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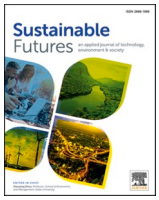

Sustainable small business lending

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ABSTRACT

Banks are the main source of external funding for small businesses. Thus, integrating sustainability considerations in small business lending can support global sustainability efforts. In surveying German banks, I show that banks are in the process of implementing sustainable small business lending. They put more emphasis on sustainability risks than on the transformation of the business model among small businesses. Sustainable relationship lending has some relevance in creating sustainability-related soft information, although respective hard information is preferred by banks. Banks and policymakers can use the findings to better apply sustainable small business lending to sustainability and resilience efforts.

1. Introduction

Sustainability[1] has become a central objective in economic development and economic transformation around the world. This has two-fold consequences for the financial sector. First, financial institutions need to integrate sustainability information in their assessment of the financial value of assets. Second, financial actors are increasingly being pressured to become, and also to portray themselves as, enablers of sustainable economic transformation[48]. contrasts those consequences as the value (financial effects) versus the values (non-financial considerations) perspectives.

These developments affect banks' small business lending activities. Banks are the main external source of financing for most small businesses (e.g., [14]). As such, they can facilitate the sustainable transformation of business models among small businesses, while also being exposed to their sustainability risks. Traditional small business lending concepts such as relationship lending and soft information generation (e.g. [9,11]) may evolve, and novel concepts such as the provision of sustainability advisory networks or the provision of sustainability tools [16] may emerge. In this paper, I discuss the concept of sustainable small business lending that encompasses these aspects. For European banks, sustainable small business lending can affect more than half of its business lending portfolio [41].

Sustainable small business lending has the potential to make significant contributions to broader sustainable transformations and to improve economic resilience to sustainability effects due to the relevance of small businesses. In the case of the European Union (EU), small businesses represent a substantial portion of employment (64%), company count (>99%), and economic value added (52%). Small businesses also contribute significantly to environmental impacts. The share of small businesses in the carbon dioxide emissions of all EU companies is 63% [26].

Given this importance, banks and policy makers are increasingly communicating the need to work with small businesses in the context of sustainable finance (e.g., [27] and [16]). However, the literature does not provide a framework or empirical evidence for the effective implementation of sustainable small business lending. Therefore, the primary objective of this paper is to assess the current state of sustainable small business lending, first, by bringing together the sustainable finance literature with the small business lending literature, and second, by conducting a survey among German banks to evaluate whether and how sustainable small business lending practices are currently being implemented. In doing so, the paper expands the sustainable finance literature by adding relevant aspects of the small business lending literature.

The results of the survey show that banks are in the process of implementing sustainable small business lending practices. However, banks report greater progress in implementing sustainable finance practices for larger and capital market-oriented clients. Banks place

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[1] Throughout the paper, I define sustainability as contributions to environmental, social and governance (ESG) goals and resilience towards ESG risks.

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Table 1
Sustainable small business lending.

		Sustainable Finance	
		Value	Values
Small Business Lending	**Transaction Lending**	**Quantification** of sustainability risks → **credit condition** adjustments	**Quantification** of counterparty sustainability → **in-/exclusion** based on fitness with own values
	Relationship Lending	Sustainability risk analysis of counterparty **business model** → **flexible terms** for business model development	Analysis of counterparty sustainability **strategy** → sustainability **objective alignment**

This table summarizes the intersection of the sustainable finance literature and the small business lending literature using value vs values and lending technologies, respectively, to represent each literature.

greater emphasis on the value and risk perspective over transformation and values considerations in their efforts to implement sustainable small business lending. This becomes visible when comparing implementation timelines of different value and values use cases.

The results also highlight the relevance of sustainable relationship lending. A majority of banks use or implement sustainability-related dialogues with small businesses. Client interaction seems to be a relevant tool for collecting sustainability-related soft information from small businesses, that is, unmeasured or hardly measurable sustainability information. Still, banks show a preference for sustainability-related hard information, that is, measured sustainability data.

The findings have implications for banks and policymakers. Banks can use the findings to structure and adjust their sustainable small business lending practices. Furthermore, the banking industry may need to revise its communication on its role in supporting the transformation of economic activities by small businesses. Policymakers can use the results to shape sustainable finance policies for small business lending by incorporating the tendency of banks to follow value- and risk-oriented practices. They may support this development and formulate policies that allow banks to establish values-supporting activities for small businesses as part of broader efforts to achieve sustainability objectives.

The remainder of the paper is organized as follows. Chapter 2 adds elements of the small business lending literature to the sustainable finance literature. Chapter 3 details the survey design and the characteristics of the respondents. Chapter 4 presents the survey results, addressing the following issues: the perception of sustainable finance by banks generally, the role of each value and values in sustainable small business lending, and the link between relationship lending and sustainable small business lending. Chapter 5 concludes.

2. Literature

Banks can support the shift toward sustainability in the economy and help mitigate sustainability risks through their financial intermediation function. This role is increasingly discussed in the literature on sustainable finance. Typically, banks represent the main external source of financing for small businesses, discussed in the literature on small business lending. Here, I combine both strands of literature by adding elements of small business lending to sustainable finance.

2.1. Sustainable finance: Value versus values

Sustainable finance is a rapidly evolving field in both academia and practice. The definitions of what constitutes sustainable finance are diverse[48]. attempts to bring nuance to the debate by contrasting the 'value' with the 'values' perspective. Value refers to how sustainability aspects influence a financial institution's assets, accounting for risks and opportunities, that is, pecuniary aspects of sustainability. Values, on the contrary, integrate ethical considerations and non-pecuniary preferences like climate change mitigation into decision making, sometimes at the expense of returns. These concepts apply to bank lending.

In banking, evaluating sustainability-related value aspects of firm lending can affect credit conditions. Banks may charge different interest rates, change collateral requirements, introduce additional covenants, or decide not to provide capital at all. This is empirically observable, since banks have begun to price policy risks and policy uncertainty associated with climate change, in the form of carbon premiums on the Scope 1 emissions of firms (e.g., [33] and [24]) and exposure to stranding risks [15]. Firm-level credit ratings also increasingly reflect their environmental performance [47].

The values perspective encompasses the bank's pursuit of sustainability targets as part of its lending strategy. Recently, many banks have publicly announced their support for climate and biodiversity targets by becoming signatories to respective initiatives, e.g., the United Nations Environment Program Finance Initiative (UNEP FI) Net Zero Banking Alliance. The operationalization of these objectives could involve engaging with clients, building green portfolios, and excluding non-sustainable activities [50]. The first evidence on values activities by banks suggests that banks can positively influence sustainability behavior by firms [32]. European banks allocate capital away from carbon-intensive activities [43]; however, without affecting the underlying economic activities [34]. The evidence on the effect of dedicated sustainable lending products on increasing sustainability in the economy is mixed. [28] finds positive signaling effects by firms through green bond issuances and [40] find positive effects of green bond issuances on firm environmental, social and governance (ESG) ratings[5]. find no effect of sustainability-linked loans on firm environmental performance. If client dialogue by banks is as effective as investor engagement (e.g. [20,30] and [45]), it is likely to be an effective channel for values support by banks.

2.2. Sustainable small business lending

So far, small business lending, that is, lending activities to predominantly unlisted and often informationally opaque firms with limited numbers of employees ([13,42], and [9]), has not been discussed in the literature on sustainable finance. This is despite the relevance of small businesses for sustainability. They are responsible for 63% of the firm emissions in the EU [26]. They account for more than half of business lending in the European Union [41] and are mainly dependent on bank lending. The importance of small businesses for banks, the economy, and sustainable economic development makes sustainable small business lending inevitable.

