Environment, social and governance (ESG) and bank loan interest rates
環境、社會、治理與銀行貸款利率

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Abstract: The trends to advocate environment, social and governance (ESG) practices are essential to the Sustainable Development Goals (SDGs) proposed by the United Nations (UN). Financial institutions pay their attention on green finance by issuing green debt, investing in firm stocks with high involvement in ESGs and lending to the firms of good practice on ESG. However, it needs to be verified whether the commercial banks price their corporate loans according to the borrowers' ESG performance. The paper uses 158 firms listed in Taiwan Stock Exchange as our sample from 2008 to 2019 and investigates whether the long-term loan interests are associated with the ESG scores. We collect the data of ESG scores from Refinitiv database and the data of long-term loan interests from Taiwan Economic Journal. The empirical results indicate that the aggregate ESG, individual environmental, social and governance performance could reduce the cost of bank loans. The higher the borrowing firms' ESG performance, the lower the loan interest rates. The results imply that the practice of ESG facilitates firms' creditability. However, as we take family features into account, the moderating effect from the family group weakens the positive effect of ESG performance on loan interest rates. Our results are robust as taking endogeneity into concerns.

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Keywords: Environment, social, governance, ESG, loan interest rates, family group.

摘要：因應聯合國提倡永續發展目標，環境保護、社會責任與公司治理（ESG）日益受到企業與資本市場的重視。金融機構亦日漸重視綠色金融，例如：發行綠色債券、投資 ESG 涉入較高的企業股票和借款給有良好 ESG 實踐的企業等。然而，商業銀行在放款給企業時，其放款利率是否依企業之 ESG 績效訂定之，仍需進一步驗證之。本研究以 2008 年至 2019 年台灣 158 家上市櫃企業為樣本，探討企業長期借款利率是否與其 ESG 績效有關。本文的 ESG 分數擷取自 Refinitiv 資料庫，而企業長期借款資料擷取台灣經濟新報(TEJ)資料庫。研究結果發現，不論整體 ESG 績效，或是個別環境保護、社會責任或公司治理績效表現，皆有助於降低銀行貸款利率，亦即企業若能實踐 ESG，將提升企業的信用。然而，當考量企業是否具家族特性，家族企業的干擾效果將弱化 ESG 績效在企業貸款上所帶來的優勢。本研究考量內生性問題後，其結果依然穩健。

關鍵詞：環境保護、社會責任、公司治理、貸款利率、家族集團

1. Introduction

Academics and industry practitioners have long explored the determinants of firms' cost of debt. The agency cost theory (Jensen and Meckling, 1976) addressed that agency conflict arisen between firms' shareholders and debtholders would cause asymmetric information. Due to the asymmetric information, the loan pricing cost varies with the information disclosure of the borrowing firms. Accounting data from the firms' financial statements is the basic source for the creditors to evaluate the credibility of the borrowing firms. Creditors then adjust the risk premium according to the types and terms of the debt. After the initiation of the Principles of Corporate Governance by the Organization for Economic Co-operation and Development (OECD) in 1999 and the launch of Sarbanes-Oxley Act in 2002, the additional concerns of loan pricing included the implementation of corporate governance. Rich literature supported that implementation of

corporate governance facilitate the reduction of firms' cost of debt (e.g., Anderson *et al.*, 2004; Boubakri and Ghouma, 2010; Fields *et al.*, 2012).

The evolution of Sustainable Development Goals (SDGs) advocated by United Nations has drawn the attention of the stakeholders in the capital market. Environment, social and governance (ESG) practices proposed by 20 financial institutions in response to the United Nations were exemplified as how firms and investors integrate ESG concerns into their business model (Gillan *et al.*, 2021). As a consequence, sustainability-linked financial commodities such as the green bonds, sustainability-linked loans, ESG investing and ESG mutual funds etc. are springing up. Statistics from Refinitiv reported that a combined $167 billion in green loans and sustainability linked loans came to the global loan market in 2019, an increase of 150% over the prior year (Chin and Lai, 2021)[2]. Financial intermediaries such as banks consider the economic situation (Graham *et al.*, 2008) as well as corporate social responsibility (CSR) of a firm (Goss and Roberts, 2011) when issuing a loan contract. Furthermore, ESG performance is a more direct measure of firms' ESG-related activities, which are directly related to environmental and sustainable development (He *et al.*, 2021). Hence, it's critical to find out whether the banks assess the borrowing firms' repayment capability and solvency risk based on their ESG performance. Moreover, the firms in need of external funds from the capital market are also keen to explore whether the practices and controversies originated from the borrowing firms' environmental protection, social justice and governance management are priced by the lenders.

Rich literature has been on the relationship between firms' ESG sustainability performance and corporate financial decisions/ business activities, such as the cost of equity (Ng and Rezaee, 2015), stock price informativeness (Ng and Rezaee, 2020), stock crashes (Dumitrescu and Zakriya, 2021) etc. However, that dedicated on the relationship between firms' ESG performance and the cost of bank loans is still in the bud (e.g., Caragnano *et al.*, 2020; Eichholtz *et al.*, 2019). The stakeholder theory (Freeman, 1984; Jensen, 2001) suggests management focus on

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[2] https://www.mondaq.com/unitedstates/financial-services/1058258/

business activities that achieve the goals of long-term value maximization as well as ESG sustainability performance that concerns all stakeholders (Jensen, 2001; Ng and Rezaee, 2015). Business sustainability considers the interests and risks the shareholders and stakeholders bear with business activities. Shareholders are those who have property/legal claims on the firms; while the stakeholders are those who have contractual agreements, legal claims or moral obligations with the firms like creditors, employees, suppliers, society, and the environment (Ng and Rezaee, 2015). Therefore, this study takes the interests of the stakeholders into account and examines the impacts of ESG performance on the borrowing firms' cost of bank loans.

Two aspects addressed how ESG performance could impact loan costs (He *et al.*, 2021). First, an increasing ESG regulations and standards have been imposed to the economy that push the banks taking credit risks into consideration. For example, low-carbon economy requires the firms' investment in their environmental protection. The costs and risks related to organizational sustainability transition would impact the firms' future cash flows and consequently, raise the credit risk of the banks. This increases the pressure on banks to evaluate the firms' ESG performances. The second is associated the reputational risks stemming from the possibility of the firm's environmental, social or governance scandal. A premium might be required in order to compensate the bank due to the wrong judgement of the lending relationship with an ESG scandal firm. Based on these two arguments, we examine how the firm's ESG performance impacts its loan interest rates.

To investigate the impacts of firms' ESG performance on the cost of bank loans, we use the sample firms publicly listed in the emerging stock markets, Taiwan Stock Exchange and Taipei Exchange. According to the estimates of Taiwan Stock Exchange, indirect financing in Taiwan reaches 82.29% in 2019, which is approximately the proportion of direct financing (87%) in the US capital market. The extraordinary skewness of indirect financing amplifies the critical role of bank loans in Taiwanese capital market.

