Sustainability and bank credit access: New evidence from Italian SMEs

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A B S T R A C T

We test whether firm sustainability positively affects access to bank credit. We carry out a panel data analysis of 125 listed Italian SMEs across 14 regions over 2017–2021. A quantitative score comprising 20 items grouped into three areas, disclosure, processes, and governance, is computed to determine the level of implementation of sustainable practices of sampled SMEs. Results show that SMEs with more sustainable orientation have greater access to bank credit and better ability to pay the cost of bank debt. This, in turn, reinforces bank-SME relationships. We contribute to the literature on SMEs, highlighting the relationship between sustainability and the availability of bank loans.

1. Introduction

Starting from the notions of sustainable development in the Brundtland Report published by the World Commission on the Environment in 1987 (WCED, 1987), further attention on sustainability has increased, culminating in several important initiatives such as the Paris Climate Agreements (COP 21) and the 2030 Agenda of the United Nations for Sustainable Development, both adopted in 2015. More recently, specific activities and regulations implemented by the European Union, including the EU Taxonomy and the European Green Deal, provide additional support for the green transition and integration of sustainability into company business models (BIS 2021).

From the perspective of banks, financial regulators are strengthening regulations in an attempt to encourage these institutions to support and promote sustainability practices. Recently banking supervisors have launched important appeals and recommendations to raise awareness on the potential effects of environmental risk, improve the understanding of climate risk measurement issues facing banks and on transitioning to a low-carbon and more circular economy. Specifically, increasing pressure is being exerted on all EU banks to integrate sustainability factors into the lending decision-making processes. In turn, increased commitment to climate issues could lead banks to develop a more effective environmental management system and environmental credit risk management which mediates bank riskiness and improves overall financial stability (EBA, 2020a, 2020b).

The development of a more stringent regulatory framework, hence, represents a strong incentive for both financial and non-financial companies to implement policies based on sustainability (Chatzistamoulou and Tyllianakis, 2022a; Smith et al., 2022;

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Angilella and Mazzù, 2019). However, while banks are currently at an advanced stage in the green transition process, non-financial firms, including small and medium enterprises (SMEs), have only recently begun to integrate the ESG (Environmental, social and governance) factors into their management processes (Mirza et al., 2023; Alam et al., 2022). Currently, most SMEs do not seem fully environmentally friendly (Gandhi et al., 2018), and implementation of green operations is still not adequately widespread (Alam et al., 2022). Moreover, SMEs approach sustainability in a less structured and formalised manner than larger companies because they generally adopt more informal strategies (Russo and Tencati, 2009; Preuss and Perschke, 2010). Finally, while the majority of European businesses report that they have been affected by climate change during 2022, only 36% of EU firms have taken action to address climate-change risks, with larger firms being more proactive and only 13% have bought insurance to protect against physical risks like extreme weather (European Investment Bank-EIB, 2023). In the different European countries, SMEs are transitioning to sustainability at different rates, with the greatest progress being made in Germany, followed by Italy, Portugal, Austria, Spain and France (Almeida and Wasim, 2023; Sohns et al., 2023; Madrid-Guijarro and Duréndez, 2023; Courrent et al., 2018).

There are several important reasons for SMEs to increasingly turn to more sustainable business models (Edeigba and Arasanmi, 2022). First, SMEs are a pillar of the global economy and the main drivers of progress in developing countries (Chatzistamoulou and Tyllianakis, 2022b) because they help spread entrepreneurial spirit and generate new employment opportunities (Toke and Kalpande, 2020; Sohns et al., 2023). Thus, these firms play a critical role in the transition to sustainability. Without their full support, the transition would simply not happen. Additionally, for SMEs, this "sustainability challenge" represents an incredible opportunity to gain or consolidate their competitive advantage. Indeed, a more sustainable approach drives innovation and secures access to certified supply chains, better financing conditions and strategic partnerships with public and private entities. Finally, SMEs face significant pressures staying in the market due to restricted operational resources, resulting in a general aversion to taking risks. Consequently, embracing sustainability can enhance the competitiveness of SMEs within the current market (Caballero-Morales, 2021; Salvador et al., 2023; Mady et al., 2023).

In recent years, such sustainable practices have been growing, which has spurred a strand of literature that explores the effects on company performance. The extant research, however, is mainly focused on large companies (Ameer and Othman, 2012), whereas SMEs have received little attention, especially in the Italian market (Bengo and Arena, 2019; Lagazio et al., 2021). Furthermore, the results are highly heterogeneous, and no conclusive evidence has been found. This is probably due to the extreme differentiation of the sustainability variables used in the analysis models.

We address these gaps by investigating whether SMEs adopting more sustainable business models are granted more loans (lines of credit) both short term and long term. We explored this link by focusing on all listed Italian SMEs over the period 2017–2021. Our analysis starts in 2017 as this is when it became mandatory for companies to publish Non-Financial Statements, the main information source for companies' sustainability strategies (Italy transposes Directive 254/14/EU with Legislative Decree 254/2016). The most recent information available for analysis is from 2021. We employed a panel data model with fixed effects. Italy is a key country for testing this relationship not only due to the high number of SMEs operating in the country but also given the different regulatory actions implemented as incentives for firms to address sustainability (see, e.g., the 'National Recovery and Resilience Plan'). To proxy the sustainability level of the business models in the sample of firms, we created a specific score (Sustainability Business Model score [SBM]) consisting of 20 items divided into three survey areas (Disclosure, Processes and Governance) by verifying compliance with a private business model (see Appendix 1). Qualitative, nonfinancial information aimed at analysing the sustainability of the firms' business models were hand-collected from public business documents (annual reports, non-financial statements and corporate governance reports), while the economic and financial variables were gathered from the Orbis database. Both the volume of short- and medium/long-term loans and the bank-debt sustainability of Italian SMEs were investigated.