Usually, banks employ two technologies in small business lending [11]:

- Transaction lending, where banks use automatic processes to provide credit. This method relies on 'hard' information, such as financial statements and credit scores.
- Relationship lending, where small businesses and banks develop long relationships. This type of technology helps firms access credit that lack formal financial data and, thus, are informationally opaque to the bank [38]. Usually relationship lending generates 'soft' information, that is, non-quantified or non-quantifiable information about the firm through the relationships.

Table 1 illustrates the potential dynamics between the two lending

Table 2
Bank and respondents characteristics.

Bank Type (N = 62)		**Significant Institutions (N = 62)**	
Savings	35.5%	Less Significant Institution	77.4%
Cooperative	33.9%	Significant Institution	14.5%
Public	16.1%	not applicable	8.1%
Private	14.5%		
Climate commitment (N = 62)		**Listed bank (N = 58)**	
No	51.6%	Unlisted	89.7%
National	45.2%	Listed	6.9%
International	3.2%	Delisted	3.5%
Bank size employees (N = 58)		**Gender (N = 61)**	
Medium	60.3%	Male	70.5%
Large	29.3%	Female	29.5%
Small	10.3%		
Department (N = 62)		**Level (N = 62)**	
Strategy	33.9%	Technical expert	38.7%
Risk management	30.7%	Senior management	29.0%
Market department	16.1%	Middle management	27.4%
Risk controlling / back-office	16.1%	C-level	4.8%
Regulatory affairs / compliance	3.2%		

This table presents a summary of the characteristics of the banks and the respondents in the final sample of 62 banks. The categories under 'Bank Type', 'Significant Institutions', 'Climate commitment', 'Listed bank', 'Bank size employees', 'Gender', 'Department', and 'Level' represent the distribution of these characteristics within the sample. The percentages are calculated on the basis of the total number of responding banks in each category. Missing or incomplete data are not represented in the percentages. 'Significant Institutions' and 'Climate commitment' are hand-collected from the ECB and bank websites. 'Listed bank' and 'Bank size employees' are based on data from BvD Orbis where some banks' data are not available. 'Bank size employees' is classified as follows: 'Small' if = <250 employees, 'Medium' if 251 - 1000 employees and 'Large' if >1000 employees.

technologies and sustainable finance represented by the perspectives 'value' and 'values'. It highlights that, regardless of the sustainable finance perspective and lending technology, there is potential for interaction between both strands of literature.

The value perspective of sustainable small business lending involves banks understanding the sustainability risks of their small business clients. For transaction lending activities, this primarily means that banks find quantifiable measures for counterparty risk, for example, by surveying their small business clients or by running their own analyzes. Based on this information, a reassessment of risk and adjustments to credit conditions could follow. Relationship lending allows banks to understand the risks associated with the sustainability of the business model more strategically, partially avoiding the challenges of measuring sustainability [23]. Relationship lending could also allow for more flexibility in adjusting credit conditions ([12] and [46]).

Small business lending could contribute to values creation by providing financial and non-financial resources to small businesses to transform their business models. Values-alignment is inevitable if banks are to meet their sustainability commitments. Banks trying to achieve their own sustainability goals can use different alignment strategies depending on the deployed lending technology. Transaction lending is likely to produce more automatic capital shifts away from small businesses that do not match the banks' own values and toward those that do, leading to a capital shift as observed by [43]. Relationship lending, in contrast, is likely to result in more strategic approaches to align sustainability objectives, as suggested by industry publications (e.g., [16] and [50]).

Banks could assign a special role to sustainable relationship lending. Information asymmetries and opaqueness will remain an issue, as sustainability-related disclosure regulations primarily target large firms [27]. Long and established lending relationships could help banks understand sustainability-related aspects in small businesses, particularly through client dialogue. Relationship lending could benefit banks and small businesses as downside risks resulting from sudden sustainability-related policy changes could be lower for firms financed through the relationship channel ([6,12] and [46]). On the values side, relationship lending could contribute to the transition of business models, as it is positively associated with innovation and operational efficiency ([31] and [51])[2].

The discussion of both strands of literature shows the potential dynamics of sustainable small business lending. So far, empirical evidence on these dynamics has been largely absent.

3. Survey

To evaluate whether and how sustainable small business lending practices are currently being implemented, I conducted a survey among German banks. Due to the field's nascence, archival data on sustainability in small business lending are scarce, creating the need for primary data collection. Surveys are regularly used in sustainable finance research to understand the positioning of stakeholders in nascent areas (e.g., [36,49] and [3]).

3.1. Survey development & delivery

The development of the survey is based on the literature and expert judgment from exchanges with banks, industry experts, and scholars. The first draft of the survey was developed mainly based on the dynamics in Table 1. In an iterative process, it was refined with practitioners and scholars. The final version of the survey was tested for clarity with additional practitioners. Despite the preparatory steps, some participants struggled to distinguish the response options "under implementation" and "within less than six months" for timeline-related questions. Therefore, these are shown as "(near) implementation" throughout the paper. See Appendix A for the final survey instrument.

The survey was structured into three parts. In the first part, personal data were collected from participants. The survey participants were asked to name their employer, while their own name remained anonymous. Although this might create bias towards favorably answering questions, this decision was deliberated to add more data ex post to the survey results and reduce the questions to proprietary information only, that is, reducing the overall length of the survey with the prospect of a higher response rate. In addition, the names of the banks allowed me to ensure that each bank participated once. The second part of the survey was designed to understand to what extent banks have made progress in integrating sustainable finance aspects into their business among all client groups and departments, and the perceived relevance of the topic. The third part was a deep dive into sustainable small business lending practices. Throughout the survey, small businesses were defined as unlisted firms with fewer than or equal to 250 employees.

The survey was sent to banks operating in Germany. The German financial system and economic structure of the countries appear to be well suited to test sustainable small business lending. The German economy is heavily bank-financed [7], increasing the relevance of bank lending for sustainable finance compared to other large economies. Germany's Mittelstand is often dubbed the 'backbone' of its economy, and small businesses represent a major share of economic output, also in sectors of high relevance for environmental and social sustainability, such as manufacturing and construction [35].

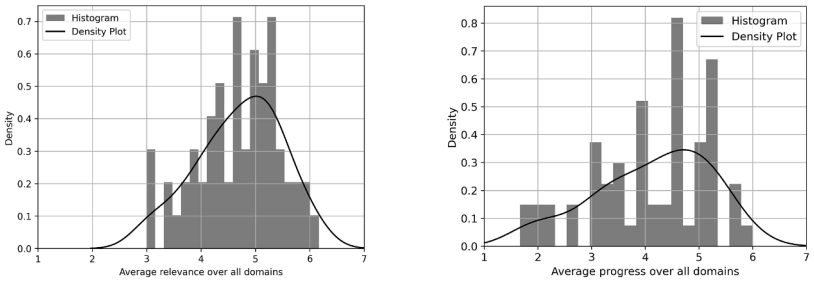
To deliver the survey, two employees from each of Germany's 314 largest banks by balance sheet size were identified with job titles that included Environmental, Social and Governance (ESG) or Sustainable

[2] Increasing lending distances (e.g., [19] and [2]) are unlikely to diminish these effects, as distances increase primarily for small transactional lending activities [1].