We conduct our analysis by using the overall ESG scores, ESG scores

discounted by the firms' controversies, three dimensions of environment, society and governance scores separately and the controversies score individually from Refinitiv database between 2008 and 2019. Our results confirm that firms' ESG performance is negatively associated with the cost of bank loans. The relationship between sustainability performance and the cost of bank loans depends on whether the firms possess family-run features, which implies that commercial banks evaluate loan interest rates based on firms' sustainability performance as well as the features of firms' decision-making authorities. We also address potential endogeneity concerns by using the two-stage least squares (2SLS) approach to correct for the potential bias in the baseline regression. The results of the 2SLS analyses suggest that the negative associations between ESG performance (the overall ESG scores, ESG scores discounted by the firms' controversies as well as the three dimensions of environment, society and governance scores separately) and the cost of bank loans are robust.

This study is motivated by two initiatives pertaining to ESG sustainability performance. First, as commercial banks begin to pay attention to firms' sustainability performance when making the loan contract, it is crucial for the borrowing firms to understand how positive and negative ESG sustainability performance factors are being priced. Second, ESG sustainability performance is crucial to the borrowers as more and more commercial banks are recommending or mandating the disclosure of ESG sustainability performance information. It is essential to comprehend how the pricing of bank loans is affected by ESG sustainability performance.

Our results shed light on the literature in the following ways. First, prior studies tend to examine the relationship between the individual dimensions of sustainability and the cost of debt (e.g., Cai and Zhu, 2020; Caragnano *et al.*, 2020; Eichholtz *et al.*, 2019) or the cost of equity (Ng and Rezaee, 2015); while our study investigates the link between the cost of bank loans and the aggregate/ individual ESG sustainability performance in an emerging country where indirect financing dominates the capital market. Second, we consider ESG sustainability performance in conjunction with the features of family-run business when

analyzing their impacts on the cost of bank loans. Third, our results have implications for policymakers, regulators, commercial banks and the borrowing firms as they are increasingly paying attention to ESG sustainability performance.

This paper is organized as follows. Section 2 reviews the literature and develops the hypotheses. Section 3 describes sample selection, variable constructions and methodology. The empirical results are presented in Section 4. Endogeneity tests are conducted in Section 5 and Section 6 concludes the research.

2. Literature review and hypotheses development

2.1 Business sustainability

Gillan *et al*. (2021) propose that ESG is an acronym suggested in a 2004 report by 20 financial institutions in response to a call from the United Nations and accordingly, define ESG as how firms and investors integrate environmental, social and governance concerns into their business model. Business sustainability considers the interests and risks the shareholders and stakeholders bear with business activities. Shareholders are those who have property/legal claims on the firms; while the stakeholders are those who have contractual agreements, legal claims or moral obligations with the firms like creditors, employees, suppliers, society, and the environment (Ng and Rezaee, 2015; Ng and Rezaee, 2020).

Prior literature examined the firms' impacts from different components of business sustainability, including the aggregate ESG performance, environmental, social, governance and controversies pillars. For example, Ng and Rezaee (2015) investigated the relationship between business sustainability performance and the cost of equity and found that only growth and research (environmental and governance) sustainability dimensions contribute to this relationship. Corporate policies associated with business sustainability could be beneficial or harmful to the stakeholders. For example, corporate social factors may have impacts on corporate reputation (Michelon, 2011), environmental factors and social factors of supplier-customer relationship may have impacts on the cost of debt (e.g., Cai and Zhu, 2020; Caragnano *et al.*, 2020). If the company has weak environmental,

social and governance infrastructure, the stakeholders could be exposed to the threat and their well-beings would also deteriorate (Ng and Rezaee, 2020).

2.2 ESG sustainability performance and the cost of bank loans

Though rich literature has been on the relationship between firms' ESG sustainability performance and corporate financial decisions/ business activities (Dumitrescu and Zakriya, 2021; Ng and Rezaee, 2015; Ng and Rezaee, 2020) etc., that dedicated on the relationship between firms' ESG performance and the cost of debt is still in the bud (e.g., Caragnano *et al.*, 2020; Eichholtz *et al.*, 2019).

Most literature supports the positive impacts of ESG performance on the reduction of firms' cost of capital, either on the cost of equity or on the cost of debt. Ng and Rezaee (2015) found that the economic sustainability performance is negatively associated with cost of equity, but only growth and research (environmental and governance) sustainability dimensions contribute to the reduction of equity cost. As taking environmental performance into account, Eichholtz *et al.* (2019) investigated the effect of corporate environmental performance on the spread of the commercial mortgages that are collateralized by individual buildings and on bonds issued by REITs. The results indicated that loans on environmentally certified buildings command lower spreads than conventional buildings. At the corporate level, REITs with a higher fraction of environmentally certified buildings have lower bond spreads in the secondary market. Caragnano *et al.* (2020) argued that the lenders could mitigate the impact of borrowing firms' GHG emissions by way of requiring firms with higher carbon emissions intensity to pay significantly higher costs for financing their operations through indebtedness. Statistically significant evidence was also found that the positive effect of carbon emissions reduction on the cost of debt financing is relevant both for high and low emitting industries. Also, high emitting firms pay a higher cost of debt financing than less polluting firms.

As taking the social performance into consideration, Cai and Zhu (2020) found that the cost of debt could be reduced when there are major customer-supplier relationships. Eliwa *et al.* (2021) find that lending institutions value both

ESG performance and disclosure. Firms with stronger ESG performance and transparent ESG disclosure have a lower cost of debt. Overall, the borrower must conduct its business so as to achieve the sustainability performance targets. If a borrower meets these sustainability targets, there is a discount on the loan. If the borrower fails to meet the target, a premium is request in the borrower's cost (e.g., Eliwa *et al.*, 2021; Erragragui, 2018; Gillan *et al.*, 2021). Thus, we propose our first hypotheses as follows.

Hypothesis 1: The cost of bank loans is negatively associated with firms' ESG sustainability performance.

Hypothesis 1.1: The cost of bank loans is negatively associated with firms' Environmental sustainability performance.

Hypothesis 1.2: The cost of bank loans is negatively associated with firms' Social sustainability performance.

Hypothesis 1.3: The cost of bank loans is negatively associated with firms' Governance sustainability performance.

Hypothesis 1.4: The cost of bank loans is positively associated with the occurrence of firms' controversies.

2.3   Impacts of family firms on the relationship between ESG sustainability and the cost of bank loans

As a large proportion of publicly listed firms in Taiwan are in the family groups, the interactive effects of family features and ESG sustainability performance could not be ignored as the cost of bank loans are concerned. Family firm in Taiwan is featured not only with its characteristics of controlling rights but also with its decision-making authorities. The reputation concerns support the monitoring role played by the family firms, while the entrenchment hypothesis suggests a negative impact from family expropriation.

