and hence economic activities (Mendicino, 2012).

2019; Zhang et al., 2020a). From a bank's perspective, firms with pollution abatement investments satisfy the legal liability for pollution remediation and have a low likelihood of causing production-related environmental damage (Mengze and Wei, 2015). Thus, we argued that firms that answered "Yes" to any environmental protection measures have better environmental performance ("*Environment*").

3.4. Model specifications

We tested the impact of a firm's environmental performance (*Environment*) on its access to credit (*Loan-Application*) in Model A, collateral requirements (*Collateral*) in Model B, and collateral value (*Over-Collateralization*) in Model C. Since these three dependent variables are a dichotomous dummy, a binary logit model is, therefore, an appropriate approach for estimation. The logit model is:

$$\Pr(Y_i = 1|\mathrm{X}) = f(Z_i) \tag{1}$$

where i represents the ith firm; Y_i is a dummy variable; $\Pr(Y_i = 1)$ conditional on the matrix of the explanatory variables being $\phi(Z_i)$ is a logistical distribution function with a range between zero and one. The specification of Z_i is a linear function of *Environment* and control variables (X). This gives:

$$f(Z_i) = \frac{e^{Z_i}}{1 + e^{Z_i}} \tag{2}$$

$$Z_i = a_0 + a_1 Environment_i + \sum_{k=1}^{m} b_k X_{k,i} + \sum_{k=1}^{n} d_k Country_{k,i} + \sum_{k=1}^{o} e_k Sector_{k,i} + U_i \tag{3}$$

where U_i is residual. The dummy variables for countries (*Country*) and industrial sectors (*Sector*) control for heterogeneity in these two dimensions.

In order to compare the differential impact of environmental performance on bank lending decisions for the EU NMSs and their EU counterparts, we further include the interaction between *NMS* and *Environment* in the three models. This gives:

$$Z_i = a_0 + a_1 Environment_i + \sum_{k=1}^{m} b_k X_{k,i} + c_1 Environment_i * NMS_i + \sum_{k=1}^{n} d_k Country_{k,i} + \sum_{k=1}^{o} e_k Sector_{k,i} + U_i \tag{4}$$

where *NMS* (EU new member states) is a dummy variable with the three old EU countries as the base.

Using the definition of the logistic distribution, we obtain:

$$\log \frac{f(Z_i)}{1 - f(Z_i)} = Z_i \tag{5}$$

Thus, the natural exponential of the coefficient of a variable in question is explained as changes in the odds ratio (for example, the approval of a loan application against the rejection, for Model A), in response to a one-unit change in the variable. When interpreting the interaction term, we keep only *Environment* and *NMS* and ignore other variables in the model specification to obtain the odds ratio:

$$\log \frac{f(Z_i)}{1 - f(Z_i)} = a_0 + (a_1 + c_1 NMS_i) * Environment_i \tag{6}$$

In Equation (6), a significant coefficient of the interaction terms (c_1) indicates the differential impact of *Environment* on a decision made, for *NMS* and for the base. The sum of a_1 and c_1 measures the impact of *Environment* on a decision made for firms in NMSs.

3.5. Control variables

The survey data include a large number of firm characteristics and detailed information about loan applications and loan contractual terms. Few empirical studies on the relationship between environmental performance and access to credit have included variables on both firm characteristics and loan contractual terms.

For the three models, firms' sales (*Sales*) and location (*Big-City*) are the common primary control variables. Firms' sales reflect the level of earning power and hence influence default risk. Firms located in the official capital or main business cities may have more liquidity suppliers than those in small cities. However, firms in small cities more easily build long-standing bank-firm relationships, which reduces asymmetric information between firms and banks. For Model A, we further included two variables representing liquidity and financial ratio. Using informal financial services for the purchase of fixed assets or working capital indicates a low level of liquidity (Hansen and Rand, 2014). Firms that rented or leased buildings or land probably have high financial leverage and poor liquidity (Rauh and Sufi, 2012). Accordingly, two variables, *Informal-Finance* and *Lease*, are incorporated in the models.

