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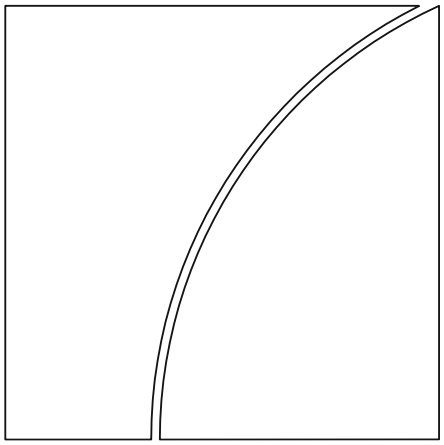

BIS Working Papers
No 1143

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Monetary and Economic Department

November 2023

JEL classification: G20; G21; M41; Q56

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ISSN 1020-0959 (print)
ISSN 1682-7678 (online)

Do banks practice what they preach?
Brown lending and environmental disclosure in the euro area[1]

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Abstract

This study examines whether the level of environmental disclosure in banks' financial reports matches less brown lending portfolios. Using granular credit register data and detailed information on firm-level greenhouse gas emission intensities, we find a negative relationship between environmental disclosure and brown lending. However, this effect is contingent on the tone of the financial report. Banks that express a negative tone, reflecting genuine concern and awareness of environmental risks, tend to lend less to more polluting firms. Conversely, banks that express a positive tone, indicating lower concern and awareness of environmental risks, tend to lend more to polluting firms. These findings highlight the importance of increasing awareness of environmental risks, so that banks perceive them as a critical and urgent pressing threat, leading to a genuine commitment to act as environmentally responsible lenders.

JEL: G20; G21; M41; Q56.

Keywords: green banking; brown lending; banking; environmental disclosure; environmental risks; climate change.

[1] The authors are grateful to an anonymous referee for the useful remarks and suggestions. We also thank Paola Agnese Bongini, Rodolfo Damiano, Galina Hale, Caterina Lucarelli, Federico Schimperna, Abhishek Srivastav, Maria Cristina Taormina and the climate stress-test experts in the Stress Test Modelling Division of the ECB for useful comments and suggestions. We also acknowledge participants of the following conferences: AIDEA 2023 XL National Conference, ADEIMF 2023 Summer Conference, Essex Finance Centre (EFiC) 2023 Conference in Banking and Corporate Finance and Yunus Social Business Centre 2023 Conference in Sustainable and Socially Responsible Finance. This paper has won the third ADEIMF 2023 best paper award at the ADEIMF 2023 Summer Conference held in Florence (Italy). This paper has been previously circulated under the title 'Do banks "greenwash" financial reports? Evidence from euro area credit registry data'. The views expressed are those of the authors and do not necessarily reflect those of the ECB and/or BIS.

1. Introduction

Transparency is key to market discipline in the banking sector (Nier & Baumann, 2006). Without sufficient transparency, investors and other stakeholders are unable to hold banks accountable for risky practices and promote the growth of healthy, sound and socially responsible financial institutions (Bliss and Flannery, 2002). Transparency is necessary not only for conventional financial risks, such as credit, interest rate and exchange rate risk, but also for emerging risks that could threaten the stability of the entire financial system. Therefore, regulatory requirements are crucial to prevent excessive opacity in banks.

Regulatory interventions have traditionally focused on reducing information asymmetries with stakeholders through the financial dimensions of bank disclosure. However, initiatives to improve non-financial disclosure, particularly in regard to environmental issues, have gained momentum only recently. The Task Force on Climate-related Financial Disclosure (2022) emphasises the importance of including environmental disclosure in annual financial reports, rather than just in sustainability reports, to inform investors about the impact of environmental risks and climate change. At European level, the Directive 2014/95/UE requires large companies, including banks, to meet minimum requirements for non-financial disclosure, including information on environmental risks and strategies to address them. With specific reference to banks, the European Central Bank (ECB, 2020) has published supervisory expectations regarding environmental and climate-related risk disclosure, including "business model, policies and due diligence processes, outcomes, risks and risk management and key performance indicators (KPIs)". Additionally, the European Banking Authority (EBA, 2022) has released specific indication for implementing technical standards on prudential disclosures for environmental, social and governance (ESG) risks. The urgency of this problem and the difficulties regulators encounter to tackle them have been remarked also by Terry Reintke, the joint leader of the Green group of the European Parliament, who recently stated that "As long as climate was something that was theoretical and abstract, everyone was in favour [. . .] But now we get to implementation, things get messy."[2]

Despite these efforts, there is a risk that banks may engage in "environmental window dressing", which involves increasing the environmental disclosure in their financial reports without actually acting as environmentally responsible lenders. This can be driven by various incentives, such as improving their ESG ratings to attract investors who are interested in managing environmental and climate-related risks in their portfolio (Yang, 2022).[3] In this respect, there appears to be a positive relationship between environmental disclosure and ESG score, as evidenced in Figure 1. Banks may also engage in window

[2] https://www.ft.com/content/5d236244-e073-412d-b981-0d2757f60b4b

[3] The latest report of the Global Sustainable Investment Alliance (2021) reveals that sustainable investments have reached an impressive USD 35 trillion globally (in North America, Europe, Japan and Australasia). As a result, banks are increasingly keen on attracting these types of investments.

dressing to convince regulators, governments, customers, and other stakeholders that they are making efforts to reduce their direct and indirect environmental impact (Cui et al., 2012).

Distinguishing banks that employ window dressing strategies from those that are genuinely concerned about environmental risks is challenging. The lack of granularity in data, such as greenhouse gas emission (GHG) intensities and loan-level data, makes it difficult to determine whether banks are truly practicing environmentally responsible lending. Thus, the literature has not yet examined the link between environmental disclosure and brown lending portfolios. This paper aims to fill this void by analysing the relationship between bank's environmental disclosure strategies and their propensity to finance "brown" firms that contribute to climate change and environmental issues.