Ma *et al.* (2017) used Chinese firms as their samples and examined the association between family control firms and their cost of debt. They found that family control was associated with a lower cost of debt. However, as firms have relatively low corporate opacity, the effects of family features on the reduction of

debt cost would be reduced. Swanpitak *et al.* (2020) also found that family firms in Thailand had lower debt financing cost compared to non-family firms. Further, family firms benefit from their trustworthy relationships with creditors, which help to alleviate information asymmetry in Thailand's weak institutional environment.

However, the effects of family features are not robust in the literature. Gao *et al.* (2020) also used a sample of Chinese listed firms to investigate the debt cost of family firms and found that family control leads to a higher bond yield-spread. As the risk of expropriation and financial reporting quality are plausible, family-run business renders higher cost of debts. As the impacts of family features are not clear, we build our second hypothesis as follows.

Hypothesis 2: The feature of family-run business affects the relationship between the cost of bank loans and ESG sustainability performance.

3.   Data and methodology

3.1 Sample construction

To examine the impacts of firms' ESG performance on the cost of bank loans, we select sample firms listed in Taiwan Exchange and Taipei Exchange between 2008 and 2019. The data of ESG performance is obtained from Refinitiv. Data sets of loan interest rates, firm characteristics and loan attributes are from Taiwan Economic Journal (TEJ). We start with all observations included in both Bank and Finance Database of TEJ, from which we collect the data of loan interest rates, loan attributes and firm characteristics. As we also need to collect ESG data from Refinitiv and a substantial number of firms are not covered by Refinitiv, our final sample renders 2,880 firm-year observations.

3.2 Sustainability factors: environmental, social and governance (ESG)

We use ESG score from Refinitiv database as the proxies of business sustainability performance. Refinitiv uses more than 450 ESG metrics of the companies to form 186 aggregate ESG measures. These measures are grouped into

10 categories that reformulate the three pillar scores (environmental, social and corporate governance), one controversies score, overall ESG and ESGC scores. The environmental pillar score is calculated from three categories - resource use, emissions and innovation. The social pillar score is obtained from four categories - workforce, human rights, community and product responsibility. The governance pillar score is summed from three categories - management, shareholders, CSR strategy. The pillar weights are normalized to percentages ranging between 0 and 100.

The ESG controversies score is calculated based on 23 ESG controversy topics, including Anti-competition, Business ethics, Critical countries, Intellectual property, Public health, Tax fraud, Child labour, Human rights, Management compensation, Consumer, Customer health and safety, Privacy, Product access, Responsible marketing, Responsible R&D, Environmental, Accounting, Insider dealings, Shareholder rights, Diversity and opportunity, Employee health and safety, Wages or working conditions, Strikes. The score of 0 represents no controversy occurred during the year. If a scandal occurs, the company involved is penalized and this affects their overall ESGC score and grading. The ESGC score is obtained by discounting the ESG performance score based on negative media stories. Thus, the ESG score reflects the firms' ESG performance, commitment and effectiveness based on publicly reported information. The ESGC scores provide a comprehensive scoring of a company's ESG performance with the ESG controversies captured from global media sources.[3]

We then use environmental, social and governance pillar scores separately and the overall ESG and ESGC scores to examine the impacts of each pillar score on firms' loan interest rates.

3.3 Dependent variable: bank loan rates

We collect the interest rates of each loan contract for the sample firms from Company Database of TEJ as the dependent variable. For each sample firm, we

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[3] https://www.refinitiv.com/en/sustainable-finance/esg-scores#methodology

consider the interest rates of long-term loan contracts.

3.4 Controlling variables

To examine the impact of firms' ESG performance on the cost of bank loans, we control for firm-specific and contract-specific factors that might affect loan interest rates (Lin *et al.*, 2013).

The firm-specific factors include firm size, market-to-book (M/B) ratio, profitability, leverage and credit risk. Firm size, measured as the natural log of firms' assets, is likely to decrease information asymmetry in credit markets. Firms' profitability, measured as return on assets (ROA), guarantees firms' loan repayment capacity. Low-leverage firms are less likely to be defaulted and we use Taiwan Corporate Credit Risk Index (TCRI) to measure credit risk of publicly listed firms in Taiwan, rating from 1 to 9 with 1 the least credit risk. Thus, we hypothesize that large firm size, great profitability, low leverage and low TCRI firms are less likely to be defaulted, and as a consequence, are expected to decrease the cost of bank loans. The M/B ratio is expected to be associated with firms' loan interest rates, but the sign is less clear. High M/B ratio may push loan interest rates up due to higher growth risk; while it may reduce the rates due to the additional value left for creditors in distress (Graham *et al.*, 2008; Lin *et al.*, 2013).

The contract-specific characteristics include the loan size, loan maturity and loan type that could affect the cost of loan. Loan size, measured as the natural log of loan amount for each contract, is one of the determinants of loan interest rates. We hypothesis that large loan size could reduce loan interest rates. Loan maturity is measured as the natural log of the loan maturity measured in days and we expect that loan maturity is positively related to the cost of loan (Lin *et al.*, 2011). Collaterals guarantee the borrowers' repayments, and we use indicator variables to indicate the loan type. The coefficient sign of collaterals is also less clear. Collateral guarantees protect the creditors' rights, which reduces the cost of bank loans; while the requested collaterals involve insolvency risk, which causes banks to ask for risk premium on it.

3.5 Family firms

Commercial banks evaluating firms' loan applications also consider the firms' decision-making authority. As more than 50% of publicly listed firms in Taiwan are family firms, corporate policies and strategies made by the family authority alter the effects of business sustainability on the cost of business loans. We also assign the indicator variable to indicate family firms.

3.6 Methodology

We first construct a panel-data regression model with industry and year effects as Eq. (1) to examine the impacts of firms' business sustainability performance on the cost of loan.

$$Rate_{c,i,t} = \alpha_i + \alpha_1 ESG_{i,t} + \beta X_{i,t-1} + \gamma Z_{c,i,t} + \sum_{t=2009}^{t=2019} \theta_t Year_t + \varepsilon_{i,t} \quad (1)$$

where $Rate_{c,i,t}$ is the loan rate of contract c firm i signed in year t; The parameter, α_i, in Equations (1) and (2) is the corresponding industry of firm i which controls for the year effects. Based on the two-digit Thomson Reuters Business Classification (TRBC), there are eight industries in this study, included Basic Materials, Consumer Cyclicals, Consumer Non-Cyclicals, Energy, Healthcare, Industrials, Real Estate and Technology; $ESG_{i,t}$ takes the value of firm i's Environmental, Social, Governance, ESG and ESGC scores respectively in year t; $X_{i,t-1}$ is the vector of firm-specific factors in year t-1, $Z_{c,i,t}$ is the vector of contract-specific characteristics in year t and $Year_t$ controls for the year effects. The firm-specific factors are regressed with a one-year lag, which ensures that the firm-specific factors are exogenous in time. For robustness, we also include the industry and year effects in our regressions to capture heterogeneity between loan contracts. The details of definitions and measurements of all the variables are reported in the Appendix.