Besides *Sales* and *Big-City*, Model B further includes loan maturity (*Maturity*), loan size (*Loan-Size*), and type of lender (*Private-Bank* for private commercial banks and *State-Owned-Bank* for state-owned banks or government agencies). Great loan size and long loan maturity are more likely to trigger credit risk and hence increase the probability of collateral requirements (Berger et al., 2011). Compared to other types of financial institutions, researchers verified that state-owned banks are more willing to deliver the required resources to eco-friendly firms (D'Orazio and Valente, 2019). Since the dependent variable (*Over-Collateralization*) in Model C is based on the ratio of collateral value to loan size, *Loan-Size* is excluded from Model C.

Following previous studies, we include a set of firm-specific control variables in those models. Large firms and/or mature firms have more stable financial performance and longer records, indicating lower credit risk (Zhang et al., 2019). From a bank's perspective, firm features such as the number of employees and firm age directly affect the inherent riskiness of a loan (Asiedu et al., 2013). A firm wholly or partly owned by foreign investors has good corporate governance and has a lower probability of being credit restricted (Zhang, 2020). The sample includes firms under different legal statuses. Of them, corporations are usually large and own assets of high value, which can be used for collateral (Andersen, 2017). Accordingly, the three models further include four variables, *Large-Firm*, *Firm-Age*, *Foreign-Owner*, and *Corporation*. See Table 1 for definitions of the variables.

3.6. Descriptive analysis

After excluding missing observations for unreported values, we obtained a subsample of 5574 firms for Model A and a subsample of 1485 firms for Models B and C. Table 1 presents the variable definitions and statistic description. The mean of *Loan-Application* is 0.878, indicating that 87.8% of firms received bank loans. For the sample for Models B and C, 63.6% of firms who had obtained bank loans over the last three years were imposed collateral requirements. Of these approved bank loans, 47% are secured by collateral with a value over the loan size. The mean of *Environment* indicates that 83.7% (92.9%) of firms invested in abatement measures for the subsample used for Model A (Models B and C).

In Table A1, we also reported the share of firms with an approved loan application (for Model A), with collateralized loans (for Model B),

Table 1
Variable descriptions and descriptive statistics.

		Model A		Models B and C	
Variable	Description	Mean	SD	Mean	SD
Loan-Application	Dummy variable (= 1 for approved loans and 0 otherwise)	0.878	0.327		
Collateral	Dummy variable (= 1 for collateral loans and 0 otherwise)			0.636	0.481
Over-Collateralization	Dummy variable (= 1 collateral value/loan size > 1 and 0 otherwise)			0.470	0.499
Environment	Dummy variable (= 1 for firms with pollution abatement investments and 0 otherwise)	0.837	0.369	0.929	0.258
Sales	Logarithmic sales in euro	15.19	2.688	16.14	2.560
Informal-Finance	Dummy variable (= 1 for firms with informal finance for the purchase of fixed assets or working capital and 0 otherwise)	0.029	0.167		
Lease	Dummy variable (= 1 for firms with rented or leased buildings or land and 0 otherwise)	0.358	0.0479		
Big-City	Dummy variable (= 1 for firms located in the official capital or the main business cities and 0 otherwise)	0.165	0.371	0.158	0.365
Large-Firm	Dummy variable (=1 for firm with employee numbers ≥ 100 and 0 otherwise)	0.202	0.402	0.226	0.419
Firm-Age	Logarithmic firm age in years	2.975	0.711	3.063	0.638
Foreign-Owner	Dummy variable (= 1 for firms with foreign owners and 0 otherwise)	0.102	0.303	0.085	0.279
Corporation	Dummy variable (= 1 for shareholding companies and 0 otherwise)	0.631	0.483	0.803	0.398
Maturity	Logarithmic loan duration in months			3.377	0.937
Loan-Size	Logarithmic loan size			13.23	2.610
Private-Bank	Dummy variable (= 1 for loans lent by private banks and 0 otherwise)			0.857	0.351
State-Owned-Bank	Dummy variable (= 1 for loans lent by state-owned bank or government agencies and 0 otherwise)			0.158	0.365

Table 2
Estimation results of the logit model for Loan-Application (Model A).