Although it may seem that the relationship between banks' environmental disclosure and their lending practices is endogenous, it is not a clear-cut issue in the literature. To address this, we rely on two competing theoretical frameworks, which are widely used in the disclosure literature (Melloni et al., 2017; Chen & Hwang, 2022), to offer different explanations for the existence of this relationship. The first one is the *signaling theory* (Spence, 1973), which suggests that banks can use environmental disclosure to signal their commitment to combat climate change, manage environmental risks effectively, and limit their negative financial consequences. The second is the *impression management theory* (Goffman, 1959), which suggests that banks can use environmental disclosure to manipulate stakeholders' and investors' perceptions of their commitment to manage environmental risks and contribute to reduce their environmental impact, regardless of their actual behaviour. Therefore, the expectation of the *signalling theory* is that banks that provide less lending to highly polluting firms (or more lending to low polluting firms) should provide higher levels of environmental disclosure. Conversely, the expectation of the *impression management theory* is that banks can engage in window dressing behaviour by being highly transparent on environmental matters while providing high volumes of lending to polluting firms (or relatively less lending to low polluting firms). Furthermore, banks may give the perception of their commitment to manage environmental risks simply to increase their ESG scores[4] in an attempt to attract more investors interested in incorporating environmental sustainability into their investment decisions (Hartzmark & Sussman, 2019). However, these funds can be subsequently used to finance highly polluting firms, thereby betraying investors and stakeholders' trust.

To determine which of the two theories mentioned above is more suitable to interpret the relationship between environmental disclosure and bank lending, we first conduct a textual analysis of bank disclosure from hand-collected financial and sustainability reports. We then create a tailor-made bank index of environmental disclosure (Loughran & McDonald, 2011, 2016; Buehlmaier & Whited, 2018).

[4] ESG rating agencies heavily rely on corporate disclosures within their methodologies to compute ESG ratings. See for instance the methodology employed by MSCI (https://www.msci.com/documents/1296102/21901542/MSCI+ESG+Ratings+Brochure-cbr-en.pdf) and by Standard & Poor's (https://www.spglobal.com/esg/documents/sp-global-esg-scores-methodology-2022.pdf).

Textual analysis has been used for various purposes in the finance literature, such as analysing the sentiments of financial and non-financial reports (Agarwal et al., 2016; Del Gaudio et al., 2020; De Amicis et al., 2021), their readability (Ertugrul et al., 2017), central bank communication (Gardner et al., 2022; Ter Ellen et al., 2022) and press releases (Davis et al., 2012; Adämmer & Schüssler, 2020), amongst the others. Second, we match the index with loan-level data collected from the credit register of the European System of Central Banks (*AnaCredit*), along with firm-level data on GHG emissions intensities and bank-level corporate governance and balance sheet data. Given the potential for firm credit demand effect, the econometric framework needs to account for firm credit demand shifts to insulate the effect of environmental disclosure on the supply of bank lending. To address this, we employ multiple bank-relationships via borrower fixed effects (Khwaja & Mian, 2008), which allows for within-firm comparisons across banks with different levels of environmental disclosure. We also construct industry-location-size (ILS) fixed effects (Degryse et al., 2019), which enable us to expand the database to single bank-relationships.

In the paper, we also aim to investigate whether the relationship between environmental disclosure and bank lending decisions is influenced by bank managers' beliefs and level of awareness concerning environmental risks, as well as by the tone of the disclosures[5]. In particular, if bank managers are unaware of environmental risks and perceive them as less severe and urgent, they are likely to be optimistic about the impact of banks have on the environment and the negative financial consequences of environmental risks. This optimistic attitude may be reflected in the tone of bank disclosures, which could be positive. In contrast, bank managers who are more aware and concerned about environmental problems and climate change may be more likely to inform investors about their negative financial impact and decrease lending to brown firms. Although there is a substantial amount of literature analysing disclosure tone (Martikainen et al., 2023), research focusing on the role of disclosure tone in understanding whether banks "practice what they preach" or engage in window dressing practices is still at its infancy. To the best of our knowledge, we are amongst the first to focus on this specific topic.

To preview our main results, we find a negative relationship between environmental disclosure and brown lending. This result is in line with the *signalling theory* and in contrast with the *impression management theory*. However, this effect depends on the overall tone of the disclosures. Specifically, banks that use a more negative tone in their annual reports, indicating a genuine concern about environmental issues and climate change, provide less credit to more polluting firms. In contrast, banks that use a positive tone, which reassures investors and stakeholders about environmental risks, lend more to polluting firms. Hence, we observe an environmental window dressing behaviour in those banks that use a positive tone in their reports.

[5] For further information on the use of expert-validated disclosure indexes and measures of disclosure tone, see Altunbas et al. (2022) and Loughran & McDonald (2011).

Our study adds to the literature by exploring a policy-relevant topic that has not yet been thoroughly investigated. With the use of a unique and confidential dataset, along with manually collected data and information from various sources, we match loan-level data with firm GHG emissions and a customised disclosure index to examine the relationship between environmental disclosure and brown lending. To the best of our knowledge, only one single study has performed such a type of analysis (a working paper by Giannetti et al., 2023), although our paper is different in several respects. First, we focus on the disclosure tone as a fundamental aspect allowing us to differentiate between banks that engage in window dressing and those that do not. Second, we use a different disclosure dictionary by drawing upon a wide range of sources and consisting on a comprehensive list of 109 environment-related terms. Third, we use different measures of GHG intensity including scope 1, 2 and 3 emissions, allowing us to take into account all emissions that are directly and indirectly attributable to each borrower. Lastly, we exploit the full granularity of our disclosure index by including it in our econometric specification, rather than just differentiating between transparent and opaque banks by means of dummy variables.

The remainder of the paper is organised as follows. Section 2 reviews the academic literature and develops our research hypotheses. Section 3 describes the content analysis methodology, the data and the empirical strategy used. Section 4 presents and discusses our results along with several robustness checks. The last section discusses the policy implications of our study.

2. Literature review and research hypotheses

Our paper makes contributions to two distinct strands of the literature. First, we add to the existing literature on disclosure in the banking sector, particularly in relation to environmental disclosure. Second, by investigating the disclosure of climate-related risks in banks' financial reports, we contribute to the literature on the factors that can potentially help banks mitigate climate change.

2.1 Disclosure in banking

This stream of the literature highlights the importance of adequate levels of bank disclosure and transparency for several reasons.

First, the effectiveness of market discipline critically depends on the level of transparency provided by banks (Nier & Baumann, 2006). Market discipline has been embedded in the international banking regulation, particularly in the third pillar of Basel regulation since the enforcement of the Basel II revised international capital framework.[6] The literature has mainly focused on the disclosure of banking

[6] This third pillar requires a set of disclosure requirements that "allow market participants to assess key pieces of information on the scope of application, capital, risk exposures, risk assessment processes, and hence the capital adequacy of the institution." (Basel Committee on Banking Supervision (2004), pp. 187).

risks addressed by Basel regulation, such as financial and operational risks (e.g. Pérignon & Smith, 2010; Barakat et al., 2014).