Moreover, we consider the moderating effects of family firms and construct the second model as Eq. (2) to examine whether the family firm alters the original relationship between business sustainability performance and the cost of loan contracts.

$$Rate_{c,i,t} = \alpha_i + \alpha_1 ESG_{i,t} + \alpha_2 ESG_{i,t} * FAM_{i,t} + \beta X_{i,t-1} + \gamma Z_{c,i,t} +$$
$$\sum_{t=2009}^{t=2019} \theta_t Year_t + \varepsilon_{i,t} \tag{2}$$

where the interaction term, $ESG_{i,t} * FAM_{i,t}$ tests the moderating effects of the family authorities.

4. Empirical results

4.1 Descriptive statistics

Table 1 reports the descriptive statistics for all firms' variables within 2008 and 2019. Rate is the cost of sample firms' loan contracts with the average interest rate 1.357% and the median at 1.32%. Most contracts are charged at a rate lower than the average. The average asset is approximately equal to NT$201.9 billion, M/B value is 1.614 and ROA is 11.202%. As most of the sample firms are characterized by the natures of small-medium enterprises, the medians of assets, M/B and ROA are less than their means. The leverage ratio is higher than 50%, and more than 50% of our sample are family firms. The average loan amount is NT$1097.6 million, with the median of NT$600 million and 75% of the loan contracts do not provide the collaterals. As for the sustainability performance, the average environmental, social, governance, ESG and ESGC scores are 42.628, 42.705, 48.480, 44.161 and 43.546, respectively. Few companies suffer from ESG controversies, with the median of 100. The overall ESG performance is less than the score of 50, implying that sample firms in Taiwan could pay more efforts on business sustainability.

Table 2 reports the Pearson correlation coefficients of those variable of interest in this study. We find that the loan rate (Rate) and ESG-related scores (ESG, ESGC, Controversies, Environment, Social, and Governance) are negatively and significantly correlated. Moreover, weak correlations between loan features (loan amount, loan maturity and collateral conditions) and ESG-related scores indicate that our empirical models are unlikely to suffer from multicollinearity problems.

Table 1
Descriptive statistics

	mean	median	standard deviation	min	max
Rate (%)	1.357	1.320	0.513	0.000	5.215
AT (NT$ million)	201892.506	132876.410	195198.565	6328.077	3407216.613
M/B	1.614	1.270	1.393	0.300	34.150
ROA	11.202	9.620	8.866	-20.600	96.450
Debt (%)	51.809	49.100	15.041	1.740	98.210
TCRI	4.195	4.000	1.471	1.000	9.000
Loan (NT$ million)	1097.583	600.000	2079.336	0.003	42000.000
Maturity(days)	1069.492	831.500	668.477	14.000	5479.000
CollateralD	0.246	0.000	0.431	0.000	1.000
ESG	44.161	45.716	22.376	1.453	91.594
ESGC	43.546	44.743	22.050	1.453	91.383
Controversies	95.601	100.000	16.004	4.545	100.000
Environment	42.628	42.932	27.380	0.000	97.316
Governance	48.480	47.235	24.149	2.493	95.396
Social	42.705	44.410	26.492	0.489	95.651
Family	0.553	1.000	0.497	0.000	1.000
Observations	2880				

Table 1 provides the mean, median, standard deviation, minimum and maximum value of the variables. The variables include the loan rate (Rate), total assets measured in millions of NT dollars (AT), the market to book value (M/B), return on assets (ROA), the debt ratio (Debt), the credit rating (TCRI), loan amount measured in millions of NT dollars (Loan), loan maturity measured in days (Maturity), the dummy variable which equals 1 if the collaterals are required (CollateralD), the ESG score (ESG), the ESG score adjusted by controversies (ESGC), the controversies score (Controversies), the Environment score (Environment), the Social score (Social), the Governance score (Governance) and a binary variable for family firms (Family). The details of definitions and measurements of all the variables are reported in the Appendix.

4.2   Mean difference test of loan attributes

Before investigating the impacts of ESG performance on firms' loan interest rates, we conduct the mean difference test of loan attributes between low- and high-ESG firms. Table 3 reports that high-ESG firms benefits from lower cost of loans than low-ESG ones, with a significant difference of 0.122%. High-ESG firms also have higher credibility to generate larger amount of loans. Moreover,

Table 2

The results of Pearson correlation coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)Rate	1										
(2)LLoan	-0.043*	1									
(3)LMaturity	0.190**	0.086**	1								
(4)CollateralD	0.212**	0.009	0.137**	1							
(5)ESG	-0.166**	0.195**	-0.014	-0.256**	1						
(6)ESGC	-0.182**	0.186**	-0.025	-0.260**	0.988**	1					
(7)Controversies	-0.046*	-0.037*	-0.068**	0.016	-0.111**	0.009	1				
(8)Environment	-0.171**	0.231**	-0.023	-0.270**	0.933**	0.919**	-0.107**	1			
(9)Governance	-0.152**	0.004	-0.057**	-0.120**	0.642**	0.647**	-0.048*	0.474**	1		
(10)Social	-0.125**	0.200**	0.028	-0.259**	0.915**	0.902**	-0.119**	0.829**	0.352**	1	
(11)Family	0.010	-0.026	-0.025	0.135**	-0.332**	-0.334**	-0.036	-0.297**	-0.089**	-0.389**	1

This table reports the Pearson correlation coefficients of those variable of interest in this study. The variables include the loan rate (Rate), the natural log of loan amount (LLoan), the natural log of the loan maturity (LMaturity), the dummy variable which equals 1 if the collaterals are required (CollateralD), the ESG score (ESG), the ESG score adjusted by controversies (ESGC), the controversies score (Controversies), the Environment score (Environment), the Social score (Social), the Governance score (Governance) and a binary variable for family firms (Family). The details of definitions and measurements of all the variables are reported in the Appendix. The notations **, and * denote statistical significance at the 1% and 5% levels, respectively.

high-ESG firms would benefit from the exemption of collaterals. Sixteen percent of high-ESG firms are asked for collaterals, which is 18% lower than that of low-ESG firms.

4.3   The impact of ESG performance on the cost of bank loans

Following the preliminary test in Table 3, we examine the impact of ESG performance on the cost of bank loans by regressing loan interest rate ($Rate_{c,i,t}$) on firms' ESG performance and all the controlling variables.