Our results support the view that more sustainable SMEs benefit from greater credit access to banks both in the short and medium/long term, confirming that sustainable business models can improve loan availability and reinforce the bank–firm relationship. Additionally, we found that the stronger an SME's commitment to sustainability, the greater their capacity to pay the cost of their bank debts, which in turn increases their reliability by further strengthening the credit relationship. This research integrates the existing literature on SMEs by providing insight into the association between bank loan availability and sustainability, emphasising its importance. Moreover, by focusing on a specific country (Italy), we overcome territorial and regulatory divergences that may influence both the adoption of sustainability practices and the effect of sustainability on firm performance and the bank relationship.

The remainder of the paper is structured as follows. Section 2 reviews the literature; Section 3 presents the research design and describes the sample and the econometric model, while Section 4 discusses the findings. Section 5 concludes the paper and examines the main implications.

2. Relevant literature and hypotheses

Some interesting systematic literature reviews provide useful orientation within the vast existing literature on sustainability (Prabawani, 2013; Bartolacci et al., 2020; Bakos et al., 2020; Van Bommel et al., 2020; Aracil et al., 2021; Naciti et al., 2022). Based on these studies, we identified a strand of literature useful to our aims that concerns the relationship between *sustainability performance and access to loans*.

In this field, studies have focused both on the banking side and on the company side. From the bank perspective, many studies have investigated the integration of sustainability into bank lending processes: i.e., how banks incorporate ESG criteria into their policies and process. Coulson and Monks (1999) provide an overview of bank commitment to the environment and consider the potential implications of corporate environmental performance within bank lending decisions. Integration is mainly represented by considering the extent to which sustainability, in the pricing model, is integrated into the business models of their customers. Weber (2005)

conducted a benchmark study of European banks and financial-service organisations, investigating the extent to which they have integrated sustainability into their policies, strategies, products, services and processes. The author identified five models for the successful integration of sustainability into banking businesses: event-related integration of sustainability, sustainability as a new banking strategy, sustainability as a value driver, sustainability as a public mission and sustainability as a requirement for clients.

A prolific body of literature has investigated the motivation underlying banks' concern about incorporating ESG criteria into their lending processes. Several authors have found that banks are rewarded through better financial performance (Ahmed et al., 2018; El Khoury et al., 2023), fewer risks (Veltri et al., 2023) and better reputations (Pacelli et al., 2022).

Surprisingly, in some cases, the results show that ESG factors neither improve the efficiency of utilities nor constitute a useful complementary criterion for credit lending managers (Veltri et al., 2023). However, this study by Veltri et al. (2023) investigates a specific sector (utilities companies) in a limited geographical area (Europe).

From the company perspective, Goss and Roberts (2011) examine the link between corporate social responsibility (CSR) and bank debt using a sample of 3996 loans to U.S. firms. They show that firms with social responsibility issues pay between 7 and 18 basis points more than firms that are more responsible. Similarly, La Rosa et al. (2018), observing a sample of listed European non-financial firms over an eight-year period from 2005 to 2012, find that corporate social performance plays a positive role in reducing the cost of debt capital.

Not all sustainability issues are considered in a similar way to the credit risk assessment process.

Abdul Razak et al. (2020) suggest risk-reducing effects across several corporate sustainability dimensions: climate change, the use of natural resources and human capital and corporate governance. Environmental concerns increase a firm's cost of debt, governance concerns have no effect on it, while environmental and governance strengths reduce a firm's cost of debt (Erragragui, 2018). Erragragui (2018) reveals a 'governance paradox' whereby governance strengths and concerns are not considered equally important by creditors. Raimo et al. (2021) analyse the effect of ESG disclosure on the cost of debt by a fixed-effects analysis conducted on a sample of 8264 observations (an unbalanced panel data of 919 firms for the period 2010–2019), revealing a negative effect of ESG disclosure on the cost of debt financing. Wellalage and Kumar (2021), focusing on a sample of 3915 firms from developing economies, find that firms with better environmental performance received about 6.4% higher loans (as a ratio of total sales) and that this outcome is more prominent in small and medium firms (Wellalage and Kumar, 2021). Their results demonstrate that companies with greater levels of transparency in the dissemination of ESG information benefit through access to third-party financial resources under better conditions. A few studies provide evidence that sustainable business models can facilitate access to credit and lead companies towards virtuous standards of financial, social and environmental protection inclusion (Pizzi et al., 2021; Lopes de Sousa Jabbour et al., 2018; Zhang et al., 2022).

Despite the different perspectives, for both banks and businesses a close connection emerges among the benefits derived from the adoption of sustainable practices (Ameer and Othman, 2012). Banking relationships promote the adoption of ESG policies by companies. Specifically, banks are more likely to grant loans to borrowers with ESG profiles like their own and positively influence the borrowers' subsequent ESG performance (Houston and Shan, 2022).