Second, banks' level of opaqueness due to their risk-taking and maturity transformation functions make them difficult to assess without comprehensive information on their strategic and operational decisions (Morgan, 2002; Flannery et al., 2013). To address this problem, the literature has proposed various countermeasures, including higher levels of mandatory disclosure (Hyytinen & Takalo, 2002; Iannotta, 2006), , stricter regulatory requirements (Repullo, 2004; Cao & Juelsrud, 2022) and the harmonisation of the risk reporting regulatory framework (Manganaris et al., 2017).

Third, inadequate disclosure by banks has been considered amongst the causes of the global financial crisis (Gorton, 2009; Sowerbutts et al., 2013). Bank opaqueness magnified uncertainty about the value of bank assets and off-balance sheet items, thereby fuelling market turmoil. Furthermore, lack of transparency on asset securitisation and derivatives complicated investors' assessment of the value and riskiness of bank assets and liabilities (Barth & Landsman, 2010), emphasizing the inextricable relationship between disclosure and financial stability (Bischof et al., 2021).

Fourth, there is substantial evidence that disclosure plays an important role in reducing the cost of capital (Diamond & Verrecchia, 1991; Botosan, 1997; Leuz & Verrecchia, 2000). In this perspective, disclosure may have positive effects in terms of bank profitability and ability to get funding at low costs.

Apart from the overall adequacy of bank disclosures, the literature has investigated disclosure tone under various aspects. Numerous studies have focused on the identification of the main determinants of disclosure tone. For instance, Davis et al. (2015) show that managers' optimistic attitude is reflected in disclosure tone. Other specific determinants of disclosure tone are size, leverage, profitability and the characteristics of the Board of Directors (Patelli & Pedrini, 2015; Martikainen et al., 2023). The literature has also focused on the main consequences of disclosure tone. Ertugrul, et al. (2017) find that an ambiguous tone is associated to information hoarding by managers, which results in increased costs to get external financing. Price et al. (2012) show that the tone of conference calls is a strong predictor of trading volumes and abnormal returns, in line with other works on market performance (Feldman et al., 2010; Henry & Leone, 2016; Bassyouny et al., 2022).

The concept of Corporate Social Responsibility (CSR), strictly related to that of ESG (Gillan et al., 2021), has gained increasing importance in the financial industry. Stakeholders and investors are interested in bank transparency on various non-financial dimension, which has led to momentum in the literature on CSR disclosure in banking (see Chantziaras et al., 2020 amongst others). Stakeholders demand transparency regarding the direct and indirect impact of banking activities on the environment, and the consequences in terms of climate change (Thompson & Cowton, 2004).

Previous research investigating whether bank environmental disclosure practices reflect an actual behaviour to combat climate change and act as a socially and environmentally responsible lender is particularly scant (Giannetti et al., 2023). This is an important gap in the literature given that banks play a pivotal role in influencing climate change and contributing to overall pollution levels through their lending decisions (Reghezza et al., 2022). Furthermore, we are the first to focus on the role of disclosure tone in assessing whether banks engage in environmental window dressing practices, and to gain insights on managers' awareness and attitudes towards environmental risks in the banking industry.

2.2 Banking, environmental risks and climate change

The banking sector is a crucial player to combat climate change. Banks can contribute to sustainable development by financing green projects and renewable energies (González & Núñez, 2021; McInerney & Bunn, 2019; An et al., 2021). Previous studies have already shown that banks charge higher lending rates to firms with below-average levels of corporate social responsibility (Goss and Roberts, 2011) or that create environmental concerns (Chava, 2014). Furthermore, studies using data from syndicated loans have shown that banks charge a premium for bearing climate risk (De Greiff et al., 2022) and started to price climate policy exposure by raising lending rates to fossil fuel-based corporates after the Paris Agreement (Delis et al., 2021). Conversely, banks tend to charge lower rates to greener firms (Degryse et al., 2020). Banks have also reduced their exposure to polluting firms, as demonstrated by Mesonnier (2019). Kacperczyk and Peydro (2022) document a reduction in bank lending to firms with a higher carbon footprint for banks committing to decarbonization, while Nguyen et al. (2022) find that higher interest rates are charged for mortgages on properties more exposed to the risk of sea level rise.

In recent years, a Network of Central Banks and Supervisors for Greening the Financial System (NGFS)[7] have provided proposals to incorporate sustainable development and environmentally friendly policies into banking regulation. This is crucial for the financial system, given the strong connection between financial stability and climate change (G20 Green Finance Study Group, 2016; ESRB, 2016; Giuzio et al., 2019; Battiston et al., 2021). One notable proposal is the climate stress-test for the financial industry, which estimates the impact of climate policy risk in the financial system. A simulated study for the 50 largest European banks revealed that the impact of exposure in sectors affected by climate policy measures depends on market participants' ability to anticipate these measures (Battiston et al., 2017).

While regulations to reduce the impact of climate change are crucial for the banking industry and for the planet (Faiella & Lavecchia, 2020), it is important to design them carefully to avoid unintended consequences. A holistic perspective is essential for designing appropriate regulatory corrective actions for climate-related issues. In July 2022, the results of the first climate stress test for European

[7] See https://www.ngfs.net/en.

systemically important banks revealed that most banks do not incorporate climate risk in their credit risk models, only 20% take climate risk into account for lending decisions, and about two-thirds of their income from non-financial firms comes from highly polluting industries (ECB, 2022).[8]

2.3 Research hypotheses

Although the two strands of the literature discussed above are expanding rapidly, the relationship between a banks' environmental disclosure practices and their lending behaviour towards highly polluting/low polluting firms has not yet been investigated in depth. We draw upon two distinct and opposing theoretical frameworks to develop our research hypotheses.

The *signalling theory* proposed by Spence (1973) provides a suitable framework to interpret the relationship between bank environmental disclosures and lending to brown firms. According to this theory, banks that provide high levels of lending to brown firms are (indirectly) more exposed to environmental risks, as brown firms are potentially more affected by the negative consequences of climate change, renewable energy transition costs and regulatory risks. In contrast, those banks that lend more to less brown firms are less affected by such risks. Therefore, even from a financial standpoint, the latter group of banks has an incentive to signal their low levels of environmental risk exposure by providing higher levels of environmental disclosure in their annual reports. This expectation is based on the idea of the existence of a positive relationship between environmental performance and environmental disclosure (Al-Tuwaijri et al., 2004). Additionally, aside from financial considerations that investors may make, other aspects related to corporate social responsibility may also influence bank disclosure strategies. For example, stakeholders may be interested on the environmental impact of the banking industry, regardless of the financial consequences (Thompson & Cowton, 2004). For this reason, banks that lend more to less brown firms may be willing to signal that they are implementing strategies to act as an environmentally responsible lender by providing higher level of environmental disclosure. Based on these theoretical arguments, we develop our first research hypothesis as follows:

H1A: There is a negative relationship between bank environmental disclosure and lending to brown firms.