Table 4 presents the results of Eq. (1). Model (1) starts with testing the effects of the controlling variables. Firms' credibility (TCRI) is associated with loan interest rate. As high TCRI indicates poor credibility of the borrowing firms, the significant coefficient of 0.415 suggests that a lower TCRI (high credibility) could reduce the cost of bank loans, which is consistent with our hypothesis. Moreover, as expected, the loan size with a coefficient of -0.031 is negatively associated with the loan rate. However, we find the collateral loans do not reduce the cost of bank

Table 3

Mean difference of loan attributes between low- and high-ESG firms

	Low ESG	High ESG	Difference
Rate	1.417	1.295	0.122[**] (6.41)
LLoan	12.950	13.421	-0.471[**] (-9.39)
LMaturity	6.749	6.797	-0.048 (-1.73)
CollateralD	0.3339	0.160	0.188[**] (12.02)
Observations	1450	1430	

Table 3 calculates the mean difference of loan attributes between low- and high-ESG firms. The attributes of loans include the loan rate (Rate), the natural log of loan amount (LLoan), the natural log of the loan maturity (LMaturity) and the dummy variable which equals 1 if the collaterals are required. The details of definitions and measurements of all the variables are reported in the Appendix. The numbers in parentheses are values of *t*-statistics. The notations [**], and [*] denote statistical significance at the 1% and 5% levels, respectively.

Table 4

Effects of firms' ESG performance on loan interest rates

	(1) Rate	(2) Rate	(3) Rate	(4) Rate	(5) Rate	(6) Rate	(7) Rate
$Size_{t-1}$	0.020	0.124**	0.120**	0.020	0.133**	0.037	0.107**
	(0.95)	(5.25)	(5.15)	(0.92)	(5.74)	(1.64)	(4.65)
M/B_{t-1}	-0.063**	-0.052**	-0.050**	-0.063**	-0.053**	-0.059**	-0.056**
	(-3.55)	(-2.97)	(-2.86)	(-3.55)	(-3.09)	(-3.32)	(-3.24)
ROA_{t-1}	-0.033	-0.050**	-0.050**	-0.033	-0.058**	-0.037*	-0.040*
	(-1.90)	(-2.91)	(-2.87)	(-1.89)	(-3.37)	(-2.12)	(-2.31)
$Debt_{t-1}$	-0.039	-0.062**	-0.065**	-0.039	-0.057*	-0.052*	-0.038
	(-1.63)	(-2.63)	(-2.75)	(-1.63)	(-2.43)	(-2.15)	(-1.60)
$TCRI_{t-1}$	0.415**	0.401**	0.400**	0.415**	0.415**	0.410**	0.397**
	(19.21)	(18.83)	(18.79)	(19.20)	(19.65)	(18.96)	(18.57)
LLoan	-0.031	-0.024	-0.023	-0.031	-0.012	-0.035*	-0.022
	(-1.96)	(-1.49)	(-1.45)	(-1.95)	(-0.76)	(-2.20)	(-1.41)
$LMaturity_t$	0.137**	0.118**	0.117**	0.137**	0.112**	0.137**	0.120**
	(8.44)	(7.35)	(7.28)	(8.41)	(7.01)	(8.45)	(7.46)
$CollateralD_t$	0.093**	0.084**	0.082**	0.093**	0.077**	0.095**	0.082**
	(5.30)	(4.86)	(4.74)	(5.29)	(4.42)	(5.38)	(4.69)
ESG_t		-0.214**					
		(-9.78)					
$ESGC_t$			-0.218**				
			(-10.09)				
$Controversies_t$				-0.002			
				(-0.10)			
$Environment_t$					-0.241**		
					(-11.23)		
$Governance_t$						-0.050**	
						(-2.63)	
$Social_t$							-0.200**
							(-9.23)
Industry Eff.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Eff.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2880	2880	2880	2880	2880	2880	2880
adj. R^2	0.363	0.384	0.385	0.363	0.390	0.364	0.381

Table 4 runs the regressions of loan rates on ESG-related scores (ESG, ESGC, Controversies, Environment, Social, and Governance), controlling for firms characteristics (firm size, market-to-book value, ROA and debt ratio), loan features (crediting rating, loan amount, loan maturity and collateral conditions), industry effect and year effect. The details of definitions and measurements of all the variables are reported in the Appendix. Standardized beta coefficients are shown; The numbers in parentheses are values of *t*-statistics. The notations **, and * denote statistical significance at the 1% and 5% levels, respectively.

loans. The coefficient of collaterals is 0.093, implying that commercial banks charge additional insolvency premiums to the firms. This is consistent with the argument of Booth and Booth (2006). Pledging collateral can be regarded as a quality signal of borrowers. High-risk borrowers will be relatively required by banks to provide collateral due to their higher default risk. It means that the worse creditworthiness of the firms is, the higher the loan interest rate will be charged by the bank. In addition, we expect loan maturity to be positively related to loan rate. Banks might face greater uncertainty and higher credit risk in loans carrying relatively long maturities (Lin *et al.,* 2011). Thus, as shown in Table 4, we find significantly positive coefficient of loan maturity which is consistent with the result of Lin *et al.* (2011). We also find significantly negative coefficient (-0.063) of M/B value, implying that the effects of the additional value left for creditors in distress dominate the growth risk of the firms.

We add business sustainability scores of ESG, ESGC, Controversies, Environment, Governance and Society to Model (2) through Model (7) respectively to examine the impact of business sustainability performance on the cost of bank loans. A significantly negative coefficient of ESG score, -0.214, in Model (2) indicates that high ESG performance reduces bank loan interest rates. A significantly negative coefficient of ESGC score, -0.218, in Model (3) suggests that high ESGC score, which is discounted by firms' controversies, facilities a reduction of loan interest rate. The coefficient of Controversies in Model (4) is insignificant. Model (5) presents a significantly negative coefficient of Environmental performance, -0.241. Model (6) reports a significantly negative coefficient of Governance performance, -0.050. Model (7) shows a significantly negative coefficient of Social performance, -0.200. The results from Model (5) to Model (7) support the evidence that Environmental, Social and Governance performance separately affects banks' evaluation on the firms and their decisions on firms' loan interest rates. Good business sustainability performance on environmental protection, social welfare and corporate governance reduces the cost of bank loans.

4.4 Interactive effects of ESG performance and family firms

Eq. (2) examines the effects of family firms on the relationship between ESG performance and the cost of bank loans. Before running the regression of Eq. (2), we conduct a mean difference test to distinguish the differences of loan rates, loan types and ESG performance between family and non-family firms. Table 5 reports the results of mean difference test. Firstly, we find no difference of loan rates, loan size and loan maturity between family and non-family firms. However, the proportion of family business which collaterals are requested is higher than that of non-family firms. In comparison with non-family firms, family firms have poorer performance on ESG, ESGC, Environmental, Governance and Social scores, indicating that family firms exert less efforts on the infrastructure of firms' ESG.