Table 3
Bank financials.

	count	mean	std	min	25%	50%	75%	max
Tier 1 ratio (%)	53.0	15.63	3.81	10.13	13.72	15.07	16.22	36.09
Profit margin (%)	57.0	17.32	12.18	-28.66	12.21	15.76	21.71	56.81
Return on assets (%)	58.0	0.20	1.11	-7.83	0.23	0.34	0.44	1.01
Total assets (bn USD)	58.0	52.56	171.07	0.40	4.90	7.48	16.12	1082.41
Loans on book (bn USD)	58.0	23.63	66.05	0.00	2.90	4.92	10.51	415.67

This table provides a statistical summary of key financial indicators for the final bank sample, with data sourced from BvD Orbis. It includes data for 58 of the 62 responding banks, although the count for each financial indicator varies slightly as indicated in the 'count' column. The financial indicators are the Tier 1 ratio, profit margin, return on assets, total assets, and loans on book. For each indicator, the table presents the counts (number of banks for which data are available), mean, standard deviation (std), minimum (min), 25th percentile (25%), median (50%), 75th percentile (75%) and maximum values (max). These metrics provide an overview of the financial health and performance of the banks in the sample. All values are based on an average of vales per bank for the period 2019 - 2021 to close data gaps and reduce the influence of one-off effects on the data.



(a) Relevance of implementing sustainable finance

(b) Progress in implementing sustainable finance

Fig. 1. Importance of sustainable finance for participating banks.

Finance, paired with risk management, C-suite titles (CFO and/or CRO), or strategy. This focus was chosen to ensure that employees have the capacity to answer the questions, as exchanges with banks show that these departments steer the implementation of sustainable small business lending projects. Names were collected by hand through LinkedIn, Xing[3] and the banks' websites. The list of banks contacted can be provided upon request. The selected employees were contacted in three waves:

1. Initial email: All employees were contacted by email at the beginning of August 2023.
2. Reminder email: After two weeks, a reminder email was sent to all employees whose bank did not participate until that point.
3. Follow-up by phone: After another three weeks, employees of banks who had started but did not finish the survey and large German banks who did not respond until then were contacted by phone.

The survey was shared in German and made available through the survey tool 'Qualtrics'. The last response was collected at the end of September 2023.

3.2. Response & bias

The response rate to the survey was high. More than 200 participants started the survey, and 77 participants completed it. I manually checked each completed response to remove double responses from banks (1 observation) and banks without small business lending activities (14 observations). The final sample includes 62 banks. This is a final bank response rate of 19.8%[4] All participating banks have their headquarters in former West Germany; see Appendix B for a map. Table 2 shows the characteristics of the participating banks.

Compared to the German banking landscape, responding banks tend to be larger and more advanced in sustainable finance. The potential size bias is reflected in the high share of significant institutions[5], which represent 14.5% in my sample compared to 5.2% in Germany according to the [21] list of significant institutions. This is also reflected in the distribution of bank types with an overly strong representation of savings banks (35.5% to 24.8%) and public banks (16.1% to 1.7%) banks and a low representation of cooperative banks (33.9% to 50.5%) compared to figures of [17]. Almost half of the participating banks (48.4%) have signed a voluntary climate commitment. Although official figures do not exist on the share of banks having signed such a commitment in Germany, this number appears high. Follow-ups by phone (wave three of the survey distribution) revealed that some banks stopped responding to the survey because they did not feel advanced enough in their sustainable finance integration to answer the questions appropriately. Therefore, the survey results could bias towards the more advanced banks in sustainable finance compared to the German banking sector.

The survey participants predominantly work in strategy (33.9%) and risk management (30.7%) departments, indicating that the contacted employees responded. Technical level employees (38.7%), middle management (27.4%) and senior management (29.0%) responded mainly, but also the C-level management participated in the survey (4.8%). Entry-level employees did not participate. More responses come from men (70.5%), which is representative of the gender distribution in the German banking sector compared to the coverage of the topic in the media. The decision to contact employees working on sustainable finance might have biased the relevance of sustainable small business lending upward due to relevance to their own work and, potentially,

[3] Xing is a platform for professionals which remains quite popular amongst German employees.

[4] This response rate is calculated by dividing the number of final banks in the sample over all banks contacted.

[5] Significant institutions are those banks who are under direct supervision by the ECB.

Table 4
Relation of relevance and progress to aspects of sustainable small business lending.

	(1)	(2)	(3)	(4)	(5)	(6)
Progress	4.0***	0.4*	0.6***	-0.3	-0.7**	-0.6***
	(1.5)	(0.2)	(0.2)	(0.2)	(0.3)	(0.2)
Relevance	1.3	-0.0	0.1	0.1	0.3	0.5*
	(1.5)	(0.2)	(0.2)	(0.3)	(0.3)	(0.3)
Return on assets	11.4**	-0.4	-1.0*	-0.5	0.5	-1.0
	(5.2)	(0.7)	(0.6)	(0.7)	(1.0)	(0.8)
Tier 1 ratio	-1.0**	-0.1*	-0.1***	-0.0	0.1***	-0.0
	(0.5)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
log(total assets)	0.3	-0.1	-0.3	0.0	0.2	-0.4***
	(0.8)	(0.2)	(0.2)	(0.1)	(0.2)	(0.1)
Department FE	Y	Y	Y	Y	Y	Y
Observations	53	51	51	52	47	50
Adjusted / Pseudo R^2	0.59	0.14	0.36	0.01	0.12	0.23

The table reports the relationship between the dependent variables that are of interest for the subsequent discussion and the relevance and progress indicators. Independent variables are: (1) Effect on credit for small businesses today (Question II-4-b), (2) Perceived ESG risk in small business lending portfolios today (Question III-1-a), (3) Expected ESG risk materialization over more than two years (Question III-1-c), (4) Timeline to implement transition risk analysis (Question III-2-a), (5) Timeline to implement ESG related management of small business portfolios (Question III-2-g), and (6) Timeline to implement sustainability-related client dialogue (Question III-2-f). Control variables are bank size and thus relevance of small business lending (represented by logarithmic (total assets)), profitability (represented by the return on assets), financial health (represented by tier 1 ratio) and respondents' department fixed effects. All regressions are ordinary least squares except (1), which is logit due to the binary nature of the independent variable. Note that timelines are shown on an inverted scale, that is, most progress equals 1 whereas least progress equals 5. Therefore, a negative statistical relationship indicates a positive relationship. The results show heteroskedasticity-consistent standard error estimators based on [39]. *p<0.1; **p<0.05; ***p<0.01

their belief system. In addition, some respondents might suffer from social desirability or recency bias, again biasing the results toward more progress in the implementation than is actually achieved.

The availability of bank names allows me to match the bank financial data with the survey results. I retrieved the data from the Bureau van Dijk (BvD) Orbis Financials for Banks database after manually matching bank names with BvD Orbis identifiers. Data are available for most of the banks in the sample; see Table 3. I take a three-year average of the data (2019–2021) as one-year cross sections contain a higher number of missing values and to smooth potential one-off effects in the data. The data show that the sample includes banks with all levels of financial strength. Key ratios such as the Tier 1 ratio appear representative compared to [22]. The sample contains 34.4% of the total German banking assets in 2021 (relating the figures in my sample to figures by [18]) and therefore represents a major share of German banking assets. Note that the estimate of this share is conservative as figures by Bundesbank include banks without small business lending operations.