Variable	Coefficient						Exponential		
	Regression 1		Regression 2		Regression 3		Regression 1	Regression 2	Regression 3
Intercept	0.1005		−0.4777	*	−0.4073				
	[0.2225]		[0.2643]		[0.2698]				
Environment	0.1112	*	0.1080	*	0.1865	**	1.120	1.117	1.210
	[0.0605]		[0.0609]		[0.0845]				
Sales	0.1099	***	0.142	***	0.142	***	1.119	1.156	1.156
	[0.0133]		[0.0167]		[0.0167]				
Informal-Finance	−0.6215	***	−0.6142	***	−0.6123	***	0.530	0.534	0.535
	[0.1144]		[0.1149]		[0.1149]				
Lease	−0.1475	***	−0.1467	***	−0.1476	***	0.860	0.861	0.860
	[0.0493]		[0.0514]		[0.0514]				
Big-City	0.1798	**	0.1753	**	0.1767	**	1.202	1.196	1.198
	[0.0789]		[0.0793]		[0.0793]				
Large-Firm			−0.3578	***	−0.3595	***		0.694	0.692
			[0.0752]		[0.0752]				
Firm-Age			0.0493		0.0485			1.052	1.051
			[0.0337]		[0.0338]				
Foreign-Owner			0.2146	**	0.2143	***		1.245	1.245
			[0.0971]		[0.0970]				
Corporation			0.0084		0.0082			1.009	1.008
			[0.0688]		[0.0688]				
Environment: NMS					−0.1589				0.850
					[0.1205]				
Environment + Environment: NMS					0.0276				1.029
Country effects	Yes		Yes		Yes				
Sector effects	Yes		Yes		Yes				
McFadden's pseudo-R2	0.0924		0.0987		0.0991				
Observations	5574		5574		5574				

Notes: *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Standard errors are in brackets.

and with over-collateralized loans (for Model C). As seen in this table, firms with pollution abatement investments have a higher share of firms with an approved loan application, for the relevant subsample by country or industry. For the share of firms with collateralized loans or with over-collateralized loans, the comparison results are inconclusive.

4. Empirical analysis

Tables 2–4 present the estimation results for Models A, B, and C, respectively. For each model, there are three regressions, i.e., Regression 1 for the specification with the primary control variables, Regression 2 with additional variables for firm characteristics, and Regression 3 with further an interaction between *NMS* and *Environment*. Aside from the estimated parameters, we also reported the exponentials of the parameters to relate the estimates to the odds ratio. For the three regressions, McFadden's (1974) pseudo-R^2 value ranges between 0.092 and 0.099 for Model A, between 0.145 and 0.149 for Model B, and between 0.112 and 0.114 for Model C. In general, the regressions have a high level of goodness of fit since the value McFadden's (1974) pseudo-R^2 ranges

Table 3
Estimation results of the logit model for Collateral (Model B).