On the other hand, there are also arguments that could reverse the relationship entirely. According to the *Impression management theory* (Goffman, 1959), banks could intentionally reveal positive aspects while hiding others to manipulate stakeholders' perceptions (Merkl-Davies & Brennan, 2011).

[8] Central banks worldwide have started to address climate-related issues, particularly related to financial risks and financial stability (Campiglio et al., 2018). An important example is the ECB, which is exploring ways to fight pollution and climate change, including taking actions in areas such as banking supervision and financial stability (see https://www.ecb.europa.eu/ecb/orga/climate/html/index.en.html).

Environmental disclosure can serve this purpose. Banks may use a 'cheap talk' approach (Dobler, 2008) and engage in window dressing by disclosing environmental information without actually committing to environmentally responsible lending and continue lending to polluting firms. This strategy allows banks to hide the fact that they are not contributing to solving environmental problems and combating climate change. According to this view, banks' environmental disclosure strategies are driven by window dressing rather than a signal of actual commitment to reducing their environmental impact. Therefore, we develop our alternative research hypothesis as follows:

H1B: There is a positive or absent relationship between bank environmental disclosure and lending to brown firms.

Another important aspect to consider is the tone of bank disclosures, which has been widely studied in the banking literature (Del Gaudio et al., 2020; Fraccaroli & Giovannini, 2020; Correa et al., 2021). Analysing the sentiment of bank disclosure is essential because disclosure strategies are shaped by the beliefs, awareness, and attitudes of bank managers (Gibbins et al., 1990; Fischer & Verrecchia, 2004; Davis et al., 2015). If bank managers are not fully aware of environmental risks, they may be more optimistic about the impact of banks on the environment and less concerned about the negative financial consequences of environmental risks. Therefore, we expect that banks with a positive tone will provide higher levels of lending to brown firms. They may also attempt to reassure stakeholders and investors that environmental problems are not urgent and downplay their environmental impact (Cormier & Magnan, 1999). In doing so, these banks would use a positive tone and engage in window dressing behaviour by providing more lending to brown firms while at the same time increasing their environmental disclosure.

In contrast, those bank managers who are more aware and genuinely concerned about environmental problems and climate change are likely to inform investors about the negative financial and environmental consequences. They can achieve this by adopting a negative tone in their disclosure. Hence these banks would increase their level of environmental disclosure while at the same time increasing lending to less brown firms. Thus, they would not engage in window dressing behaviour. This approach would enable banks to reduce their environmental impact and exposure to environmental risks and inform investors about this. Therefore, we develop our second research hypothesis as follows:

H2: Banks using a positive tone in their disclosures engage in environmental window dressing*, while banks using a negative tone do not.*

3. Methodology and data

3.1 Content analysis methodology

Textual analysis is commonly used in the literature to extract valuable information from annual financial reports (Buehlmaier & Whited, 2018). In our study, we employ a quantitative content analysis methodology based on a tailored disclosure dictionary designed to examine bank annual reports. To develop this dictionary, we followed the methodology of Lang & Stice-Lawrence (2015) and selected the most relevant words to analyse environmental disclosures from various sources (see Appendix A). The dictionary was then validated by a panel of experts in banking, disclosure, environmental science and green energies.[9] We created our own tailored dictionary because previous studies have shown that using standardised dictionaries outside of their specific context may invalidate the content analysis (Loughran & McDonald, 2011). The complete list of words in our dictionary is reported in Appendix B.

We used this dictionary to compute our environmental disclosure index ($Disclosure_Index$) by counting the occurrences of the words of the dictionary in the annual report and dividing by the total number of words of the report. Following the methodology of Buehlmaier & Whited (2018), we modeled each report as a bag of words, meaning that we did not consider grammar or word order, and the only relevant information used was word frequency.

Formally, our disclosure index for bank *b* is computed as follows:

$$Disclosure_Index_b = \sum \frac{occurrences\ of\ the\ words\ of\ the\ dictionary}{total\ number\ of\ words\ of\ the\ report} \quad [1]$$

Before conducting the actual textual analysis, we pre-processed the reports by removing non-alphanumeric characters, tables, charts and graphs. This step ensured that only the narrative content of the report was taken into consideration. In addition, we stemmed all words of the dictionary to capture each relevant term, regardless of their suffixes (Peterson et al., 2015). The objective of this pre-processing phase was to minimise unnecessary noise in the text.

We adopt a similar approach based on the count of word occurrences also to measure the tone of the reports. Specifically, we use the dictionary developed by Loughran & McDonald (2011) to determine the degree of positivity or negativity in the report's tone. This allows us to conduct a sentiment analysis

[9] We are grateful to the climate stress-test experts in the Stress Test Modelling Division of the ECB for the validation of the dictionary.

of bank annual reports, enabling us to discern whether and to what extent banks are optimist or pessimist in their disclosures (Rogers et al., 2011).

To test the robustness of our analysis and explore alternative methods of measuring environmental disclosure, we adopt the "inverse document frequency approach" developed by Brown & Tucker (2011). This approach assigns higher weights to words in the dictionary that appear less frequently across all the reports analysed, indicating that those words are more meaningful and therefore more important. We compute the $BT_Disclosure_Index$ as follows:

$$BT_Disclosure_Index_b = \sum \frac{occurrences\ of\ the\ words\ of\ the\ dictionary}{total\ number\ of\ words\ of\ the\ report} * \log(\frac{M}{m}) \quad [2]$$

where *M* is the total number of documents of the sample and *m* represents the number of documents in which that specific word appears.

3.2 Data

We rely on data collected from multiple sources. First, we gather loan-level data from *AnaCredit*, which is the credit register of the European System of Central Banks. AnaCredit contains information on all individual bank loans to firms above EUR 25,000 in the euro area,[10] including information on bank and borrower characteristics such as credit volume, firm location, firm size and firm sector. Moreover, loans are classified into different industrial sectors according to the Statistical Classification of Economic Activities in the European Community (NACE Rev. 2) codes. Due to the limited time coverage of *AnaCredit*, which started data collection in September 2018, and the potential confounding effects arising from the policy measures taken to counteract the Covid-19 pandemic, our study focuses on the year 2019 for 52 banks, amounting to a total of 910,895 observations. Panel A of Table 1 presents summary statistics of the loan-level dataset. Lending is the outstanding amount indebted by a debtor to a creditor. In Table 1, we report the lending variable both in level and in logarithm, with the latter included as the endogenous variable in our econometric specifications.