The literature is essentially unanimous in believing that many benefits are gained from the greater sustainability of companies in accessing credit. The variables investigated, the samples examined and the territorial areas of reference, however, are very different. Most investigations are on large companies. Little attention has been paid to SMEs, despite them being more numerous, even in terms of employment levels. Small firms possess organisational characteristics favourable to promoting the internal implementation of CSR-related practices in core business functions but constrain external communication and reporting on CSR (Baumann-Pauly et al., 2013; Belas et al., 2022; Khan et al., 2023; Refait-Alexandre and Serve, 2020).

To the best of our knowledge, no papers have examined Italian SMEs by linking sustainability to bank financing. In some cases, the focus is only on certain aspects of sustainability. Arcuri and Pisani (2023), for example, focus only on environmental sustainability, exploring the effect of being 'green' in attracting external funding. They examined SMEs in Italy during the COVID-19 pandemic, verifying that, both before and during the pandemic, greener Italian SMEs did not attract more external funding than other SMEs but did rely more on trade credit than non-green SMEs.

Hence, our research fills this gap and empirically examines the effect of sustainable business models on the availability and costs of financing in a sample of Italian SMEs.

We chose Italy, where according to OECD (Organisation for Economic Co-operation and Development) estimates, SMEs account for the vast majority of firms, providing nearly 80% of the industrial and service labour force and generating about two thirds of turnover and value added (OECD, 2022).

Based on the literature providing evidence that sustainable business models allow for better access to credit for large companies, and considering that, in recent years, SMEs have also been developing sustainability-oriented models (Gregurec et al., 2021; Pizzi et al., 2021; Edeigba and Arasanmi, 2022), our research intends to verify the following hypotheses:

H1.   : SMEs adopting more sustainable business models obtain a higher volume of loans (both short- and medium/long-term loans).

H2.   : SMEs adopting more sustainable business models have a greater capability to pay the cost of their bank debt.

3. Methodology

3.1. Data and sources

The paper focuses on all listed Italian SMEs. The final sample is the result of a cross-analysis of data published on Consob's website

and Borsa Italiana for each year under investigation (2017–2021). Companies that did not provide information for all survey years and financial companies were eliminated. The sample firms belong mainly to the manufacturing industry (see Table 1).

The qualitative information used to analyse the sustainability of the sample firms was obtained by consulting the firms' main corporate documents (the annual report, non-financial corporate governance report). All economic and financial data were retrieved from Orbis database.

3.2. Econometric model

To test the relationships between access to bank-credit by SMEs and their sustainability level, we estimated the following panel data model with fixed effects and clustered heteroscedasticity standard errors at the firm level to account for the serial correlation of the dependent variable for each firm:

$$\text{LENDING}_{ijt} = \alpha + \beta \quad SUSTAINABILITY_{it} + \text{CONTROL VARIABLES}_{it}\gamma + \tau_t + \kappa_j + \varepsilon_{ijt}$$

where i indexes companies, j regions and t years; α is the constant term; β denotes the independent variable of interest; γ represents the set of control variables; τ denotes fixed effects and κ region-fixed ones; and ε is the error term. Standard errors are clustered at the firm level.

3.2.1. Dependent variables

We employed four dependent variables. Following Michaelas et al. (1999), Sogorb-Mira (2005) and Bonfim and Antão (2012), we computed the access to bank loans by Italian SMEs using two measures of debt: (i) the long-term debt ratio (LT_DEBT RATIO), defined as the ratio of long-term debt to total assets, and (ii) the short-term debt ratio (ST_DEBT_RATIO), defined as the ratio of short-term debt to total assets (Mateev et al., 2013). We added a third dependent variables by calculating the sum of these two variables. We thus computed the total debt ratio (TOT_DEBT_RATIO), defined as the total debt exposure to banks over the total assets. Additionally, since we expect that the adoption of sustainable business models could improve the bank debt sustainability for SMEs, as a fourth dependent variable we considered the interest coverage ratio (ICR) between the EBITDA margin and the interest expense. Specifically, this ratio expresses a firm's capacity to pay interest at a given time t with EBITDA as income margins (Dothan, 2006; Ghalke et al., 2022). The ICR belongs to the set of credit-granting criteria recommended by EBA when banks must perform creditworthiness assessments and credit-risk monitoring (EBA, 2020a, 2020b).

3.2.2. Independent and control variables

To verify the sustainability level of the business model of the sample firms, we used a quantitative score comprising 20 items as a main explanatory variable, grouped into three categories: Disclosure, Processes and Governance. The items were selected by consulting the primary corporate documentation (annual report, non-financial statement and corporate governance report). We named the final score the 'Sustainability Business Model score' (SBM_Score). It ranges from 0 to 100%, where the maximum value indicates perfect adherence to the analysis model and thus the highest level of sustainability achieved by the company. The choice to elaborate an ad hoc score was strongly influenced by the scarcity of information on the sustainability of SMEs in the most important databases. Therefore, we considered it more appropriate to employ the official documents so that we could test the research hypotheses on all Italian SMEs. By contrast, the use of a database, such as Eikon-Refinitiv, would have forced us to greatly reduce the number of observations because only about half of the listed Italian SMEs are currently surveyed by it. Appendix 1 provides the analysis model. To limit the authors' judgement as much as possible, we almost always awarded a score of 1 when the item was positively verified (except item 15, see Appendix 1).