Table 5

Mean differences of loan attributes and firms' ESG performance between family and non-family firms

	Family firms	Non-family firms	Difference
Rate	1.361	1.351	-0.010 (-0.51)
LLoan	13.152	13.224	0.073 (1.42)
LMaturity	6.756	6.793	0.037 (1.34)
CollateralD	0.298	0.181	-0.117** (-7.30)
ESG	37.498	52.418	14.92** (18.85)
ESGC	36.938	51.737	14.80** (18.99)
Controversies	95.083	96.243	1.160 (1.93)
Environment	35.317	51.690	16.37** (16.71)
Governance	46.552	50.869	4.317** (4.79)
Social	33.448	54.179	20.73** (22.66)
Observations	1602	1298	

Table 5 calculates the mean difference of loan attributes and firms' ESG performance between family and non-family firms. The attributes of loans include the loan rate (Rate), the natural log of loan amount (LLoan), the natural log of the loan maturity (LMaturity) and the dummy variable which equals 1 if the collaterals are required. Moreover, ESG-related scores (ESG, ESGC, Controversies, Environment, Social, and Governance) are also considered. The details of definitions and measurements of all the variables are reported in the Appendix. Standardized beta coefficients are shown; The numbers in parentheses are values of *t*-statistics. The notations **, and * denote statistical significance at the 1% and 5% levels, respectively.

Table 6 reports the results of Eq. (2). From Model (1) to Model (6), we add an interaction of ESG performance and family firms to explore the moderating effect of the family features. The effects of the controlling variables and ESG proxies are consistent with those examined in Eq. (1). ESG scores remain significantly and negatively associated with the cost of bank loans. However, the coefficients of the interactive terms ($ESG_{i,t} * FAM_{i,t}$) from Model (1) to Model (6) are all significantly positive, implying that family firms might impair the benefit of loan interest reduction from firms' good ESG performance.

Overall, the results in this section confirm our conjecture that business sustainability performance is negatively associated with the cost of bank loans. The relationship between sustainability performance and the cost of bank loans depends on whether the firms possess family features, which implies that commercial banks evaluate loan interest rates based on firms' sustainability performance as well as the features of firms' decision-making authorities.

5. Endogeneity concerns

To alleviate the concern about endogeneity, we employ a 2SLS estimation method to test the robustness of our results. In the first stage, ESG performance is instrumented by instrumental variables via ordinary least square method. Our choice of instrumental variables is all the exogenous variables in Eq. (1) and three firm's governance characteristics (board independence, duality, and blockholder ownership) which is motivated by the extant literature. Here, we regress each ESG performance variable on all exogenous variables in the system to receive the prediction of ESG performance and obtain the first-stage F-statistics. Table 7 reports the first-stage regression results of two stage least square regressions. We find that the values of F-statistics for ESG, ESGC, Controversies, Environment, Governance and Society score equations are respectively 80.63, 79.66, 13.67, 62.18, 75.99 and 98.89. The F-statistics value is over 10 for all first stage instrument equation and indicate that instruments are sufficiently strong. Moreover, the results obtained from Anderson (1984) canonical correlations test (underidentification test) and overidentification test of all instruments by Sargan

Table 6

Impact of family firms on the relationship between firms' ESG performance and loan interest rates

	(1) Rate	(2) Rate	(3) Rate	(4) Rate	(5) Rate	(6) Rate
$LSize_{t-1}$	0.099**	0.094**	-0.008	0.118**	0.010	0.082**
	(4.17)	(4.03)	(-0.39)	(5.11)	(0.46)	(3.45)
M/B_{t-1}	-0.074**	-0.073**	-0.097**	-0.074**	-0.087**	-0.071**
	(-4.22)	(-4.17)	(-5.47)	(-4.26)	(-4.88)	(-4.03)
ROA_{t-1}	-0.045**	-0.045**	-0.035*	-0.054**	-0.037*	-0.035*
	(-2.64)	(-2.60)	(-2.02)	(-3.13)	(-2.13)	(-2.03)
$Debt_{t-1}$	-0.042	-0.044	-0.008	-0.040	-0.045	-0.021
	(-1.80)	(-1.88)	(-0.33)	(-1.69)	(-1.85)	(-0.87)
$TCRI_{t-1}$	0.421**	0.419**	0.429**	0.440**	0.417**	0.414**
	(19.73)	(19.70)	(20.15)	(20.69)	(19.47)	(19.11)
$LLoan_t$	-0.020	-0.020	-0.031*	-0.008	-0.033*	-0.020
	(-1.27)	(-1.27)	(-1.98)	(-0.52)	(-2.05)	(-1.29)
$LMaturity_t$	0.120**	0.119**	0.126**	0.111**	0.138**	0.123**
	(7.53)	(7.46)	(7.85)	(7.01)	(8.65)	(7.69)
$CollateralD_t$	0.085**	0.083**	0.085**	0.080**	0.095**	0.081**
	(4.92)	(4.81)	(4.93)	(4.64)	(5.49)	(4.70)
ESG_t	-0.264**					
	(-11.52)					
$ESG_t \times FAM_t$	0.125**					
	(6.80)					
$ESGC_t$		-0.269**				
		(-11.88)				
$ESGC_t \times FAM_t$		0.128**				
		(6.98)				
$Controversies_t$			-0.033*			
			(-1.99)			
$Controversies_t \times FAM_t$			0.187**			
			(9.87)			
$Environment_t$				-0.310**		
				(-13.19)		
$Environment_t \times FAM_t$				0.131**		
				(6.92)		
$Governance_t$					-0.141**	
					(-6.50)	
$Governance_t \times FAM_t$					0.173**	
					(8.57)	
$Social_t$						-0.221**
						(-9.99)
$Social_t \times FAM_t$						0.080**
						(4.33)
Industry Eff.	Yes	Yes	Yes	Yes	Yes	Yes
Year Eff.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2880	2880	2880	2880	2880	2880
adj. R^2	0.393	0.395	0.384	0.400	0.380	0.385

Table 6 runs the regressions of loan rates on ESG-related scores (ESG, ESGC, Controversies, Environment, Social, and Governance) and interaction terms of family features and ESG-related scores, controlling for firms characteristics (firm size, market-to-book value, ROA and debt ratio), loan features (crediting rating, loan amount, loan maturity and collateral conditions), industry effect and year effect. The details of definitions and measurements of all the variables are reported in the Appendix. Standardized beta coefficients are shown; The numbers in parentheses are values of *t*-statistics. The notations **, and * denote statistical significance at the 1% and 5% levels, respectively.