Second, we use firm-level data on GHG emissions from *Urgentem*, which covers the full spectrum of Scope 1, 2 and 3 emissions. Specifically, *Urgentem* collects GHG emissions reported by 6,000 companies worldwide and it estimates emissions for a large sample of other companies via industry-based estimation models.[11] Following Bolton and Kacpercyk (2021), we measure firms' GHG intensity as tonnes of GHG equivalent divided by the company's revenues (in EUR millions). We also consider

[10] Detailed documentation about AnaCredit can be found here: https://www.ecb.europa.eu/stats/money_credit_banking/anacredit/html/index.en.html

[11] Based on the 1997 Kyoto Protocol, seven GHG are considered: (a) carbon dioxide; (b) methane; (c) nitrous oxide; (d) hydrofluorocarbons; (e) per-fluorocarbons; (f) Sulphur hexafluoride; and (g) nitrogen trifluoride.

all the three "scopes", based on the Greenhouse Gas Protocol. Scope 1 accounts for direct emissions that occur from sources owned or controlled by a firm. Scope 2 covers indirect emissions associated with the purchase of electricity, steam, heating and cooling consumed by a firm. Scope 3 comprises all other indirect emissions generated in a firm's value chain. Panel B of Table 1 reports summary statistics of the GHG emissions dataset. The variable labelled *GHGTot* sums up all emissions (Scope 1, 2 and 3) and shows that the average firm in our sample produces 772.96 GHG tonnes per million EUR. *GHGTot* emissions are primarily driven by Scope 3 relative emissions (labelled *GHG3*), which account for about 90% of the total emissions produced by the firms in our sample, while the amount of Scope 1 and Scope 2 emissions (labelled *GHG12*) is much smaller.

Consolidated bank-level balance sheet variables are collected from ECB supervisory statistics. Bank balance-sheet characteristics are taken at December 2018, as they have the potential to influence subsequent lending decisions. Panel C of Table 1 reports summary statistics of the bank balance sheet indicators. Although the 52 banks included in the sample are large, with an average total assets of EUR 647 billion, we control for bank size (*Totass)* to capture the possibility that larger banks may grant larger loans than smaller banks. Additionally, we include the deposit to total liability ratio (*dep_tl*) to control for differences in bank funding structure (Bustamante et al., 2019). We use the ratio of non-performing loans to gross loans (*NPL_r*) to control for the effect of asset quality in bank loan portfolios, as banks with better asset quality should be able to provide more credit to firms. We use the net income to total assets ratio (*ROA*) to proxy bank profitability, as low profitability may hinder the ability of banks to expand lending. We capture the heterogeneity in the level of liquidity across banks via the ratio of cash and cash equivalents to total assets (*Cash_ta*), while the bank business model is captured by the ratio of fees and commissions to operating income (*Fee_opInc*). Finally, we also control for the CET1 ratio (*CET1_r*), as a better capital position is conducive to support lending by banks (Gambacorta and Shin, 2018).

Panel D of Table 1 presents the descriptive statistics of firm-level specific characteristics, which we collected from Orbis Amadeus. Similar to the bank balance-sheet data, the firm-level data are taken at December 2018. Although, in the main econometric specification we use firm-fixed effects to absorb firm-specific characteristics, we control for heterogeneity at the firm level in the ILS specification. We include firm-specific characteristics that we believe are important for capturing the within-ILS cluster demand for credit. Specifically, we further control for firm size (*Firm_ta*), which we define as the logarithm of firm total assets. Despite size being one of the variables used for the computation of the ILS cluster, there may still be within-quartile size differences across firms. We include the ratio of cash and cash equivalents to current liabilities (*Firm_cash*) to capture the possibility that, within the ILS cluster, less liquid firms may take up larger loans. We account for firms' level of debt via the ratio of current liabilities plus non-current liabilities to total assets (*Firm_debt*) and the ratio of interest paid to earnings before interest and taxes (*Firm_gearing*). Finally, we include the ratio of earnings before

interest and taxes to total assets (*Firm_ROA*) and the ratio of working capital to total assets (*Firm_WC*) to control for firms' profitability and future investment capabilities.

Panel E of Table 1 reports summary statistics for the bank corporate governance variables and ESG indicators collected from Refinitiv Eikon (hereafter Eikon). We use the environmental, social and governance score (*ESGscore*) to control for differences in the level of ESG which may affect a bank's environmental performance. The ESG score captures over 500 bank-level ESG measures that are grouped into categories and rolled up into three pillar scores (environmental, social and corporate governance) to compute a final score normalised to percentages ranging between 0 and 100.[12] Controlling for the ESG score is particularly important in our empirical setting as it might be correlated to our variable of interest (*Disclosure_index*). Indeed, banks that are more socially responsible might also pay more attention to their environmental disclosure and be careful about their lending decisions. We also include the number of ESG controversies (*ESGcontroversies*), computed as the yearly number of ESG-related controversies published in the media. Banks with a higher number of media scandals/misconduct behaviours may be more cautious about the quality and level of details of their disclosure and, therefore, also about their environmental disclosure.

To account for external governance pressures as a potential substitute (or complement) for internal forces driving banks to adopt more sustainable lending practises, we include a dummy for stakeholders' engagement (*Stakeholders*). Additionally, we control for board size (*Board_size*), defined as the logarithm of the number of directors in the boardroom. On the one hand, De Villiers et al. (2011) report a positive and statistically significant relationship between board size and firm environmental performance. Larger boards increase the probability of having expert in environmental fields who can contribute to the adoption of effective green practises reflected also in more environmental disclosure. On the other hand, Boone et al. (2007) document that larger boards result in a lower degree of efficiency and coordination, resulting in underestimating environmental concerns.

We employ board tenure (*Board_tenure*), measured as the average number of years that each board member has been on the board. According to the *resource dependence theory*, greater human and social capital is reflected in the length of the directorship term, therefore board members in the boardroom for a longer time period may be better suited to influence bank's environmental performance. We also include a dummy variable (*CSRcomp*) that takes the value 1 if a bank has CSR compensation in place, and 0 otherwise, to look at whether executives' compensation is linked to a bank CSR performance (Berrone & Gomez-Majia, 2009). Finally, we include the percentage of independent board members

[12] For a more detailed description of the ESG score refer to: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf

(*Ind_board*) as greater board independence is conducive of better corporate environmental performance (De Villiers et al., 2011).