4. Results & discussion

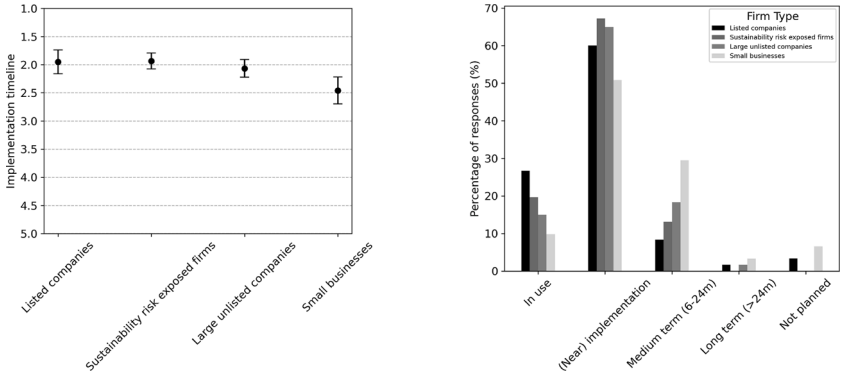
The results of the survey show that banks are in the process of implementing sustainable small business lending. I discuss the results along the questions how banks have progressed in implementing sustainable finance in general, how they are implementing the value and the values channels in sustainable small business lending, and how relationship lending and sustainability are linked.

4.1. How do German banks perceive sustainable finance?

First, I assess how banks perceive the relevance of sustainable finance and how they progress in implementing sustainable finance throughout the bank. This step helps contextualize subsequent responses to the survey in the banks' overarching view on sustainable finance. In the survey, banks were asked to evaluate the relevance of sustainable finance data for their bank (Question II-1), for example, ESG ratings in risk management, and the banks' progress in using sustainability data (Question II-2), such as ESG data integration in product development. For both relevance and progress, banks rated themselves on a scale from 1 (low relevance / progress) to 6 (high relevance / progress) in the following domains: risk management, strategy, reporting, product sales, product development, and client dialogue. By averaging the responses from the different domains, I construct a relevance and a progress indicator for each bank; see Fig. 1.

Fig. 1 indicates that all participating banks consider sustainable finance to be relevant, with a majority rating it highly relevant. The progress indicator presents a more heterogeneous picture. Some banks report substantial progress, others report minimal progress. The progress indicator is likely biased towards more progress due to the survey setup and the respondent characteristics, see Chapter 3.2. Therefore, unbiased results would likely show a more left-skewed picture.

Progress but not relevance also affects how banks answer subsequent questions; see Table 4. Banks that have made more progress in sustainable finance are more likely to adjust credit conditions for small businesses and expect a higher level of sustainability risk to materialize. Not surprisingly, these banks are also more advanced in implementing specific sustainable small business lending use cases. For example, being one category more advanced on the progress score is related to being 0.7



(a) Aggregated view (b) Disaggregated bar chart view

Fig. 2. Timeline of sustainable finance integration by different firm types Figure (a) and (b) show the same data in different formats. Figure (b) reports the raw data whereas figure (a) shows the data aggregated by type of firm with 95% confidence interval. The values 1 to 5 are assigned based on the categories shown in (b) (e.g., 1 = 'In use'). A value of 2 in figure (a) indicates that on average, banks are '(Near) implementation'.

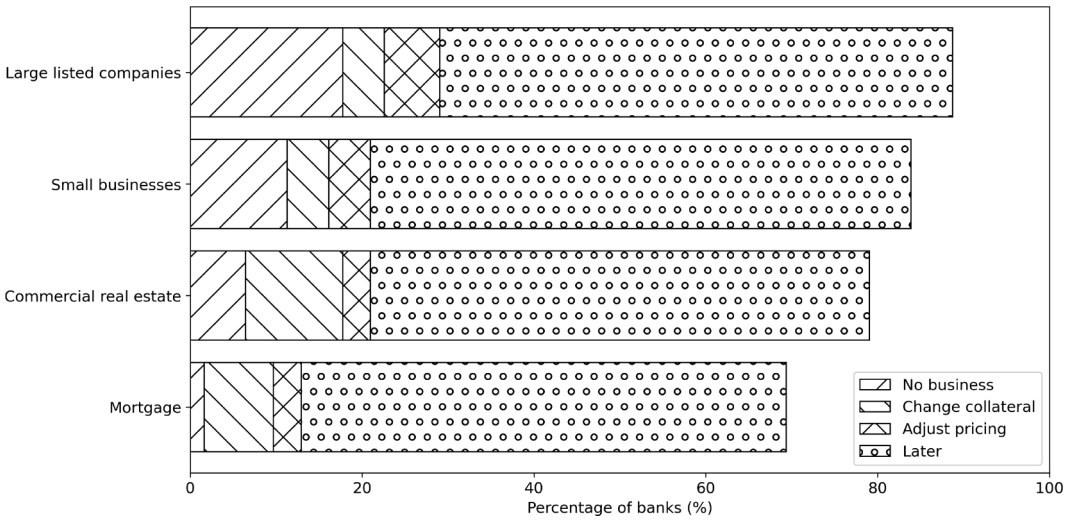


Fig. 3. Sustainability aspects in credit decisions by firm type.

categories more advanced in implementing client dialog. Hence, banks making general progress on the implementation of sustainable finance also progress on the implementation of sustainable small business lending activities with an elasticity of 0.3 to 0.7. This finding underscores a general consistency in responses throughout the survey while pointing to some variation in the sample.

In the regressions of Table 4, I control for the return on assets, the Tier 1 ratio, and the logarithm of total assets for the following reasons. More profitable banks might be able to invest more in their sustainability strategy [4], which I control for using Return on Assets. The Tier 1 ratio, a measure of the financial health of a bank, ensures that the financial stress of bank does not affect the results [29]. Finally, Total Assets control for the relevance of small businesses for the banks business model as small business lending is more relevant for smaller banks [10].

The survey then inquired about the timing of the integration of sustainable finance between different types of companies, including listed and unlisted large companies, firms with high exposure to sustainability risks, and small businesses (Question II-3). To proxy the timelines with a tangible issue for practitioners, banks were asked about the timing of applying ESG data across these types. The results in Fig. 2 show that the implementation is ongoing for all types of firms. However, small business lending is noticeably behind[6]. This appears to be a matter of timing rather than relevance of small business clients for sustainable finance among participating banks. Fig. 2 (b) shows that only a small share of banks do not plan to integrate sustainable finance into their small business lending operations. However, the one- to two-year difference in the rollout of sustainable finance could affect small businesses implementation of value and values aspects in their business models with potential repercussions for the banks' resilience and sustainability strategy.

Finally, I explore whether and how sustainability considerations influence banks' credit supply today measured as forgone business, changes to demands for collateral, and adjustments to credit pricing (Question II-4). Banks were asked to report any changes in their lending practices due to sustainability aspects in various types of credit, including credit to large companies, credit to small businesses, commercial real estate lending, and mortgages.

Fig. 3 shows that banks have changed credit supply to large companies slightly more than in other lending activities[7]. Some banks have already begun to adjust the credit supply to small businesses (21.0%). For both large corporations and small businesses, excluding business is currently the preferred strategy for banks to deal with sustainability aspects. This is in line with [43] who show that European banks allocate capital away from carbon-intensive industries. A majority of banks anticipate changes in credit conditions in the future (62.9% in the case of small businesses). Firm lending appears to be potentially more affected than mortgages, although mortgages are also potentially exposed to sustainability risks such as climate risks [25].