Table 7
First-stage regression results of two stage least square regressions

	(1) ESG	(2) ESGC	(3) Controversies	(4) Environment	(5) Governance	(6) Social
Size$_{t-1}$	0.421**	0.399**	-0.157**	0.432**	0.232**	0.389**
	(22.81)	(21.40)	(-6.22)	(22.96)	(10.80)	(21.07)
M/B$_{t-1}$	0.082**	0.095**	0.027	0.081**	0.033	0.088**
	(5.47)	(6.26)	(1.31)	(5.25)	(1.87)	(5.83)
ROA$_{t-1}$	-0.072**	-0.065**	0.090**	-0.090**	-0.108**	-0.011
	(-4.94)	(-4.45)	(4.54)	(-6.08)	(-6.39)	(-0.73)
Debt$_{t-1}$	-0.118**	-0.129**	0.009	-0.083**	-0.291**	0.004
	(-5.95)	(-6.48)	(0.34)	(-4.11)	(-12.67)	(0.23)
TCRI$_{t-1}$	-0.121**	-0.132**	-0.043	-0.065**	-0.056**	-0.177**
	(-6.58)	(-7.08)	(-1.70)	(-3.43)	(-2.60)	(-9.55)
LLoan$_t$	0.017	0.019	0.028	0.064**	-0.092**	0.025
	(1.31)	(1.47)	(1.56)	(4.78)	(-6.04)	(1.89)
LMaturity$_{t-1}$	-0.088**	-0.092**	-0.068**	-0.105**	-0.004	-0.082**
	(-6.54)	(-6.81)	(-3.71)	(-7.62)	(-0.26)	(-6.07)
CollateralD$_{t-1}$	-0.033*	-0.037*	-0.006	-0.047**	-0.011	-0.031*
	(-2.22)	(-2.49)	(-0.28)	(-3.17)	(-0.65)	(-2.11)
Indep$_{t-1}$	0.224**	0.210**	-0.116**	0.154**	0.219**	0.204**
	(11.30)	(10.48)	(-4.26)	(7.59)	(9.50)	(10.29)
Dual$_{t-1}$	-0.084**	-0.081**	0.050**	-0.058**	-0.160**	-0.042**
	(-5.96)	(-5.66)	(2.59)	(-4.02)	(-9.75)	(-2.97)
BigOwn$_{t-1}$	-0.138**	-0.156**	-0.079**	-0.172**	0.097**	-0.216**
	(-8.82)	(-9.87)	(-3.68)	(-10.73)	(5.32)	(-13.79)
Industry Eff.	Yes	Yes	Yes	Yes	Yes	Yes
Year Eff.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2880	2880	2880	2880	2880	2880
adj. R^2	0.583	0.574	0.218	0.565	0.436	0.581
F-stat.	80.63	79.66	13.67	62.18	75.99	98.89
Anderson(1984)	234.61**	231.92**	41.15**	182.58**	221.61**	285.18**
Sargan(1958)	23.05**	18.02**	76.38**	10.45**	75.23**	17.24**

Table 7 runs the regressions of ESG-related scores (ESG, ESGC, Controversies, Environment, Social, and Governance) on firm's financial characteristics (firm size, market-to-book value, ROA and debt ratio), loan features (crediting rating, loan amount, loan maturity and collateral conditions), firm's governance characteristics (board independence, duality, and blockholder ownership), industry effect and year effect. Anderson (1984) and Sargan (1958) are the results obtained from canonical correlations test for underidentification test and overidentification test of all instruments, respectively. The details of definitions and measurements of all the variables are reported in the Appendix. Standardized beta coefficients are shown; The numbers in parentheses are values of *t*-statistics. The notations **, and * denote statistical significance at the 1% and 5% levels, respectively.

(1958) concluded the same suggestion. Thus, the 2SLS regressions are applied by calculating the expected level of ESG sustainability performance factors in the

Table 8

Endogeneity concerns: two stage least square regressions

	(1) Rate	(2) Rate	(3) Rate	(4) Rate	(5) Rate	(6) Rate
Size$_{t-1}$	0.302**	0.297**	-0.006	0.358**	0.061*	0.261**
	(6.93)	(7.15)	(-0.17)	(7.76)	(1.96)	(6.99)
M/B$_{t-1}$	-0.033	-0.027	-0.063**	-0.035*	-0.053**	-0.046**
	(-1.81)	(-1.48)	(-3.55)	(-1.97)	(-2.87)	(-2.58)
ROA$_{t-1}$	-0.079**	-0.079**	-0.023	-0.108**	-0.043*	-0.052**
	(-4.32)	(-4.31)	(-1.14)	(-5.53)	(-2.35)	(-2.96)
Debt$_{t-1}$	-0.102**	-0.112**	-0.038	-0.093**	-0.073*	-0.036
	(-4.06)	(-4.39)	(-1.59)	(-3.79)	(-2.39)	(-1.51)
TCRI$_{t-1}$	0.377**	0.373**	0.413**	0.417**	0.404**	0.365**
	(17.16)	(16.91)	(18.98)	(19.50)	(17.93)	(16.38)
LLoan$_t$	-0.010	-0.008	-0.028	0.026	-0.041*	-0.007
	(-0.63)	(-0.48)	(-1.73)	(1.52)	(-2.44)	(-0.40)
LMaturity$_{t-1}$	0.086**	0.082**	0.129**	0.063**	0.137**	0.090**
	(4.91)	(4.64)	(6.92)	(3.45)	(8.45)	(5.27)
CollateralD$_{t-1}$	0.069**	0.062**	0.089**	0.043*	0.097**	0.061**
	(3.87)	(3.48)	(4.92)	(2.33)	(5.47)	(3.41)
$\widehat{ESG}_t$	-0.370**					
	(-7.40)					
$\widehat{ESGC}_t$		-0.383**				
		(-7.75)				
$\widehat{Controversies}_t$			-0.058			
			(-0.91)			
$\widehat{Environment}_t$				-0.456**		
				(-8.24)		
$\widehat{Governance}_t$					-0.057	
					(-1.80)	
$\widehat{Social}_t$						-0.380**
						(-7.82)
Industry Eff.	Yes	Yes	Yes	Yes	Yes	Yes
Year Eff.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2880	2880	2880	2880	2880	2880
adj. R^2	0.380	0.381	0.367	0.383	0.368	0.381

Table 8 runs the regressions of loan rates on 2LSL estimated ESG-related scores (ESG, ESGC, Controversies, Environment, Social, and Governance), controlling for firms financial characteristics (firm size, market-to-book value, ROA and debt ratio), loan features (crediting rating, loan amount, loan maturity and collateral conditions), industry effect and year effect. The details of definitions and measurements of all the variables are reported in the Appendix. Standardized beta coefficients are shown; The numbers in parentheses are values of *t*-statistics. The notations **, and * denote statistical significance at the 1% and 5% levels, respectively.

first stage (e.g., Ng and Rezaee, 2015; Ng and Rezaee, 2020).