Finally, our environmental disclosure index was constructed by analysing the content of bank annual financial reports and sustainability/integrated reports (when available). We manually collected such reports from banks' official website as reported in the Orbis Bank Focus database. We only analysed the English and audited version of the consolidated annual financial reports to ensure their comparability and the reliability of our content analysis. Panel F of Table 1 reports the descriptive statistics of the disclosure indexes employed in our empirical analysis, as described in section 3.1. Figure 2 visually displays the distribution of the occurrences of the ten most common words used by the banks of our sample. It is evident that several of the most common words represent important environmental concerns, such as climate change, sustainable development, renewable energies and biodiversity. In addition, Figure 2 shows that there is variability across the banks of our sample, thereby confirming the validity of our disclosure dictionary to differentiate between banks that provide high and low levels of environmental disclosure. This makes our tool useful and reliable to test our research hypotheses.

3.3 Empirical strategy

To examine the relationship between environmental disclosure and banks' lending decisions depending on firms' GHG emissions intensity, we employ two different identification strategies. First, we follow Khwaja and Mian (2008) and use multiple bank-firm relationships to control for firm credit demand by comparing the lending decisions of banks with different levels of environmental disclosure but lending to the same firm. Second, we adopt the approach proposed by Degryse et al. (2019) and construct ILS fixed effects, which enable us to capture the effects of bank-firm relationships at the individual level, otherwise absorbed by the Khwaja and Mian (2008) approach. The industry clusters are based on 4-digit NACE codes while the location clusters are based on 5-digit postal codes. The size clusters are built on quarterlies of firms' total assets. The baseline econometric equation is specified as follows:

$$Lending(\log)_{b,f} = \alpha_{f(ILS)} + \beta Disclosure_index_b + \delta GHGemissions_f + \gamma Disclosure_index_b * GHGemissions_f + \theta X_{b,t-1} + \tau T_{b,t-1} + \mu Z_{f,t-1} + \epsilon_{bf} \quad [3]$$

where b indicates the bank and f the firm. As indicated in Section 3, the reference year, t, is 2019. Lending (log) is the logarithm of the outstanding amount owed by a debtor f to bank b. α indicates either firm (f) or ILS fixed effects, which are used to capture the heterogeneity in credit demand across firms. *Disclosure_index* is our environmental disclosure index, as described in section 3.1. We standardise the index to have a mean of zero and a standard deviation of one to improve the economic interpretation of the effect of environmental disclosure on bank lending. *GHGemissions* is a variable that captures the

emissions of climate-warming gases of firm *f.* This variable is measured as tonnes of GHG over revenues (EUR millions), and separately accounts for (i) Scope 1, 2 and 3 emissions (*GHGTot*); (ii) Scope 1 and 2 emissions (*GHG12*) and; (iii) Scope 3 emissions (*GHG3*). Our coefficient of interest lies on the interaction term (*Disclosure_index*GHGemissions*), which captures whether banks' lending behaviour towards more polluting versus less polluting firms depends on banks' levels of environmental disclosure.

X is a vector of lagged (end of 2018) bank-level controls, including bank size (*TotAss*), measured by the logarithm of bank's total assets; deposit to total liabilities (*Dep_tl*); NPLs to gross loans (*NPL_r*); net income to total assets (*RoA*); cash and cash equivalents to total assets (*Cash_ta*); fees and commissions to operating income (*Fee_opInc*); and CET1 capital to risk-weighted assets (*CET1_r*). In addition to these, we include the environmental, social and governance score (*ESGscore*), the number of ESG-related controversies reported in the press (*ESGcontroversies*), and a dummy variable that equals 1 if a bank engaged with its stakeholders to adopt more sustainable lending practises, and 0 otherwise (*Stakeholders*).

T is a vector of lagged (end of 2018) bank corporate governance characteristics, including *board_size*, (measured as the logarithm of number of directors elected to the board), board-tenure (computed as the average number of years that each board member has been on the board), *Ind_board* (the percentage of independent board members) and *CSR_comp* (a dummy variable to account for whether the compensation of senior executives is linked to CSR objectives).

Z is a vector of lagged (as of end of 2018) firm-level characteristics that include: (i) Firm size, measured as the logarithm of firm total assets; (ii) the ratio of cash holdings to current liabilities (*Firm cash*); (iii) current liabilities plus non-current liabilities to total assets (*Firm debt*); (iv) the ratio of earnings before interest and taxes to total assets (*Firm ROA*); (v) working capital to total assets (*Firm WC*); and (vi) interest paid to earnings before interest and taxes (*Firm gearing*). Robust standard errors (ε_{bj}) are two-way clustered at the bank-firm level.

The definition and sources of all variables are reported in Table C1 in Appendix C.

4. Results

4.1 Environmental disclosure and brown lending

The results of our baseline regressions are reported in Table 2. In columns 1, 3 and 5, we show the results of our regression model [3], in which we include the interaction term between the disclosure index and GHG emissions, considering the total emissions, scope 1 + scope 2 emissions, and scope 3

emissions, respectively. In columns 2, 4 and 6, we consider the models with ILS fixed effects and include both these interaction terms and the levels of emissions. All regressions include our comprehensive set of control variables, and we use robust standard errors two-way clustered at bank and firm level.

We find that the interaction term between firm emissions and our disclosure index is negative and statistically significant at the 1%-10% significance level, depending on the econometric specification and the GHG emissions considered. This indicates that more environmentally transparent banks provide lower lending volumes to highly polluting firms, regardless of whether firm emissions are directly caused by them or by the production of the electricity needed in the production processes (scope 1 + scope 2) or by the entire value-chain (scope 3). The effect we find is also economically meaningful. To provide a visual inspection of the findings, Figure 3 (left) shows the effect of a standard deviation increase in the disclosure index on the estimated lending volume for the within-ILS estimation of column 2. Specifically, we compare how the effect on the estimated bank lending volume for firms that are the least (≈ 1,2 tonnes GHGTot/Revenues) and the most (≈ 54 tonnes GHGTot/Revenues) polluting firms in our sample differs depending on the heterogeneity in our disclosure index. As per Figure 3, a one standard deviation increase in the environmental disclosure index is associated with about 6.4% lower lending volume to the most polluting firms relative to the least polluting. An F-test for joint significance of the two point estimates suggests that this difference is statistically significant at the 1% level (p-value<0.001). In addition, lending to the least polluting firms is not lower for banks reporting higher environmental disclosure as the confidence interval crosses the line at zero indicating that higher environmental disclosure entails lower lending volumes to more polluting firms only.