The first set of questions establishes that sustainable finance is important for banks. They are actively working toward its integration and anticipate that it will alter their credit supply to clients, including small businesses. Although progress on lending activities to large and capital market-oriented firms is larger, the findings underscore the growing relevance of sustainable small business lending in the banking industry.

4.2. *What is the role of value in sustainable small business lending?*

Risk management increasingly encompasses understanding sustainability-related risks, that is, understanding value aspects. From the survey, I find that banks expect sustainability risks to increasingly materialize over time in small business lending portfolios and are in the process of implementing risk management instruments in small business lending.

To explore how banks perceive the effect of materialization of sustainability risk in their small business lending portfolios, banks were asked to rate the effect of ESG risks on their small business lending today, over the next two years, and beyond the two years (Question III-1), on a Likert scale from 1 (low) to 6 (high). The findings in Fig. 4 indicate a moderate perception of sustainability risks in small business portfolios today, with expectations of an increase in the medium to long term[8] This highlights the relevance of implementing value-based approaches for small business lending throughout the banking sector to manage these risks. The increase in anticipated risk is independent of the perceived relevance of sustainable finance by banks, but significantly

[6] The differences in means between small businesses and all other firm categories are statistically significant. The respective p-values for the t tests and the Mann-Whitney U tests are the following: for large firms p=.00 and p=.00, for firms with high sustainability risk exposure p=.00 and p=.00, and for unlisted large firms p=.01 and p=.02.

[7] The remaining empty space in the figure is due to the answers 'no adjustment expected' and 'don't know'.

[8] Differences between perceived risk today and expected risks in the future are statistically significant at p=.00 for t-tests and Mann-Whitney U tests.

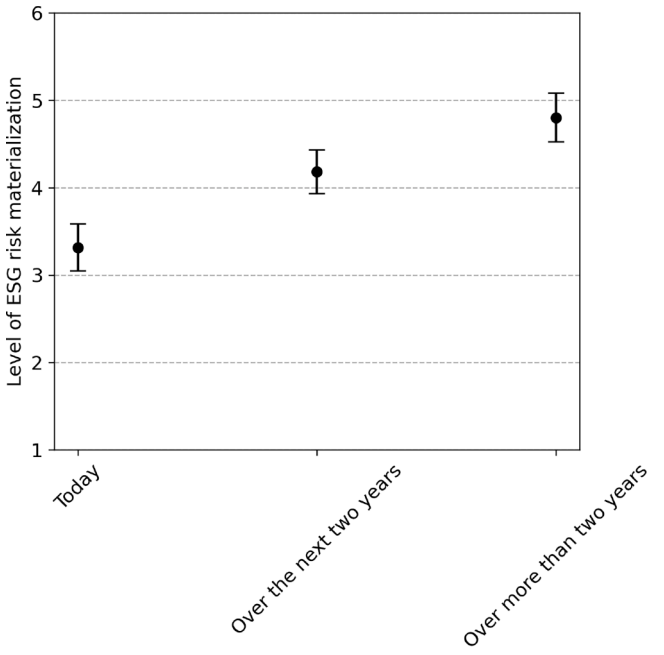


Fig. 4. Expected materialization of sustainability risks in small business lending over time.

positively related to progress (see Table 4). This could be interpreted as higher levels of implementation, and thus a better understanding of sustainability aspects, resulting in higher risk perception, or vice versa, as higher perceived risks motivate banks to progress faster in their value implementation.

Sustainability risks can be assessed using different instruments, such as transition risk analysis, physical risk analysis, sustainability-related stress tests, implementation of internal ESG ratings, and risk adjustments in models based on sustainability aspects. I inquire about the implementation timelines of the instruments for small business lending (Question III-2). Some banks use these instruments today for their small business lending, while most banks are implementing or planning to implement them within the next 24 months, see Fig. 5. Risk analysis and stress testing are more advanced, probably due to regulatory emphasis.

Internal ESG ratings and risk adjustments in models based on sustainability aspects are less advanced. 20.0% of the participating banks

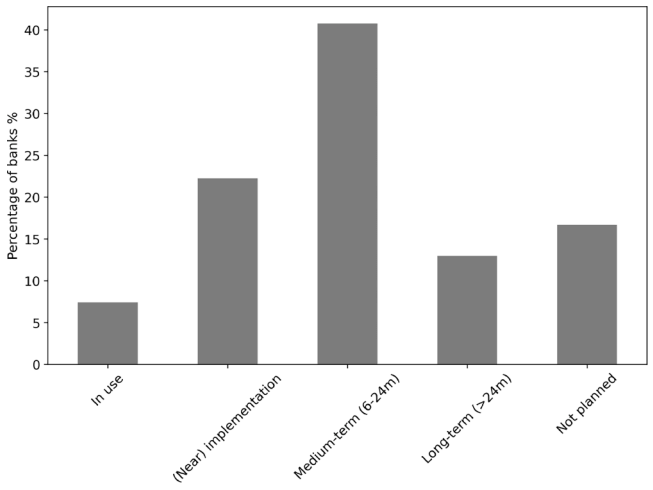


Fig. 6. Implementation timeline of sustainability-related management of small business lending portfolios.

do not plan to implement internal ESG ratings, contrasting with the widespread use of these ratings in asset management and corporate banking [8]. This discrepancy raises questions about the applicability of ESG ratings for small business portfolios, given the lower economies of scale that external ESG rating providers can expect when supplying such ratings.

In summary, banks expect a significant increase in the materialization of sustainability risks, highlighting the relevance of value aspects for sustainable small business lending. Progress in implementing specific use cases is advanced but not uniformly, with regulatory-driven use cases slightly ahead of others.

4.3. *What is the role of values in sustainable small business lending?*

Banks are increasingly claiming to work toward sustainability goals, such as climate action and biodiversity restoration, and have made commitments to these objectives [50]. This raises the question whether these commitments and other values initiatives by banks affect small business lending and how they support small businesses transforming business models in line with sustainability objectives.

Banks were asked about their progress in implementing sustainability-related portfolio management in small business lending