Moreover, we added several control variables that are often employed in the empirical literature. Firstly, we controlled for the firm dimension (SIZE), computed as the natural logarithm of a firm's total assets (Fama and French, 2002; Sogorb-Mira, 2005; Mateev et al., 2013). Second, we controlled for firm performance using two different variables: a) the return on asset ratio (ROA), which measures

Table 1

Sample composition by industry.

Firms by Business sector	2017	2018	2019	2020	2021	Average no. of firms	Average in%
Automotive, Aerospace and Nautical	8	8	8	8	9	8,2	6,8
Chemicals, Energy, Oil and Gas	10	10	11	10	10	10,2	8,4
Construction and Engineering	6	5	6	6	8	6,2	5,1
Electronics and Telecommunications	14	14	15	15	16	14,8	12,3
Food and Beverage	6	5	7	6	6	6	5,0
Healthcare and Pharma	4	4	5	5	6	4,8	4,0
Logistics and Transport	3	3	4	4	4	3,6	3,0
Machine and Plant	11	11	10	10	8	10	8,3
Retailers, Textile and Manufacturing	30	28	26	26	27	27,4	22,7
Media and Publishing	7	7	6	6	5	6,2	5,1
Services and Utilities	22	21	20	18	20	20,2	16,7
Steel and Technology	4	3	3	3	3	3,2	2,6
Sample size	125	119	121	117	122	120,8	100,00

the company's core profitability on a normalised basis, and b) the ratio between the EBITDA and the net revenue (EBITDA_MARGIN), which expresses the firms' asset value creation (Acharya et al., 2013; Lahmann et al., 2017). Finally, to control for short-term liquidity exposure, we included a liquidity variable constructed by the ratio of current assets to current liabilities (Bonfim and Antão, 2012; Mateev et al., 2013). Finally, we also controlled for time- and region-fixed effects.

Table 2 summarises all variables used in the econometric model.

4. Results and discussion

In this section, we give a brief overview of the distribution of observations of SMEs variables. In particular, Table 3 presents the statistics summary of our key variables in this study while the Pearson correlation matrix of our key variables is shown displayed in Appendix 2.

Table 3 shows that on average SMEs experience difficulties obtaining bank loans. The indicators, ST_DEBT_RATIO and LT_DEBT_RATIO, suggest that SMEs access more short-term than long-term loans. Indeed, Table 3 highlights that the higher amount of bank debt is mostly related to short-term debt (ST_DEBT_RATIO) since it presents a higher mean (3.28) with respect to long-term debt (LT_DEBT_RATIO, 2.21). As stated above, the SBM_Score ranges from 0 to 100%; in our sample, SMEs have a mean of 36%, and the highest percentage of sustainable business model is 95%, meaning that no firm in the sample is yet fully compliant with sustainable practices involving disclosure, processes and governance features. The average natural logarithm of the total assets (SIZE) is 14.03. The LIQUIDITY ratio is relatively high, displaying a mean of 1.41, which shows that the average firm in our sample has no problem meeting its current obligations. Return on assets (ROA) constitutes 4.57% of the total assets.

Before carrying out our estimations, we performed the correlation between the variables implemented in the econometric model. Correlation coefficients with stars are significant at the 5% level, and they are mostly $< |0.5|$, suggesting a small or medium-strength correlation. Therefore, our data does not present a severe multicollinearity issue. The correlation can be given by the composition of the variables; as most of them are financial ratios, the total assets are included in their construction. This could explain the higher correlation between the dependent variables (LT_DEBT_RATIO, ST_DEBT_RATIO, TOT_DEBT_RATIO) and the natural logarithm of firm assets (SIZE). In any case, none of these create any multicollinearity concerns (see Appendix 2).

The current study performed an OLS regression analysis to test the relationship between the SBM_Score (Sustainable Business Model score) and access to bank credit by listed Italian SMEs, as proxied by the ratio of their bank debts to total assets (Table 4). The regression results shown in Table 5 can be interpreted by following the four main models. Models (1), (2) and (3) display the results of the fixed-effects panel data model, using as a dependent variable the proxy of access credit, while Model (4) presents evidence of the relationship between SBM_Score and the interest coverage ratio (ICR). All independent and control variables are lagged by one year to address endogeneity. Model 1 shows the regression results considering the long-term debt ratio (LT_DEBT_RATIO) as the dependent variable. The coefficient for SBM_Score is positively and statistically significant at the 1% level, meaning that, whenever SMEs have sustainability practices in their business model, an increasing SBM score allows them greater access to long-term credit. From Model 2 we can also infer that a positive relationship exists between SBM_Score and SMEs' short-term debt ratio (ST-DEBT_RATIO) at the 1% level of significance. Importantly, these results display a greater coefficient of short-term debt with respect to the coefficient of the long-term debt variable. Model 3 corroborates the previous results by considering the total bank loans (TOT_DEBT_RATIO); the

Table 2
Variable Description.