	Coefficient						Exponential		
Variable	Regression 1		Regression 2		Regression 3		Regression 1	Regression 2	Regression 3
Intercept	−3.1780	***	−3.8634	***	−1.4512	***			
	[0.5158]		[0.6187]		[0.4507]				
Environment	−0.2370	*	−0.2322	*	−0.2885	**	0.785	0.789	0.744
	[0.1411]		[0.1417]		[0.1531]				
Sales	−0.0025		0.0399		−0.1034	***	0.997	1.042	0.900
	[0.0307]		[0.0366]		[0.0301]				
Maturity	0.1374	***	0.1403	***	0.1035	***	1.151	1.154	1.112
	[0.0407]		[0.0409]		[0.0380]				
Loan-Size	0.2019	***	0.2095	***	0.2008	***	1.229	1.239	1.228
	[0.0308]		[0.0310]		[0.0284]				
Private-Bank	0.5598	**	0.5370	**	0.3833		1.773	1.732	1.480
	[0.2461]		[0.2464]		[0.2401]				
State-Owned-Bank	0.6287	**	0.5892	**	0.3345		1.902	1.827	1.408
	[0.2661]		[0.2667]		[0.2569]				
Big-City	0.0137		0.0136		0.2423	**	1.014	1.014	1.281
	[0.1167]		[0.1173]		[0.1059]				
Large-Firm			−0.2053	*	0.1392			0.811	1.153
			[0.1193]		[0.1028]				
Firm-Age			−0.0351		0.0537			0.965	1.056
			[0.0618]		[0.0579]				
Foreign-Owner			−0.2144		−0.0214			0.803	0.978
			[0.1367]		[0.1307]				
Corporation			−0.0194		−0.1328			0.980	0.873
			[0.1214]		[0.0910]				
Environment: NMS					0.2845	***			1.338
					[0.0957]				
Environment + Environment: NMS					−0.0040				0.996
Country effects	Yes		Yes		Yes				
Sector effects	Yes		Yes		Yes				
McFadden's pseudo-R2	0.1451		0.1485		0.1486				
Observations	1485		1485		1485				

Notes: *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Standard errors are in brackets.

between 0.2 and 0.4.[6,7]

4.1. Estimation results of model A (Hypothesis 1)

As one sees in Table 2, the parameter of *Environment* is significant and the corresponding exponential is greater than one for Regressions 1 and 2, indicating a positive relationship between environmental performance and bank lending decisions and the failure to reject Hypothesis 1. Firms with good environmental performance (hence low environmental risk) have a higher odds ratio between access to credit and the rejection of loan applications, as compared to other firms. In Regression 3, the insignificant interaction term suggests that the role of environmental performance in bank loan assessment processes does not depend on heterogeneity across those EU countries.

Literature has argued that stringent environmental regulations and the required investment in pollution abatement capital may severely threaten firm competitiveness (Henderson and Millimet, 2007). However, our empirical findings indicate that financial institutions in the EU are probably more concerned about the negative impacts of poor environmental performance on a firm's capacity and earnings, in line with the findings in Altman and Saunders (1998). This may also reflect a high level of sustainable finance in this region.

The primary control variables, *Sales*, *Informal-Finance*, *Lease*, and *Big-City*, are all significant in the three regressions. Except for *Corporation* and *Firm-Age*, all the variables representing firm characteristics are significant. Although there may exist a link between firms' environmental performance and their legal statuses (Zhang et al., 2019), banks may directly use the environmental variables to assess credit risk. Firms with great sales, in big cities, or with foreign ownership are more likely to obtain bank loans. Of these factors, foreign ownership contributes the most to the probability of obtaining a line of credit. This coincides with Tian and Lin's (2019) findings that firms with foreign ownership have better access to finance, likely due to high profitability and good corporate governance. These firms may further invest in environmental protection projects (Zhang et al., 2019), indicating a good interdependence between environmental performance and external financing. Firms with informal finance and leased assets have limited access to finance. Those firms may be treated as high credit risk. The positive coefficient of *Large-Firm* means that large firms (regarding the number of employees) have limited access to credit. In general, large firms have a sound financial health condition and have low credit risk. Considering the estimate of *Sales* and *Large-Firm*, banks may relate firm size to sales rather than the number of employees when evaluating credit risk.

4.2. Estimation results of model B (Hypothesis 2)

In Table 3, the parameter of *Environment* in Regressions 1 and 2 is significant and with a close magnitude. Good environmental performance reduces the odds ratio between the probabilities of a collateralized loan and an uncollateralized loan, indicating that we fail to reject

[6] McFadden's (1974) pseudo R^2 value is generally much lower than R^2 value in the ordinary least squared (OLS) model because the continuous dependent variable in the binary logit model is latent (Dedman et al., 2014).

[7] Based on the log-likelihood ratio (LLR) test, for each model, Regression 3 (with a complete specification) fits the data better than the other two regressions.