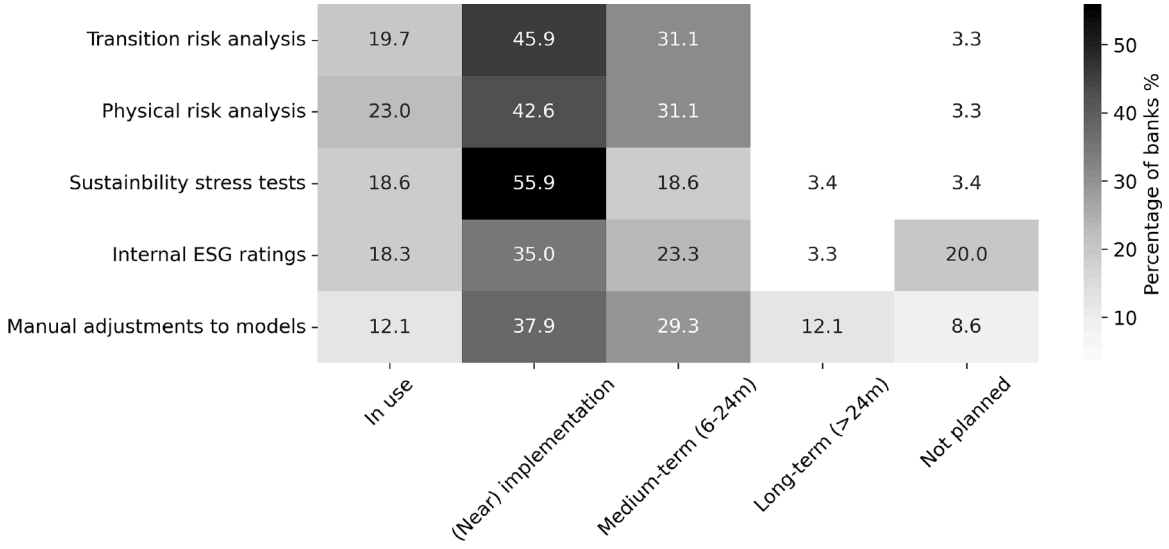
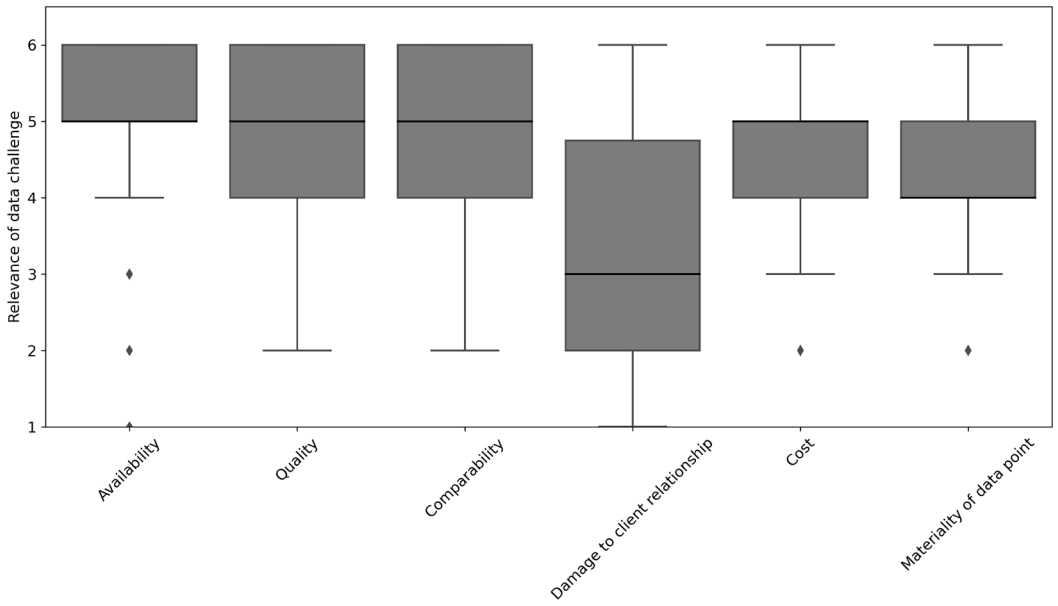
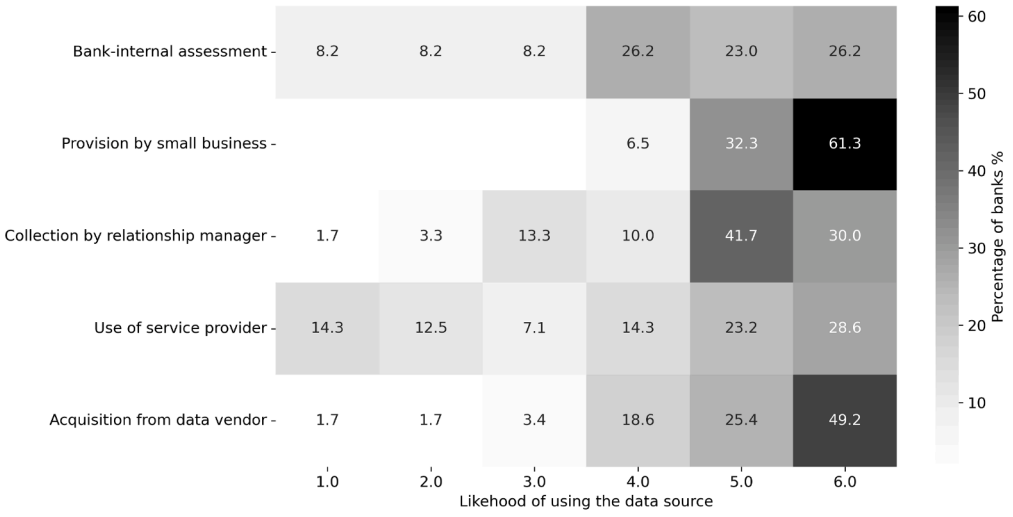


Fig. 5. Timeline for implementing different instruments for value assessment in small business lending.



(a) Data challenges



(b) Likely data sources

Fig. 9. Sustainability data challenges and sources.

(Question III-2-g). Banks could implement this by tilting the small business lending portfolio towards or away from small businesses with specific sustainability characteristics, potentially affecting liquidity and capital costs for small businesses. Fig. 6 shows that only a minority (7.4%) of banks are currently using or implementing (22.2%) such approaches. Surprisingly, 29.6% of the banks consider it a long-term issue or do not have implementation plans. This low usage rate is notable, especially compared to the rate of changes in credit supply (recall Fig. 3), which potentially implies that credit supply is affected primarily through the value channel and not the values channel. The lack of sustainability data from small businesses could also play a role (see Fig. 9).

Next, I explore the level of relevance of values in sustainable small business lending practices. Several use cases that would position banks as enablers of the transformation of small businesses were examined. Those include support in the development of transition plans, scenario analysis as a service for small businesses, provision of internal and external advisory services, provision of data and tools, and supply of sustainable financial products such as green loans, sustainability-linked loans, as well as financing of sustainability-related research and development (Question III-6).

Fig. 7 shows that while most of these use cases are somewhat relevant, their relevance is heterogeneous. Banks seem to prioritize financing activities over additional advisory services. This means that banks focus on their core business instead of developing auxiliary products and services. Within these additional services, some, such as external advisory services, are considered more important than others, such as transition plan development or scenario analysis. With research pointing to a mixed effect of dedicated sustainability products on increasing sustainability among financed firms ([5,28]), the effectiveness of the values channel in sustainable small business lending remains opaque. This puts into question whether banks actively support sustainability integration in the small business segment.

Finally, Table 5 shows that climate commitments by banks, which are a public communication of the climate mitigation values, have little

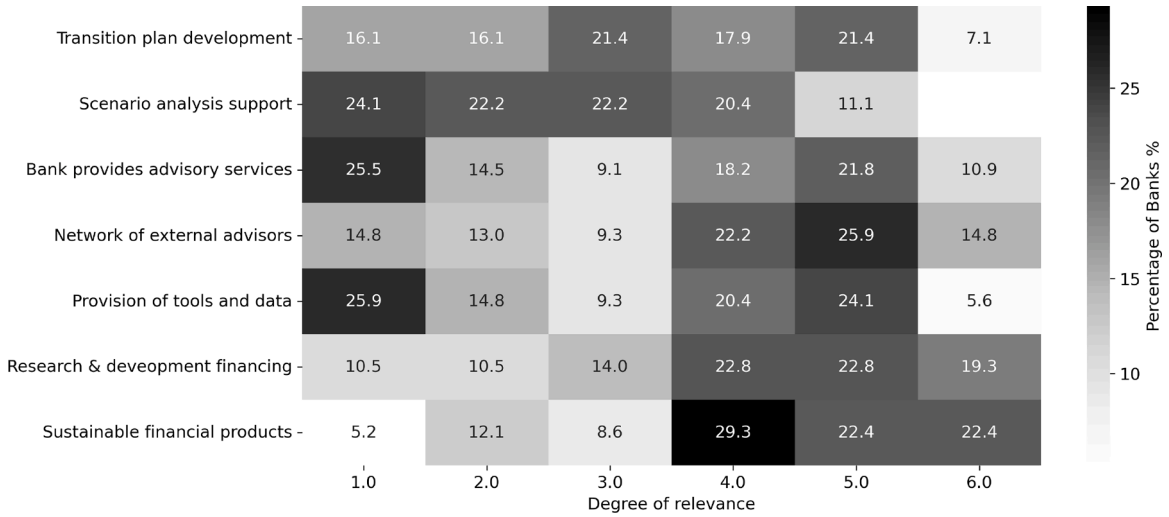


Fig. 7. Relevance of values activities for sustainable small business lending.