Table 8 reports the results of the 2SLS analyses. Our empirical results remain economically and statistically significant in 2SLS regressions. We use expected level of business sustainability scores of ESG, ESGC, Controversies, Environment, Governance and Society to Model (1) through Model (6) of Table 8 respectively

to examine the impact of business sustainability performance on the cost of bank loans. A significantly negative coefficient of expected ESG score, -0.370, in Model (1) indicates that high ESG performance reduces bank loan interest rates. A significantly negative coefficient of expected ESGC score, -0.383, in Model (2) suggests that high ESGC score, which is discounted by firms' controversies, facilities a reduction of loan interest rate. The coefficient of expected Controversies in Model (3) is also insignificant. Model (4) presents a significantly negative coefficient of Environmental performance, -0.456. Model (5) reports a significantly negative coefficient of Governance performance, -0.057. Model (6) shows a significantly negative coefficient of Social performance, -0.380. The results from Model (4) to Model (6) of Table 6 support the evidence that Environmental, Social and Governance performance separately affects banks' evaluation on the firms and their decisions on firms' loan interest rates. Good business sustainability performance on environmental protection, social justice and corporate governance reduces the cost of bank loans.

6. Conclusion

This paper investigates the relationship between firms' ESG sustainability and the cost of bank loans as taking the moderating effects of the family features into consideration. Our results confirm that firms' aggregate ESG, environmental, social and governance sustainability performance is negatively associated with the cost of bank loans. However, the family features impair the benefit of loan interest reduction from firms' good ESG performance.

We also address potential endogeneity concerns by using the 2SLS approach to correct for the potential bias in the baseline regression. The results of the 2SLS analyses suggest that the negative associations between ESG performance (the overall ESG scores, ESG scores discounted by the firms' controversies as well as the three dimensions of environment, society and governance scores separately) and the cost of bank loans are robust.

Our results shed light on the literature by examining the link between the cost of bank loans and the aggregate/ individual ESG sustainability performance

Table 9

Endogeneity concerns: moderating role of firm's family feature

	(1) Rate	(2) Rate	(3) Rate	(4) Rate	(5) Rate	(6) Rate
LSize$_{t-1}$	0.054*	0.056*	-0.002	0.064*	-0.036	0.062*
	(2.05)	(2.16)	(-0.09)	(2.44)	(-1.55)	(2.33)
M/B$_{t-1}$	-0.077**	-0.075**	-0.095**	-0.077**	-0.103**	-0.070**
	(-4.32)	(-4.17)	(-5.34)	(-4.35)	(-5.70)	(-3.91)
ROA$_{t-1}$	-0.041*	-0.041*	-0.037*	-0.045**	-0.026	-0.037*
	(-2.38)	(-2.39)	(-2.11)	(-2.61)	(-1.50)	(-2.16)
Debt$_{t-1}$	-0.033	-0.037	-0.010	-0.030	0.002	-0.027
	(-1.40)	(-1.56)	(-0.40)	(-1.26)	(0.07)	(-1.16)
TCRI$_{t-1}$	0.424**	0.421**	0.429**	0.432**	0.440**	0.414**
	(19.69)	(19.57)	(20.10)	(20.37)	(20.47)	(18.87)
LLoan$_t$	-0.023	-0.023	-0.031	-0.017	-0.021	-0.024
	(-1.49)	(-1.48)	(-1.94)	(-1.06)	(-1.32)	(-1.49)
LMaturity$_t$	0.118**	0.117**	0.128**	0.112**	0.127**	0.121**
	(7.37)	(7.32)	(8.00)	(7.04)	(7.97)	(7.53)
CollateralD$_t$	0.088**	0.087**	0.088**	0.085**	0.088**	0.086**
	(5.11)	(5.03)	(5.06)	(4.92)	(5.06)	(4.94)
$\widehat{ESG}_t$	-0.188**					
	(-8.45)					
$\widehat{ESG}_t \times FAM_t$	0.125**					
	(5.88)					
$\widehat{ESGC}_t$		-0.193**				
		(-8.75)				
$\widehat{ESGC}_{tt} \times FAM_t$		0.118**				
		(5.55)				
$\widehat{Controversies}_t$			0.004			
			(0.22)			
$\widehat{Controversies}_t \times FAM_t$			0.172**			
			(9.24)			
$\widehat{Environment}_t$				-0.223**		
				(-10.35)		
$\widehat{Environment}_t \times FAM_t$				0.123**		
				(5.80)		
$\widehat{Governance}_t$					-0.056**	
					(-3.00)	
$\widehat{Governance}_t \times FAM_t$					0.205**	
					(9.77)	
$\widehat{Social}_t$						-0.176**
						(-7.74)
$\widehat{Social}_t \times FAM_t$						0.074**
						(3.35)
Industry Eff.	Yes	Yes	Yes	Yes	Yes	Yes
Year Eff.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2880	2880	2880	2880	2880	2880
adj. R^2	0.391	0.391	0.381	0.397	0.385	0.384

Table 9 runs the regressions of loan rates on 2LSL estimated ESG-related scores (ESG, ESGC, Controversies, Environment, Social, and Governance) and interaction terms of family features and 2LSL estimated ESG-related scores, controlling for firms characteristics (firm size, market-to-book value, ROA and debt ratio), loan features (crediting rating, loan amount, loan maturity and collateral conditions), industry effect and year effect. The details of definitions and measurements of all the variables are reported in the Appendix. Standardized beta coefficients are shown; The numbers in parentheses are values of *t*-statistics. The notations **, and * denote statistical significance at the 1% and 5% levels, respectively.

in an emerging country where indirect financing dominates the capital market.

Second, we consider ESG sustainability performance in conjunction with the features of family-run business when analyzing their impacts on the cost of bank loans and identify a weakened impact from the family firms. Third, our results have implications for policymakers, regulators, commercial banks and the borrowing firms as they are increasingly paying attention to ESG sustainability performance.

Appendix: Definitions of variables

Variable names	Variable definitions
Dependent variable	
Rate	Bank loan rate, which is the interest rates of each long-term loan contract for the sample firm.
ESG-related scores	
ESG	The ESG score
ESGC	The ESG score adjusted by controversies.
Controversies	The Controversies score.
Environment	The Environment score.
Governance	The Social score.
Social	The Governance score.
Control variables	
AT	Total assets measured in millions of NT dollars.
Size	Natural log of total assets measured in millions of NT dollars.
M/B	Market-to-book ratio.
ROA	Return on total assets.
Leverage	Total liabilities divided by total assets.
TCRI	Taiwan Corporate Credit Risk Index (TCRI) measures credit risk of publicly listed firms in Taiwan, rating from 1 to 9 with 1 the least credit risk.
Loan	Loan amount measured in millions of NT dollars.
LLoan	Natural log of the loan amount measured in millions of NT

	dollars.
Maturity	The loan maturity measured in days.
LMaturity	Natural log of the loan maturity measured in days.
CollateralD	A dummy variable that equals one if the collaterals are required and zero otherwise.
Family	A dummy variable that equals one if the firm is a family-run business and zero otherwise.

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