Variables	Definition	Explanation	Source	Expected sign
Dependent variables				
LT_DEBT_RATIO	Long-Term Debt Ratio	Long-term bank debt to total assets	Orbis	
ST_DEBT_RATIO	Short-Term Debt Ratio	Short-term bank debt to total assets	Orbis	
TOT_DEBT_RATIO	Total Debt Ratio	Total bank debt to total assets	Authors' computation on Orbis data	
ICR	Interest Coverage Ratio	Total interest expenses to EBITDA. It expresses firm's capacity to pay interest-related expenses with EBITDA	Authors' computation on Orbis data	
Independent variable				
SBM_Score	Sustainable Business Model Score	Score 0-100 proxy for SMEs sustainability	Authors' computation on corporate documents (especially NFS)	+
Control variables				
SIZE	Total assets, proxy for firm size	Natural logarithm of firm's total assets	Orbis	+ / -
EBITDA_MARGIN	Firm's operating profit	The ratio between a firm's EBITDA and net revenue, expressed as a percentage	Orbis	+
LIQUIDITY	Firm's proxy for short-term liquidity	The ratio of current assets to current liabilities	Orbis	+ / -
ROA	Return on assets	Firm's profitability	Orbis	+
TIME	Year dummy	A dummy used to control for different time periods	Authors' elaboration	
REGIONS	Country dummy	A dummy used to control for regions specific characteristics	Authors' elaboration	

Table 3
Descriptive Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
LT_DEBT_RATIO	442	2.21	15.93	0.00	169.26
ST_DEBT_RATIO	473	3.28	23.77	0.00	222.39
TOT_DEBT_RATIO	503	5.02	36.76	0.00	370.80
ICR	449	0.01	0.02	-0.03	0.26
SBM_Score	503	0.36	0.22	0.00	0.95
SIZE	503	14.03	1.99	5.68	19.15
EBITDA_MARGIN	503	17.80	15.13	-24.60	91.02
LIQUIDITY	503	1.41	0.71	0.00	8.04
ROA	503	4.57	7.86	-37.80	59.58

Table 4
Regression Results.

Explanatory variables	Model 1 LT_Debt Ratio	Model 2 ST_Debt Ratio	Model 3 TOT_Debt Ratio	Model 4 ICR
L.SBM_Score	22.0359***	29.9774***	46.5939***	0.0145**
	(8.1254)	(10.4990)	(17.4383)	(0.0063)
L.SIZE	-5.4999***	-8.4731***	-12.5714***	0.0020***
	(1.6913)	(2.1672)	(3.6300)	(0.0003)
L.EBITDA_MARGIN	0.2062***	0.2815***	0.4851***	
	(0.0686)	(0.0832)	(0.1490)	
L.LIQUIDITY	-2.0749*	-3.4140**	-4.5682**	-0.0056*
	(1.0792)	(1.4491)	(2.1432)	(0.0029)
L.ROA	-0.1913**	-0.3281**	-0.5074**	-0.0003***
	(0.0897)	(0.1294)	(0.2046)	(0.0001)
Observations	350	371	395	353
Time Fixed Effects	YES	YES	YES	YES
Region Fixed Effects	YES	YES	YES	YES
R2-adj	0.3473	0.4195	0.3640	0.1477

Time fixed effects and firms fixed effects are included in the regressions. P-values are computed using heteroskedasticity-robust standard errors clustered for firms and are presented in parentheses. * , ** , and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Table 5
Baseline results excluding Italian listed SMEs in manufacturing.

Explanatory variables	Model 1 LT_Debt Ratio	Model 2 ST_Debt Ratio	Model 3 TOT_Debt Ratio
L.SBM_Score	22.4255 ***	30.6613 ***	47.9818 ***
	(8.2022)	(10.5834)	(17.5850)
L.SIZE	-5.5714 ***	-8.5927 ***	-13.0737 ***
	(1.7014)	(2.1744)	(3.6979)
L.EBITDA_MARGIN	0.2052 ***	0.2760 ***	0.4939 ***
	(0.0682)	(0.0819)	(0.1498)
L.LIQUIDITY	-2.0055 *	-3.4260 **	-4.3115 **
	(1.0830)	(1.5038)	(2.1380)
L.ROA	-0.2277 **	-0.3861 ***	-0.6061 ***
	(0.0958)	(0.1353)	(0.2192)
Observations	345	366	387
Time Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
R2-adj	0.3528	0.4258	0.3768

coefficients remain positively and statistically significant, with a higher amount of credit access for SMEs involved in sustainability practices. Overall, our results prove that that sustainable business models can improve availability of loans and reinforce the credit relationship between banks and enterprises.

Furthermore, we also tested whether firms that adopt sustainable business models can benefit from lower interest expenses on their loans. Model 4 (Table 4) shows that SBM_Score is positively and statistically significant, highlighting that SMEs adopting a sustainable attitude do improve their capacity to pay interest-related expenses, which is proof of the economic benefit deriving from sustainability. This result endorses the rationale that, for non-financial firms, being sustainable is not just a goal for the transition to a low-carbon economy (and to address ESG issues) but could also be recognised as an economic strategy to cut bank-debt costs. As ICR represents a proxy for assessing a company's ability to cover its interest-related expenses, a positive sign means that a company's financial resilience is profitable enough to pay off its interest expenses using its pre-tax income. Therefore, an improvement in the EBITDA_Margin may also increase the debt ratio, as operational improvements seem to be an important source of value creation channelled by

higher access to credit. Thus, we may conclude that our evidence confirms previous studies that adopting a more sustainable business model not only improves loan availability but also reduces bank debt, bringing the enterprises to reinforce the bank–firm relationship (Pizzi et al., 2021; Lopes de Sousa Jabbour et al., 2018).