Table 4
Estimation results of the logit model for Over-Collateralization (Model C).

	Coefficient						Exponential		
Variable	Regression 1		Regression 2		Regression 3		Regression 1	Regression 2	Regression 3
Intercept	−2.2375	***	−2.7726	***	−1.4566	***			
	[0.4938]		[0.5925]		[0.4293]				
Environment	−0.2478	*	−0.2469	*	−0.4124	***	0.776	0.777	0.656
	[0.1349]		[0.1352]		[0.1461]				
Sales	0.116	***	0.1463	***	0.0532	***	1.126	1.161	1.056
	[0.0217]		[0.0297]		[0.0169]				
Maturity	0.0949	**	0.0979	**	0.0795	**	1.102	1.105	1.085
	[0.0385]		[0.0386]		[0.0362]				
Private-Bank	0.3527		0.3331		0.1806		1.434	1.406	1.203
	[0.2450]		[0.2457]		[0.2381]				
State-Owned-Bank	0.435	*	0.4069		0.0956		1.560	1.516	1.103
	[0.2637]		[0.2646]		[0.2536]				
Big-City	−0.0541		−0.0524		0.1673	*	0.946	0.948	1.187
	[0.1109]		[0.1111]		[0.0975]				
Large-Firm			−0.1597		0.0512		1.000	0.849	1.054
			[0.1123]		[0.0967]				
Firm-Age			0.0091		0.0654		1.000	1.009	1.069
			[0.0604]		[0.0561]				
Foreign-Owner			−0.133		0.0168			0.873	1.017
			[0.1282]		[0.1229]				
Corporation			0.0153		−0.0556			1.016	0.945
			[0.1206]		[0.0878]				
Environment: NMS					0.4116	***			1.523
					[0.0906]				
Environment + Environment: NMS					−0.0008				0.999
Country effects	Yes		Yes		Yes				
Sector effects	Yes		Yes		Yes				
McFadden's pseudo-R2	0.112		0.1137		0.1138				
Observations	1485		1485		1485				

Notes: *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Standard errors are in brackets.

Hypothesis 2. As shown in Equation (6), in Regression 3, the sum of the *Environment* and *Environment * NMS* coefficients captures the impact of environmental performance on collateral requirements for NMSs. The sum of the *Environment* and the interaction coefficients is −0.004.[8] Unlike firms in the old EU countries, the NMSs' firms with desirable environmental performance do not have a low probability of being imposed collateral requirements.

Of the primary control variables, *Maturity* and *Loan-Size* are significant in all three regressions. As expected, a long-term and large loan likely has a collateral guarantee. Regressions 1 and 2 show significant coefficients of bank dummies. The odds ratio for *Private-Bank* and *State-Owned-Bank* ranges between 1.73 and 1.90, indicating that private and state-owned banks tend to impose collateral requirements for their lending, compared to other financial institutions. Thus, our empirical findings do not support D'Orazio and Valente's (2019) proposition that state-owned banks are more willing to provide firms with the required resources for environmental protection. For firm characteristics, only *Large-Firm* is significant in Regression 2. Although firm characteristics affect banks' lending decisions (as evidenced in Model A), firms' environmental performance and loans' maturity and size are the primary determinants of collateral requirements.

4.3. Estimation results of model C (Hypothesis 3)[9]

As seen in Table 4, the coefficient of *Environment* is significant and negative in Regressions 1 and 2. This means that excellent environmental performance adversely affects the odds ratio between over-collateralization and under-collateralization, suggesting the failure to reject Hypothesis 3. Again, the individual *Environment* variable in Regression 3 is for the base countries. The interaction between *Environment* and *NMS* is firmly significant, with a value close to the coefficient of the stand-alone *Environment* variable but with an opposite sign. Thus, environmental performance does not affect the collateral value for firms in NMSs, in line with the findings from Model B, regarding collateral requirements.