The negative relationship holds up well, although overall less statistically significant, also for scope 2 GHG emissions (GHG12) as shown in columns 3 and 4. Again, to provide a visual inspection of the results for Scope 2 GHG emissions, we plot the estimated coefficient for lending volume at different levels of GHG12 emissions following a standard deviation increase in our disclosure index. Figure 3 (right) shows that a one standard deviation increase in the environmental disclosure index results in about 4% lower lending volume to the most polluting firms relative to the least polluting. An F-test for joint significance of the two point estimates suggests that this difference is statistically significant at the 5% level (p-value=0.030). The marginal effect for scope 3 emissions (GHG3) is similar to that of GHGtot.

These results are in line with the *signalling theory* (Spence, 1973; Connelly et al., 2011; Khan et al., 2021 Siddique et al., 2021), because it emerges that banks use environmental disclosures as a signal of their actual commitment to mitigate climate change by reducing lending towards highly polluting firms. Consequently, we reject the "environmental window dressing hypothesis" and the prediction of the *impression management theory* (Goffman, 1959). These results support our research hypothesis H1A.

Among the bank-specific controls (columns 1-6), we find a positive and statistically significant (at the 1%-10% level) correlation between bank size and lending volumes. Additionally, a positive and statistically significant (at the 1% level) relationship is observed between the ratio of fees and commissions to operating income and the logarithm of bank lending volumes. We also find a negative and statistically significant (at the 1% level) relationship between bank profitability (and liquidity) and bank lending.

Regarding the firm-specific controls, we find significant associations for size, liquidity, debt profitability and gearing (even columns). Larger and more profitable firms tend to borrow more funds than smaller corporates, as reflected in the positive and statistically significant (at the 1% level) relationship between our endogenous variable and *firm_size* and *firm_ROA*. Additionally, we find that more leveraged firms, as captured by *firm_debt* and *firm_gearing*, receive more lending.

Among banks' corporate governance factors (columns 1 to 6), we find that banks with larger boards grant more credit, as displayed by the positive and statistically significant (at the 1% level) relationship between *Board_size* and bank lending volumes. Finally, we find that the coefficient on *CSR_comp* is negative and highly statistically significant (at the 1%-5% level), suggesting that banks that link their senior executives' compensation to CSR objectives grant lower volumes of credit.

4.2 Tone of disclosures

To delve deeper into the relationship between disclosure practices and lending behaviour, in Table 3, we include both a double and a triple interaction term. The former is computed by interacting our disclosure index with the measure of the tone of the annual reports proposed by Loughran & McDonald (2011), differentiating between positive and negative tone. The latter is computed by interacting the double interaction term with the GHG emissions, once again differentiating between scope 1 + scope 2, scope 3 and total emissions.

Our results indicate that banks with a more negative tone in their annual reports provide less lending to highly polluting firms, regardless of the scope of GHG emissions. These findings can be interpreted in light of the idea that managers' awareness and beliefs shape disclosure tone (Gibbins et al., 1990; Fischer & Verrecchia, 2004). Specifically, bank managers who are more pessimistic and aware of the consequences of environmental risks and their exposure to environmental risks tend to provide less lending to brown firms, reducing their environmental impact and risk exposure. On the other hand, those banks that use a more positive tone tend to provide more lending to polluting firms. These banks' managers are more optimistic and less aware of the negative effects of environmental risks and are not concerned about their environmental risk exposure or reducing their environmental impact. These relationships are statistically significant at 10% level or higher in almost all regressions, supporting our research hypothesis H2.

These results are represented in a visual fashion in Figure 4 which shows the effect of the triple interaction amongst the disclosure index, the positive tone index and the level of GHG intensity on the estimated bank lending volume. For simplicity, this chart refers to the estimated effect for those firms whose value of GHGtot is equal to about 54 (i.e. the most polluting firms of our sample). On the one hand, the left part of the chart shows the effect of a standard deviation increase in the disclosure index on the estimated lending volume by those banks whose positive tone index is one standard deviation lower than the mean (i.e. those banks that have a less positive tone). It emerges that those banks adopting a less positive tone significantly decrease lending to highly polluting firms by approximately 15%. On the other hand, the right part of the chart shows that such effect is much lower (-7.4%) when banks use a more positive tone (i.e. the positive tone index is one standard deviation above the mean), although still statistically significant.[13] Thus, we show that banks adopting a positive tone in their disclosures are less concerned about environmental risks and keep financing brown firms regardless of their high level of transparency with reference to environmental risks.

These findings suggests that banks with a negative tone may be more environmentally responsible, as they are more aware of environmental issues and try to have a positive indirect impact on the level of pollution, while at the same time reducing their exposure towards environmental risks. In contrast, banks with a positive tone in their financial reports may be less aware of environmental issues and try to reassure investors and stakeholders by using positive words in their public documents. These banks do not perceive pollution and climate change as a urgent and pressing threats and continue to provide high levels of lending to highly polluting firms, without trying to have a positive impact on the environment or reducing their exposure to environmental risks.

4.3 Robustness tests

Aiming to test the robustness of our baseline results, we employ a different methodology to construct our disclosure index. In particular, the disclosure index used in our baseline regressions is based on the idea that each word of the dictionary has the same importance and consequently an equal weight is attributed to each of them. However, the literature has shown that word occurrences can be weighted according to their relative frequency within the whole set of documents analysed (Loughran & McDonald, 2016), so that a higher weight is given to less frequent words that are supposed to be more meaningful. In order to take into account this aspect, we follow the "inverse document frequency approach" proposed by Brown & Tucker (2011).

This approach consists of multiplying the relative term frequency of each word by the logarithm of M/m, in which M is the total number of documents in the sample and m represents the number of

[13] An F-test for joint significance confirms that the difference between the two point estimates (≈ 7.5%) is statistically different from zero.

documents in which that specific word appears. Following Salton et al. (1975), we assign a low weight to the words that are most commonly used by the banks in our sample (i.e. to the least important words amongst the terms included in our dictionary) and a high weight to the words that are less common (i.e. the most important words).

The results reported in Table 4 show that our main findings are qualitatively unchanged. In particular, the interaction between the inverse document frequency index and the amount of GHG emissions enters the regressions with a negative and statistically significant coefficient, showing that banks tend to provide less lending to brown firms while keeping higher levels of lending to firms that have lower levels of GHG emissions, regardless of whether we consider the total emissions (columns 1 and 2) or differentiate between scope 1 and scope 2 (columns 3 to 6).

The same holds for the analysis of the tone of the disclosures. In Table 5, we perform the same analysis of the disclosure tone carried out in Table 3 by replacing the unweighted environmental disclosure index used in our baseline regressions with the index weighted according to the procedure suggested by Brown & Tucker (2011). Table 5 shows that, also in this case, the results are almost unchanged. These tests indicate that our results are robust to the use of an alternative disclosure index in our regression model.