Regarding the size of SMEs and the provision of benefits in terms of access to credit, the negative sign of the coefficient (SIZE) may be linked to the potential drawbacks of growth in size. The inability to seize favourable development prospects is a result of the effort required to pay loan interest (Goddard et al., 2005). Moreover, greater size may indicate a requirement for additional regulation in the connections among the numerous agents involved in corporate activities: i.e., the owners of the business have less control over management decisions. This could also be seen as a driver that may explain the negative correlation between size and performance (Pi and Timme, 1993; Goddard et al., 2005). Indeed, as ROA presents a negative sign, managers are likely to invest into profitable but risky ventures. Based on such probability, creditors impose more stringent credit-granting criteria, contributing to poor performance (Jensen and Meckling, 1976). Because debt ratio (long, short and total) and asset structure are negatively correlated, current assets are financed with short-term debt (current liabilities), which shows higher and statistically significant coefficients than LIQUIDITY (Model 2). These findings support the so-called 'maturity matching principle' and encourages accepting the trade-off theory's prediction that SMEs with more physical assets are likewise more indebted than other firms since they have more possible collateral for loans (Mateev et al., 2013).

5. Robustness tests

In the previous section, we perform the regressions on all Italian listed SMEs regardless of the industry. To further examine the relationship between sustainable SMEs and bank loan availability we re-estimated the baseline model. This section presents a set of additional tests conducted to validate the findings of our primary analysis as presented in Table 4. In particular, we analyze subsamples to assess the impact of SMEs industry and region distribution. We check whether our results are driven by the number of SMEs belonging to the manufacturing industries and in the region of Lombardy, respectively.

Our first robustness test is aimed at excluding manufacturing SMEs from the sample. These firms account for almost 14% of all observations in our sample. The results for the smaller sample of banks are reported in Table 6. Previous findings are confirmed. The lagged term of SBM score remains significant and positive in the regression for the LT_Debt Ratio (Table 5, column 1), the same applies to ST_Debt Ratio and TOT_Debt Ratio (Table 5, columns 2 and 3). Secondly, as SMEs in the Lombardy region account for almost 39% of all observations in our sample (see Appendix 3) we proceeded by creating a subsample excluding them. The results, displayed in Table 6, confirm previous evidence. Control variable signs are in line with the baseline estimation. Overall, our findings do not seem to be driven by the number of manufacturing SMEs nor by the SMEs in the region of Lombardy.

Given the increasing attention that supervisory authorities are placing on ESG issues and the impetus they are giving to banks in this regard, as a further analysis we re-estimated the model by.

examining whether the positive correlation found between sustainability performance and loans granted is constant or has increasing over time. As shown in Table 7, the relationship between SBM_Score and the amount of loans has been increasing. The time variable "year trend" and its interaction with SBM_Score, i.e., time year*SBM_Score, show a positive coefficient, meaning that as the years go by, the impact of sustainability criteria on the dependent variable increases (see Table 7, columns 1 to 3). Moreover, we create a set of year dummies and the interaction of each dummy with the SBM_Score; we use the first year 2017 as the omitted category. This approach has enabled to check whether, for each year with respect to 2017, the SBM_Score has a different effect on the dependent variable. The results in Table 7 show that the coefficient is increasing over time with an ever-greater statistical significance where Columns 4 to 6 show the positive and significant coefficient for each dependent variable. The interaction between year and SMB_score is positive, the coefficient increases moving from 2018 to 2021, which could be due to the importance that sustainability criteria have acquired over time. Our findings provide strong evidence that Italian SMEs have had greater access to lending, following the announcement of the Paris Agreement (2015). It may also suggest that recent climate change initiatives are prompting banks to shift away from polluting industries and towards greener businesses, at least in comparison to previous levels (Reghezza et al., 2022). This

Table 6
Baseline results excluding listed SMEs in Lombardy.

Explanatory variables	Model 1 LT_Debt Ratio	Model 2 ST_Debt Ratio	Model 3 TOT_Debt Ratio
L.SBM_Score	25.4192***	37.3118***	58.7442***
	(8.2362)	(10.8078)	(18.8192)
L.SIZE	-6.8393***	-11.1040***	-15.9586***
	(1.8127)	(2.3956)	(3.8208)
L.EBITDA_MARGIN	0.2546***	0.3339***	0.5450***
	(0.0953)	(0.0982)	(0.1739)
L.LIQUIDITY	-1.1604	-3.7502***	-3.1648*
	(0.9363)	(1.3786)	(1.8663)
L.ROA	-0.2366**	-0.3116**	-0.5650***
	(0.0974)	(0.1248)	(0.2132)
Observations	345	367	388
Time Fixed Effects	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes
R2-adj	0.4262	0.4757	0.4338

Table 7
Additional Robustness checks.