The lack of an impact of environmental performance on collateral value indicates that banks may relate high recovery rates to tangible assets rather than pollution abatement capital. Andersen (2017) pointed out that restrictive collateral requirements force firms to replace pollution abatement investments with tangible assets. These valuable tangibles help firms to command better contractual terms, as stated in Braun (2005). Collateral requirements could become a barrier for environmentally friendly firms to obtain bank loans, which consequently reduces the economic benefits of previous investments in environmental protection technologies.

Besides environmental performance, *Sales* and *Maturity* are the primary determinants of the collateral value. Estimation results from Model B indicate that firms with high sales do not have a high probability of being imposed collateral requirements. Estimation results from Model C

[8] The Wald test for the joint significance of *Environment* and the interaction term indicates a failure to reject the null hypothesis. This also applies to Model C.

[9] As per one reviewer's request, we estimated Model C for firms with collateral loans. The estimation results indicate that all environmental variables are significant and with the same signs as their counterparts in Table 4.

suggest that, once firms with high sales are imposed collateral requirements, they are likely to provide high-value collateral. For the bank type dummies, only *State-Owned-Bank* in Regression 1 is marginally significant. Except for *Big-City* in Regression 3, all the variables for firm characteristics are insignificant. Thus, the results suggest that firms' characteristics only affect banks' lending decisions, not collateral requirements and collateral value.

4.4. Robustness checks

The error terms from Models B and C are likely correlated. Following Falk and Hagsten (2019), we applied a bivariate probit model to test the robustness of the estimation results of these two models. The bivariate probit model estimates the complete specification (Regression 3) of Models B and C simultaneously, by accounting for the correlation between the error terms. The estimation results (Table A3 in the Appendix) show that the correlation between the error terms is about 0.69 and firmly significant. Moreover, for both Model B and Model C, the estimated coefficients for *Environment* and its interaction with *NMS* are similar to that in the original regressions (Regression 3 in Tables 3 and 4), indicating the robustness of the original results.

5. Conclusions and policy implications

In this study, we investigated whether a firm's environmental performance affects bank lending decisions and collateral requirements. Poor environmental performance leads to uncertainty in a firm's capacity and earnings, subsequently magnifying credit risk. A firm's environmental and financial performance may be positively linked due to rapid technology life cycles (King and Lenox, 2001) and consumers' growing awareness of greenness (Feng et al., 2018; Li et al., 2021). A bank generally uses collateral requirements for loans to reduce credit risk. Assets related to pollution abatement capital are likely less favorable because of financial institutions' limited knowledge and asymmetrical access to the information on those assets' value. However, the value of tangible assets may dramatically decrease as a consequence of firms' environmentally destructive activities. Since the environment performance-bank lending link also depends on a country's financial and economic development, we further tested the difference in the impacts of the environmental performance on bank lending in the EU new member states and three old EU countries.

The empirical results from the various estimated models indicate that sound environmental performance improves the likelihood that a loan application would be approved. This suggests that financial institutions in this region incorporate environmental risk in the assessment of loan applications. Moreover, environmentally friendly firms are less likely to face collateral requirements. When a bank provides collateralized loans to an environmentally friendly firm, the collateral value is lower relative to the loan size. We, therefore, concluded that banks take environmental performance into account when they make lending decisions and customize the most critical non-price contractual terms.

Comparing NMSs with their EU counterparts, we first confirmed that banks' willingness to lend to an eco-friendly firm does not depend on the type of country in which the firm is located. However, financial institutions in NMSs do not treat environmental performance as a positive sign when making a decision on collateral requirements or collateral value. Those findings are in line with the NMSs' lower rate of adoption of voluntary codes on sustainable finance. Restrictive collateral requirements may discourage eco-friendly firms from applying for a bank loan. For these firms, a low level of liquidity decreases the effectiveness of previous investment in pollution abatement capital and further undermines environmental performance.

This study contributes to a growing literature on the role of financial development in environmental protection, the relationship between credit shortages and environmental performance, and sustainable finance on environmentally friendly projects. We used the logit model to evaluate how environmental performance affects banks' lending decisions, the type of loans, and collateral value. As such, our methods reveal a complete assessment process of loan applications. There are several notable implications of this study for firms, financial institutions, and governments.