Table 5
Effects of climate commitments on values integration in small business lending.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Climate commitment	-0.6	0.4	0.1	0.6	0.8	1.1**	0.4	-0.0
	(0.4)	(0.4)	(0.4)	(0.6)	(0.5)	(0.4)	(0.5)	(0.6)
Progress	-0.4*	0.5*	0.3	0.1	0.3	0.2	0.0	0.4
	(0.2)	(0.3)	(0.3)	(0.3)	(0.4)	(0.3)	(0.3)	(0.4)
Return on assets	0.3	-1.3	-1.4	-1.7	-1.2	-0.8	0.2	0.4
	(1.1)	(1.4)	(1.0)	(1.4)	(1.3)	(1.0)	(1.5)	(1.2)
Tier 1 ratio	0.1***	0.0	-0.1	-0.0	0.0	-0.1**	0.1*	-0.0
	(0.0)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)
log(total assets)	0.1	-0.4	-0.5**	-0.4	0.0	-0.4*	0.3	0.3
	(0.2)	(0.3)	(0.3)	(0.4)	(0.3)	(0.2)	(0.3)	(0.3)
Department FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	47	48	46	47	45	46	48	49
Adjusted R^2	0.17	0.07	0.08	0.02	0.12	0.21	-0.05	-0.05

The table reports the relationship between the Climate Commitment indicators and the values cases as independent variables. Independent variables are (1) Timeline to implement ESG-related portfolio management, (2) Relevance of supporting small businesses in developing transition plans, (3) Relevance of supporting small businesses with scenario analysis, (4) Relevance of providing bank internal advisory services to small businesses, (5) Relevance of providing a network of external advisors to small businesses, (6) Relevance of providing sustainability-related tools and data to small businesses, (7) Relevance of providing financing for research & development, and (8) Relevance of providing sustainable financial products (Question III-6). Control variables are progress (represented by the progress indicator), size of the bank and thus relevance of small business lending (represented by log(total assets)), profitability (represented by return on assets), financial health (represented by tier 1 ratio) and respondents' department fixed effects. All regressions are ordinary least squares. Note that the timeline in (1) is shown on an inverted scale, that is, most progress equals 1 whereas the least progress equals 5. Therefore, a negative statistical relationship indicates a positive relationship. The results show heteroskedasticity-consistent standard error estimators based on [39]. *p<0.1; **p<0.05; ***p<0.01

or no effect on how banks pursue and perceive values-related practices in their small business lending activities. In the regression analysis, I show that the eight values cases from Fig. 7 are not structurally more (or less) relevant to those banks that have committed to align their portfolios with climate goals than to non-committed banks. Only the provision of sustainability-related tools and data shows a statistically significant positive relationship with climate commitments (at the 5%-level). This calls into question the effectiveness of voluntary climate commitments in delivering a sustainable impact on the economy, which is consistent with the findings of [44]. In addition, the finding hints at contradictory signals that banks send to their small business clients. On the one hand, they send strong strategic signals for climate action through their climate commitment, and on the other hand, they do not follow through with this signal at the point of client interaction.

The results on values show that banks take a restrained position towards the values perspective in sustainable small business lending. There is some progress and recognition of its importance, but values approaches are viewed heterogeneously across the German banking sector. It appears that financing activities are of greater relevance than additional services. This finding contrasts the narrative of the bank as an enabler of the transformation among small businesses, which is repeatedly presented by the European banking industry [16].

4.4. How are relationship lending and sustainable small business lending currently linked?

Relationship lending could become a relevant aspect of sustainable small business lending. Given the opaque nature of sustainability in small businesses, which is likely to remain [27], and the difficulties in quantifying some sustainability dimensions [23], there is a potential case for the importance of soft information typically obtained through relationship lending. In addition, banks may be interested in engaging in value- and values-based exchanges with their small business clients. To explore the role of relationship lending in this field, the survey examines client dialogue and data sources.

Fig. 8 shows the timeline to implement the sustainability-related

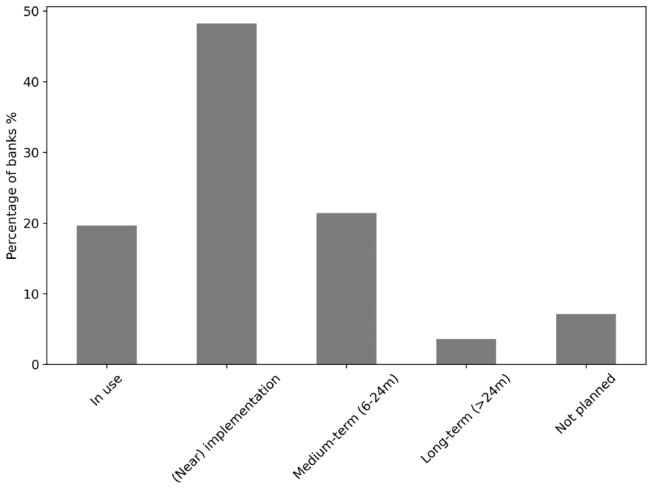


Fig. 8. Implementation timeline of sustainability related client dialog with small businesses.

client dialogue with small businesses (Question III-2-f). 19.6% of the banks already employ this kind of dialogue in their relationships with small businesses. Most banks are currently implementing or planning to implement client dialogue on sustainability-related measures within the next 24 months (69.6%), with only a minority viewing it as a long-term or irrelevant issue. This finding highlights a potential need for exchange on value and values as well as a potential role for soft information in the assessment of the sustainability profile of small businesses.

To improve the understanding of whether banks seek hard or soft sustainability information, the survey investigates the challenges banks face in acquiring sustainability-related data from small businesses (Question III-4) and the likelihood of using specific data sources (Question III-5). Both blocks of questions were formulated using a Likert scale from 1 (unlikely / low) to 6 (very likely / high).

Fig. 9 (a) shows that relevant data challenges include data availability, quality, comparability, cost, and materiality. These findings highlight that sustainability data from small businesses are not available in many cases to banks today. Interestingly, perceived damage to client relationships as a result of sustainability data acquisition is reported to be less relevant than other challenges[9]. This suggests that the commonly stated concern about banks' inability to collect client data for competition reasons may not be as substantial as perceived by practitioners.

When asked about the likelihood of using different data sources (see Fig. 9 (b)), banks state that the data provided by small businesses are a major source. Data vendors are also considered a significant source, suggesting the reliance on hard information for analysis. This is in line with the literature on the "hardening" of information in small business lending [37]. The likelihood of using data vendors as a data source is surprising given the unlikely availability of widespread ESG ratings or similar data sources for small businesses from such vendors, at least based on data originating from the small business.

In addition, banks' own assessments and the role of relationship managers are likely to be used for data acquisition, though this is not as pronounced as the hard information channels. This finding underscores the relevance of relationship lending as a means of generating soft information on the sustainability aspects of small businesses, albeit in a complementary role.