	(1) Model 1 LT_Debt Ratio	(2) Model 2 ST_Debt Ratio	(3) Model 3 TOT_Debt Ratio	(4) Model 1 LT_Debt Ratio	(5) Model 2 ST_Debt Ratio	(6) Model 3 TOT_Debt Ratio
Year*SBM_Score	0.0001***	0.0002***	0.0003***			
	(0.0000)	(0.0000)	(0.0001)			
year= 2018 *SBM_Score				0.1758*	0.2156**	0.3910**
				(0.1012)	(0.1010)	(0.1799)
year= 2019 *SBM_Score				0.3044**	0.3546***	0.6159***
				(0.1217)	(0.1237)	(0.2260)
year= 2020 *SBM_Score				0.2630***	0.3596***	0.5715***
				(0.0906)	(0.1144)	(0.1905)
year= 2021 *SBM_Score				0.2535**	0.3185**	0.5101**
				(0.1027)	(0.1341)	(0.2250)
L.SIZE	-6.2503***	-9.0676***	-14.0964***	-6.2559***	-9.0849***	-14.1070***
	(1.6374)	(1.9719)	(3.4366)	(1.6427)	(1.9795)	(3.4491)
L.EBITDA_MARGIN	0.1934***	0.2624***	0.4629***	0.1944***	0.2643***	0.4658***
	(0.0577)	(0.0709)	(0.1265)	(0.0578)	(0.0713)	(0.1272)
L.LIQUIDITY	-1.6057*	-2.9605**	-3.5685*	-1.6196*	-2.9752**	-3.5614*
	(0.9387)	(1.3563)	(1.9101)	(0.9410)	(1.3576)	(1.9081)
L.ROA	-0.2491***	-0.4074***	-0.6308***	-0.2488***	-0.4095***	-0.6345***
	(0.0940)	(0.1257)	(0.2047)	(0.0938)	(0.1262)	(0.2052)
Observations	360	383	404	360	383	404
Fixef Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes
r2_a	0.39	0.48	0.43	0.39	0.48	0.42

trend is likely driven by expectations of stricter policies and a growing awareness of the risks associated with climate change.

6. Conclusions, implications and future research lines

The 'sustainability challenge' represents a global issue that affects all companies, whether financial or non-financial, especially following the Covid-19 pandemic. Falling behind in this process of adaptation not only means losing a competitive advantage but also risking being pushed out of the marketplace altogether. This is true for banks, which are now being asked by regulators to rearrange all their main business processes (e.g., strategies, risk management, capital allocation, loan origination and monitoring, disclosure), adapting them to comply with specific ESG sustainability criteria. It is even more true, however, for non-financial firms, especially SMEs. These firms are a pillar of the European economy and a central player in value chains and community dynamics (Beck, 2013; Gomes and Pinho, 2023; Angilella and Mazzù, 2015). Thus, involving them in the sustainability process is vital to ensuring the success of the transition to sustainability in Europe. In addition, for SMEs, being included in the sustainability agenda is paramount to accessing key resources and opportunities, obtaining better financial conditions and entering into important partnerships (European Investment Bank-EIB, 2023).

Scholars have revealed that an increasing number of banks are starting to include ESG factors in their lending decisions (Scholtens, 2009; Goss and Roberts, 2011). Many financial intermediaries, facing the threats generated by ESG risks, tend to prefer lending to businesses that are more sustainable and, therefore, less risky (Weber, 2012). Academic research shows that this strategy is virtuous because granting credit to more sustainable companies creates value for banks in terms of a higher net interest margin and a reduction in default risk (Mirza et al., 2023). For these reasons, banks are also increasing their share of green operations by offering capital at lower cost to firms more compliant with environment goals (Attig et al., 2013; El Ghoul et al., 2018; Wellalage and Kumar, 2021).

Based on these considerations and the current empirical evidence, this paper provides results verifying a positive relationship between the adoption of more sustainable business models by SMEs and their access to bank credit in both the short and long term. Moreover, the results show that a greater commitment to sustainability enables non-financial firms to better support the cost of their debt. The empirical analysis, conducted on all listed Italian SMEs over the years 2017–2021, confirms both of our research hypotheses. The results of the regression study, run on 350–395 observations (unbalanced sample) and with a time lag of one year, show positive and significant relationships between each of the three main dependent variables and bank credit access by SMEs (long-term debt ratio, short-term debt ratio and total debt ratio) and the SBM score, which we developed to assess the level of specific sustainability criteria in firms' business models. Additionally, the relationship between this sustainability score and the interest coverage ratio is positive, showing that, the better the commitment to sustainability by SMEs, the greater their capacity to pay financial interests with EBITDA as income margins. Thus, the effect of the cost of bank debt on a firm's financial structure will likely be lower, resulting in an increase in SMEs' debt capacity.

These findings have useful implications both for SMEs, banks and regulators alike. SMEs can see that adopting more sustainability processes is no longer a mere regulatory duty but a key driver for accessing bank credit and thus overcoming the financial constraints (Berger and Udell, 2006; Álvarez Jaramillo et al., 2019). This becomes even more important in the current more restrictive conditions to access to credit. In turn, banks are encouraged to finance especially sustainable SMEs due to the higher capacity of these firms to efficiently support the cost of their financial interests and thus repay their bank debts (Bengo and Arena, 2019). Consequently, this

reinforces the bank–firm relationship and allows banks not only to comply with recent regulatory recommendations (EBA, 2020a, 2020b) but also to participate more actively and vigorously in the green transition. Finally, our analysis offers regulators new empirical evidence on the benefits of sustainability policies on the real economy and collective well-being. A stronger and more virtuous bank-firm linkage, in fact, underpins the ability of Central Banks to achieve the institutional objectives of price and financial stability and thus the overall economic prosperity (Dikau and Volz, 2021).