First, the revealed impacts of environmental performance on bank lending decision supplement the existing research, which has documented the negative impact of the limited access to finance on environmental performance (Tian and Lin, 2019; Zhang et al., 2019). Desirable environmental performance is likely a precondition when banks evaluate loan applications. As is the case with other intangible assets (for example, innovative activities, see Gorodnichenko and Schnitzer, 2013), environmental protection projects are prone to asymmetric information and are less favorable for securing a loan. A firm may first rely on internal funds for environmental protection projects, which signals good environmental performance and low environmental risk when the firm later applies for external financing.[10]

Second, sustainable finance that targets environmental protection should include new elements such as non-price contractual terms. The null impact of environmental performance on collateral requirements in NMSs indicates a low degree of sustainable finance. Banks there may have limited knowledge for valuating environmental protection equipment or may be concerned about the value of the tangible assets in the event of contamination. Consequently, banks may increase credit ratings assigned to loans by requiring high-valued collateral, regardless of firm environmental performance. Decision-makers may encourage financial institutions in these countries to adopt voluntary codes on sustainable finance and set up contractual terms that consider firms' environmental performance, a vital element of the Corporate Social Performance (CSP) indicator.

Third, policies can be designed to remove financing barriers caused by high collateral requirements. High collateral requirements discourage eco-friendly firms from applying for bank loans, which then prevents these firms from achieving high returns on environmental protection projects. Government support programs are a vital instrument and become an effective tool for improving credit availability for environmentally friendly firms/industries when the EU member states outline their adaptation strategies for achieving the climate-neutrality target by 2050.[11]

In the end, we would like to discuss the limitations and several lines of future research extended from this paper. Regarding the data used in this study, the cross-section data may not fully control for firm heterogeneity, although we included many firm characteristics in the model specifications. Due to the data availability, we compared the NMSs with three old EU countries. The comparison results are probably subject to the choice of sample countries. For the relationship between environmental performance and access to credit, a natural follow-up study could investigate how increased liquidity influences the capital allocation between pollution abatement projects and other tangible assets. Finally, testing the impact of environmental performance on other contractual terms, such as interest rates, would further reveal the interrelationship between environmental performance and external financing.

Credit author statement

Not applicable. This is a study conducted by a single author.

[10] Zhang et al. (2020b) pointed out that firms may choose internal funds to finance pollution control investments because of the low cost of internal funds or limited access to finance.

[11] As a part of the Green Deal, the European Commission planned to mobilize at least euro 1 trillion of sustainable investments to deliver on the policy objectives (https://ec.europa.eu/info/business-economy-euro).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

Table A1
Distribution of observations (firms) by country.

Country/Sector	N. obs.	Share of approval (Model A)		Share of collateralized loans (Model B)		Share of over- collateralized loans (Model C)	
By country							
Czech Republic	502	95.4%	(95.0%)	73.6%	(74.0%)	61.0%	(74.0%)
Estonia	360	93.3%	(94.0%)	74.5%	(76.0%)	61.8%	(76.0%)
Greece	600	78.7%	(79.0%)	75.4%	(74.0%)	55.2%	(74.0%)
Hungary	805	89.7%	(91.0%)	67.2%	(67.0%)	49.6%	(67.0%)
Italy	760	76.6%	(81.0%)	76.3%	(77.0%)	55.0%	(77.0%)
Latvia	359	85.9%	(86.0%)	81.3%	(81.0%)	71.3%	(81.0%)
Poland	1369	88.5%	(88.0%)	63.6%	(61.0%)	33.3%	(61.0%)
Portugal	1062	92.7%	(93.0%)	38.4%	(39.0%)	23.0%	(39.0%)
Republic of Cyprus	240	80.4%	(80.0%)	93.2%	(93.0%)	84.7%	(93.0%)
Slovenia	409	95.7%	(96.0%)	60.4%	(59.0%)	40.6%	(59.0%)
Total/average	6466	87.8%	(88.9%)	63.6%	(63.3%)	47.0%	(46.7%)
By sector							
Food	737	85.8%	(87.0%)	62.3%	(64.0%)	39.6%	(40.0%)
Garments	267	83.3%	(83.0%)	40.7%	(42.0%)	31.5%	(33.0%)
Fabricated Metal Products	747	87.0%	(88.0%)	61.0%	(62.0%)	44.2%	(43.0%)
Rubber & Plastics Products	135	94.4%	(96.0%)	71.4%	(67.0%)	42.9%	(50.0%)
Machinery & Equipment	578	90.5%	(91.0%)	65.5%	(65.0%)	51.1%	(50.0%)
Furniture	143	93.1%	(92.0%)	75.0%	(50.0%)	25.0%	(50.0%)
Other Manufacturing	1340	88.1%	(90.0%)	62.9%	(62.0%)	46.8%	(46.0%)
Retail	1045	87.3%	(89.0%)	64.8%	(63.0%)	50.8%	(49.0%)
Other Services	1474	88.5%	(89.0%)	67.9%	(68.0%)	50.7%	(51.0%)
Total/average	6466	87.8%	(88.9%)	63.6%	(63.3%)	47.0%	(46.7%)