In summary, the findings suggest that relationship lending is becoming part of sustainable small business lending. The exchange with small businesses on sustainability issues appears to be relevant. Relationship lending as a means to generate soft information seems to be rather complementary to the use of hard information, which is the main data source in sustainable small business lending.

[9] All other data challenges are statistically significant different from damage to client relationship with p=.00 for t-tests and Mann-Whitney U tests.

5. Conclusion

This paper discusses sustainable small business lending through a survey in the German banking market. The results reveal a trend toward the integration of sustainable small business lending practices. More progress is observable for the value as opposed to the values aspects. This could be explained by expectations of increased sustainability risk materialization over time and the pressure of regulators. Banks implement sustainable relationship lending, in particular through dialogue with small businesses on sustainability. This is likely to generate sustainability-related soft information while banks prefer hard information. In general, banks have made more progress in implementing sustainable finance for large and listed firms than for small businesses.

The study is not without limitations. First, the survey focuses on banks, which offers insight into the lenders' perspective but potentially omits the perspective of small businesses. They are instrumental in implementing sustainable practices and sustainability risk mitigation strategies. Informal exchanges with chief financial officers of small businesses show a rather critical perspective on the current state of sustainable finance. Second, the survey's broad definition of sustainability may have skewed the emphasis on certain sustainability aspects over others. Informal discussions with representatives of a subset of participating banks show a strong focus on climate aspects at the moment. Thus, the results might primarily show banks' positions on this particular topic. Third, the geographical confinement of the study to Germany may not accurately represent the conditions in other banking markets with different levels of capital market integration and cultural characteristics. Future research should aim to broaden this scope. As sustainable small business lending becomes increasingly practiced, future research should employ various empirical methods to deepen our understanding of sustainable small business lending and the role of different stakeholders in this context.

The findings have implications for banks and policymakers. Banks can use the findings to structure and adjust their sustainable small business lending practices. Furthermore, the banking industry may need to revise its communication on its role in supporting the transformation of economic activities by small businesses. Policymakers can use the results to shape sustainable finance policies for small business lending by incorporating the tendency of banks to follow value and risk-oriented practices. They may establish policies to support this development. Additionally, they may consider developing policies that allow banks to establish values and transformative supporting activities for small businesses as part of broader efforts to achieve sustainability objectives.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author used ChatGPT (GPT4), Copilot, and Writeful in order to code efficiently and refine text. After using these tools, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

CRediT authorship contribution statement

Sebastian Rink: Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

None

Data availability

Data will be made available on request.

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Appendix A. Survey

Table A1
Survey instrument.

Part	Question number	Question	Sub-elements & response options
I	1	Name of the bank	Open text field
I	2	In which department do you work?	Response options: Strategy, Risk management, Market department, Risk controlling / back-office, Regulatory affairs / compliance
I	3	In which hierarchical level do you work?	Response options: C-level, Senior management, Middle management, Technical expert, Junior management
II	1	How relevant are ESG data for the following areas of your bank?	Sub-elements: (a) Risk management, (b) Strategy, (c) Reporting, (d) Product sales, (e) Product development, (f) Client dialogue Response options: Likert scale 1 (very low) - 6 (very high) plus 'don't know' Note: The responses to Under implementation and within less than six months are shown as one in the paper as they have similar meanings, and some respondents struggled to distinguish them.
II	2	How progressed is your bank in using ESG data in the following areas?	Sub-elements: (a) Risk management, (b) Strategy, (c) Reporting, (d) Product sales, (e) Product development, (f) Client dialogue Response options: In use, Under implementation, Within less than six months, 6–24 months, >24 months, Not planned plus 'don't know' Note: The responses to Under implementation and within less than six months are shown as one in the paper as they have similar meanings, and some respondents struggled to distinguish them.
II	3	When do you plan to use ESG data for the following types of firms?	Sub-elements: (a) Listed companies, (b) Sustainability risk exposed firms, (c) Large unlisted companies, (d) Small businesses Response options: In use, Under implementation, Within less than six months, 6–24 months, >24 months, Not planned plus 'don't know' Note: The responses to Under implementation and within less than six months are shown as one in the paper as they have similar meanings, and some respondents struggled to distinguish them.
II	4	How did ESG factors affect credit supply today for the following lending types?	Sub-elements: (a) Large listed companies, (b) Small businesses, (c) Commercial real estate, (d) Mortgages Response options: No business, Changes to collateral, Pricing adjustments, Adjustment expected for the future, No adjustments expected plus 'don't know'
III	1	How do you perceive and expect ESG risks to materialize in your small business lending portfolio?	Sub-elements: (a) Today, (b) Over the next 24 months, (c) Beyond 24 months Response options: Likert scale 1 (very high) - 6 (very low) plus 'dont know'
III	2	When do you expect to use ESG aspects for the following cases in small business lending?	Sub-elements: (a) Transition risk analysis, (b) Physical risk analysis, (c) Sustainability stress tests, (d) Internal ESG ratings, (e) Manual adjustments to models, (f) Sustainability-linked client dialogue, (g) Sustainability-related management of small lending portfolios Response options: In use, Under implementation, Within less than six months, 6–24 months, >24 months, Not planned plus 'don't know' Note: The responses to Under implementation and within less than six months are shown as one in the paper as they have similar meanings, and some respondents struggled to distinguish them.
III	3	Which level of granularity of ESG data do you need for the following use cases in small business lending? (multiple choice)	Sub-elements: (a) Transition risk analysis, (b) Physical risk analysis, (c) Sustainability stress tests, (d) Internal ESG ratings, (e) Manual adjustments to models, (f) Sustainability-linked client dialogue, (g) Sustainability-related management of small lending portfolios Response options: Public industry averages, Self-calculated industry averages, Peer group assessments, External firm assessment, Unaudited firm data, Audited firm data plus 'dont know' Note: this question was designed for market research and is not discussed in this paper.
III	4	What level of challenge do you experience in obtaining ESG data on small businesses?	Sub-elements: (a) Availability, (b) Quality, (c) Comparability, (d9 Damage to client relationship, (e) Cost, (f) Materiality of data point Response options: Likert scale 1 (very low / no challenge) - 6 (very high) plus 'dont know'
III	5	How likely are you to use the following data sources to access sustainability data from small businesses?	Sub-elements: (a) Bank-internal assessment, (b) Provision by small businesses, (c) Collection by relationship manager, (d) Use of service providers, (e) Acquisition from data vendors Response options: Likert scale 1 (very likely) - 6 (very unlikely) plus 'don't know' Note: for consistency, I have inverted the scales in the paper.
III	6	How relevant are the following use cases for your bank to support small businesses in transforming business models towards more sustainability?	Sub-elements: (a) Transition plan development, (b) Scenario analysis support, (c) Bank provides advisory services, (d) Bank has a network of external advisors, (e) Provision of tools and data, (f) Research and development financing, (g) Sustainable financial products Response options: Likert scale 1 (very relevant) - 6 (not relevant) plus 'don't know' Note: for consistency, I have inverted the scales in the paper.

The table shows the survey as distributed to German banks. It is translated into English. For some questions, sub-elements exists, that is, a question was asked for several elements. Questions are coded as Part - Question number - Sub-element (if necessary).

Fig. B.10. Map of headquarters by participating banks The map shows the location of the headquarters of the participating banks. The analysis is based on postal codes. If several banks have the same postal code, only one pin is shown.

Appendix B. Bank Location

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