This study is limited to the Italian market and does not distinguish between loans granted by local and large banks, so we cannot know whether the positive effect of SMEs' sustainable business models on credit access is confirmed for both types of banks (Meslier et al., 2022). This, however, is a limit of the dataset that does not make this distinction. Regarding Italy, we consider that the characteristics of such a country (e.g., the high presence of SMEs and stringent regulatory framework regarding sustainability) make our empirical evidence sufficiently generalisable.

However, subsequent research developments could be aimed at analyzing whether the positive correlation found between sustainability performance and credit granted holds to the same extent for all three ESG factors or whether some factors are more relevant than others. Furthermore, it would be interesting to investigate not only the amount of credit granted but also whether the financing conditions (rates, guarantees) change when SMEs have a high sustainability performance.

Data Availability

Data will be made available on request.

Acknowledgments

Appendix 1 - Sustainability Business Model Score – SBM score (The Analysis Model)

Disclosure		
1	Length of non-financial Statement	If pages > average * pages = 1; if pages < average* pages = 0
2	Integrated Report	If yes = 1; if no = 0
3	Non-financial Statement (NFS)	If separated report = 1; if integrated report on operations = 0
4	Pages of economic section of NFS	If pages > average* pages = 1; if pages < average* pages = 0
5	Pages of environmental section of NFS	If pages > average* pages = 1; if pages < average* pages = 0
6	Pages of governance section of NFS	If pages > average* pages = 1; if pages < average* pages = 0
7	Pages of social section of NFS	If pages > average* pages = 1; if pages < average* pages = 0
Processes		
8	Sustainability plan	If yes = 1; if no = 0
9	Sustainability committee	If yes = 1; if no = 0
10	ESG short-term targets	If yes = 1; if no = 0
11	ESG long-term targets	If yes = 1; if no = 0
12	Environmental goals targets	If yes = 1; if no = 0
13	Social goals targets	If yes = 1; if no = 0
Governance		
14	Stakeholder engagement	If yes = 1; if no = 0
15	Forms of stakeholder engagement	If none = 0; if only 1 mode = 1; if more modes = 2
16	Emission_Intensity [(GHGScope1 +GHGscope2)/TOT employees)]	If > average* = 1; if < average = 0
17	Board gender diversity (% share of women on the board)	If > 33% = 1; if no = 0
18	Women managers	If > average* = 1; if < average* = 0
19	Gender pay gap disclosure	If present = 1; if no = 0
20	Adoption of sustainability remuneration targets	If yes = 1; if no = 0

Source: Authors' elaboration.

*The term 'average' means that, for all items of the analysis model, the corresponding average value computes for all sample firms.

Appendix 2 - Pairwise correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) LT_DEBT_RATIO	1.000								
(2) ST_DEBT_RATIO	0.941 *	1.000							
	(0.000)								
(3) TOT_DEBT_RATIO	0.978 *	0.979 *	1.000						

(continued on next page)

(*continued*)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(0.000)	(0.000)							
(4) ICR	-0.004	0.011	0.012	1.000					
	(0.931)	(0.822)	(0.796)						
(5) SBM_Score	0.045	0.018	0.031	0.121 *	1.000				
	(0.343)	(0.702)	(0.490)	(0.010)					
(6) SIZE	-0.503 *	-0.556 *	-0.523 *	0.153 *	0.373 *	1.000			
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)				
(7) EBITDA_Margin	0.058	0.024	0.033	-0.153 *	0.284 *	0.280 *	1.000		
	(0.225)	(0.605)	(0.461)	(0.001)	(0.000)	(0.000)			
(8) LIQUIDITY	-0.072	-0.111 *	-0.093 *	-0.200 *	-0.154 *	-0.098 *	-0.015	1.000	
	(0.128)	(0.016)	(0.036)	(0.000)	(0.001)	(0.028)	(0.742)		
(9) ROA	-0.010	-0.050	-0.036	-0.229 *	-0.078	-0.028	0.394 *	0.368 *	1.000
	(0.841)	(0.275)	(0.418)	(0.000)	(0.082)	(0.529)	(0.000)	(0.000)	

Notes: This table reports the correlation coefficients of all the variables used in the sample for SMEs Italian sector during the 2017–2021 time period.
Source: Stata16 Statistical Software.

Appendix 3. Sample distribution by regions

Regions	2017	2018	2019	2020	2021	Average no. of firms	Average in%
Emilia Romagna	17	17	21	20	20	19	15,73
Friuli-Venezia Giulia	2	2	2	2	2	2	1,66
Liguria	2	2	1	1	2	1,6	1,32
Lombardia	51	49	46	43	45	46,8	38,74
Piemonte	8	7	7	7	7	7,2	5,96
Trentino-Alto Adige	1	1	2	2	2	1,6	1,32
Veneto	12	10	12	12	13	11,8	9,77
Lazio	18	17	16	16	16	16,6	13,74
Marche	3	3	3	3	3	3	2,48
Toscana	6	6	6	6	6	6	4,97
Umbria	1	1	1	1	1	1	0,83
Campania	1	1	2	2	2	1,6	1,32
Puglia	1	1			1	1	0,83
Sardegna	2	2	2	2	2	2	1,66
Total	125	119	121	117	122	120,8	100

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