Notes: The numbers in parentheses are the shares for eco-friendly firms.

Table A2
List of energy efficiency measures and other pollution prevention measures.

Measures (pollution abatement investment)	N. obs.	Share
Non-energy related measures		
Heating and cooling improvements	2401	37.1%
More climate-friendly energy generation on site	1022	15.8%
Machinery and equipment upgrades	3372	52.1%
Energy management	2047	31.7%
Waste minimization, recycling and waste management	3381	52.3%
Air pollution control measures	915	14.2%
Water management	1211	18.7%
Upgrades of vehicles	2352	36.4%
Improvements to lighting systems	3258	50.4%
Other pollution control measures	712	11.0%
Energy efficiency measures	2539	39.3%

Table A3
Estimation results of the bivariate probit model for *Collateral* and *Over-Collateralization* (Models B and C)

	Coefficient				Exponential	
Variable	Model B		Model C		Model B	Model C
Intercept	−1.5381	***	−1.4389	***		
	[0.4389]		[0.4234]			
Environment	−0.2945	**	−0.4329	***	0.740	0.642
	[0.1529]		[0.1481]			
Sales	−0.0240		0.0527	***	0.976	1.055
	[0.0232]		[0.0169]			
Maturity	0.1090	***	0.0851	**	1.118	1.091
	[0.0365]		[0.0354]			
Loan-Size	0.1070	***			1.116	
	[0.0191]					
Private-Bank	0.417	*	0.1804	**	1.532	1.203
	[0.2347]		[0.2337]			

(*continued on next page*)

Table A3 (*continued*)

	Coefficient				Exponential	
Variable	Model B		Model C		Model B	Model C
State-Owned-Bank	0.3548		0.1124	**	1.437	1.122
	[0.2510]		[0.2492]			
Big-City	0.2088	**	0.1689		1.238	1.189
	[0.1035]		[0.0977]			
Large-Firm	0.1175		0.0547	*	1.128	1.058
	[0.1011]		[0.0965]			
Firm-Age	0.0681		0.0629		1.072	1.066
	[0.0570]		[0.0558]			
Foreign-Owner	0.0420		−0.0435		1.044	0.956
	[0.1265]		[0.1217]			
Corporation	−0.1432	*	−0.0519		0.864	0.948
	[0.0892]		[0.0877]			
Environment: NMS	0.2953	***	0.4140	***	1.353	1.527
	[0.0949]		[0.0909]			
Environment + Environment: NMS	0.0008		−0.0189		1.001	1.000
Sector effects	Yes		Yes			
Observations	1485		1485			

Notes: *, **, and *** stand for the significance level of 10%, 5%, and 1%, respectively. Standard errors are in brackets. We estimated the model without country effects. Including country effects fails to obtain the convergent results.

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