Our results could also be driven by the fact that some banks publish a sustainability/non-financial report in which they provide disclosures on several environmental aspects, and consequently they decide not to report such a type of information in the annual financial reports that are analysed in our previous models. To address this concern, we re-run our baseline regressions by substituting the disclosure indexes of the annual financial reports with those of the merged annual financial and sustainability reports (for those banks that publish such documents). The results are reported in Table 6, and they are similar to those of our baseline models, with the exception of column 4, which shows a statistically insignificant coefficient for the interaction between scope 1 + scope 2 GHG emissions and the disclosure index. However, the results are still statistically significant at 95% level (column 3) and 99% (columns 1, 2, 5 and 6) in the remaining five regressions, supporting the robustness of our baseline models.

In Tables D1 and D2 in Appendix D, we perform two additional analyses by taking into consideration that those banks that prepare a sustainability report might behave differently from those that do not provide such a report. Specifically, in Table D1 we re-run the same regressions shown in Table 3, analysing the tone of the disclosure, but in this case we focus specifically on the tone of the sustainability reports, since the tone of these reports may differ from that adopted in the annual financial reports. In line with our previous regressions, we introduce separate disclosure indexes capturing the positive and negative tone by employing the dictionaries suggested by Loughran & McDonald (2011).

The results reported in Table D1 generally support the robustness of our baseline regressions. Specifically, the triple interaction between the disclosure index, GHG intensity and the negative tone index is negative and statistically significant in all regressions, regardless of the GHG scope (results hold for scope 1 + 2, scope 3 and the total amount of emissions). These results support the idea that bank managers who are more concerned about environmental risks tend to reduce lending to high polluting firms. However, as for the positive tone, the sign of the triple interaction terms is never statistically significant.

In Table D2, we present an additional test based on the hypothesis that banks that publish sustainability report are more concerned about pollution and environmental risks compared to those that do not. Therefore, we can replace our disclosure index with a dummy variable that identifies those banks that publish sustainability reports. If our hypothesis is correct, we should observe that banks that provide sustainability report lend less to brown firms compared to the other banks of the sample.

The results reported in Table D2 support this hypothesis. Specifically, the interaction between the dummy variable and the level of GHG intensity enters the regressions with a negative and statistically significant sign, supporting the robustness of our baseline findings. Therefore, we show that our results are not driven by the way we construct our environmental disclosure index; what matters is the overall amount of environmental/sustainability disclosure, which can be captured by a simple dummy variable that identifies banks that publish sustainability reports and, therefore, provide higher levels of environmental/sustainability disclosure.

We carry out another robustness test by employing an alternative dependent variable taking into account only the new loans issued in 2019. This test allows us to rule out the hypothesis of reverse causality in our econometric specification. The results reported in table D3 are qualitatively unchanged, thereby supporting the robustness of our results to endogeneity bias.[14]

[14] To economise on the number of tables, we conducted three additional unreported robustness tests. The first two are based on alternative computations of our environmental disclosure index using only the sustainability report (Sustainability_Disclosure_Index) and the annual financial report merged with the sustainability report (Disclosure_Index_merge_sust). In both cases, our (unreported) results remained qualitatively unchanged from our baseline regressions, remarking the robustness of our baseline results. In a last robustness check, we run within-ILS estimation by focusing only on single bank-firm relationships (i.e. excluding from the ILS cluster firms borrowing from multiple banks). Since firms with single bank relationships are generally small and micro firms, this test allows us to see whether the relationship between bank environmental disclosure and brown lending holds also when we consider only small enterprises in our estimation. Our (unreported) results hold up well for the majority of the specifications supporting the robustness of our baseline model. All results are available from the authors upon request."

5. Conclusions

The aim of this study was to investigate the relationship between bank environmental disclosure and brown lending. To achieve this, we merged loan-level data with firm GHG emissions and bank disclosure indexes. We examined whether there is a negative correlation between the level of transparency provided by banks on environmental-related matters in their annual financial reports and the amount of lending to brown firms.

Our results show that, overall, we should reject the window dressing hypothesis, as we found that banks that provide higher levels of environmental disclosure lend more to low polluting firms and less to highly polluting firms. Therefore, our findings suggest that the signalling theory (Spence, 1973) is a most suitable theoretical framework to explain the relationship between bank environmental disclosure and brown lending, while the impression management theory (Goffman, 1959) plays a less prominent role.

However, we did observe evidence of environmental window dressing behaviour depending on the tone adopted in the financial reports. Specifically, we found that banks that use a more negative tone (i.e. those that are more aware and genuinely concerned about environmental risks and climate change) lend less to brown firms, while banks that use a more positive tone (i.e. those that are less aware and concerned about environmental risks) tend to finance more brown firms. Therefore, we show that the tone of disclosures plays a crucial role in assessing whether a bank is engaging in window dressing or its willingness to inform stakeholders and investors on environmental matters results in actual behaviour to tackle environmental risks by reducing brown lending. However, we should also bear in mind that lending to polluting firms is not necessarily harmful for the environment as banks can play a pivotal role in financing the transition towards the use of renewable energies and more environmentally sustainable practices by lending to brown firms.

Based on the idea that disclosure strategies and tone are shaped by managers' awareness and beliefs (Gibbins et al., 1990; Fischer & Verrecchia, 2004), we contend that these results may be driven by the pessimistic (optimistic) attitude by bank managers using a negative (positive) tone, who are (not) fully aware of the negative consequences of environmental risks. As a result, this may lead to negative (positive) disclosures and, more importantly, lower (higher) levels of lending for polluting firms and lower (higher) levels of exposure to environmental risks.

The conclusions of this paper have important policy implications. They show that, although banks in general do not engage in window dressing, the amount of environmental disclosure provided is not the only factor to be considered. Bank managers' attitude, as reflected in the tone of their disclosures also play a crucial role in determining environmental window dressing behaviour. Banks with a more optimistic attitude may engage in window dressing because they do not consider environmental risk to be urgent or pressing. On the other hand, banks with a higher level awareness of environmental risks

and climate change, and a more negative tone in their disclosures, are more likely to engage in environmentally responsible lending.

In perspective, while disclosure requirements can be helpful, they alone may not be sufficient to encourage banks to reduce their brown lending. It is essential to raise awareness of environmental risks and climate change to ensure that they are perceived as urgent and pressing threats by banks. This would result in a strong commitment to avoid financing highly polluting firms and act as environmentally responsible lenders. Therefore, policy measures to increase awareness and promote responsible environmental lending should be a priority to promote sustainable economic growth.

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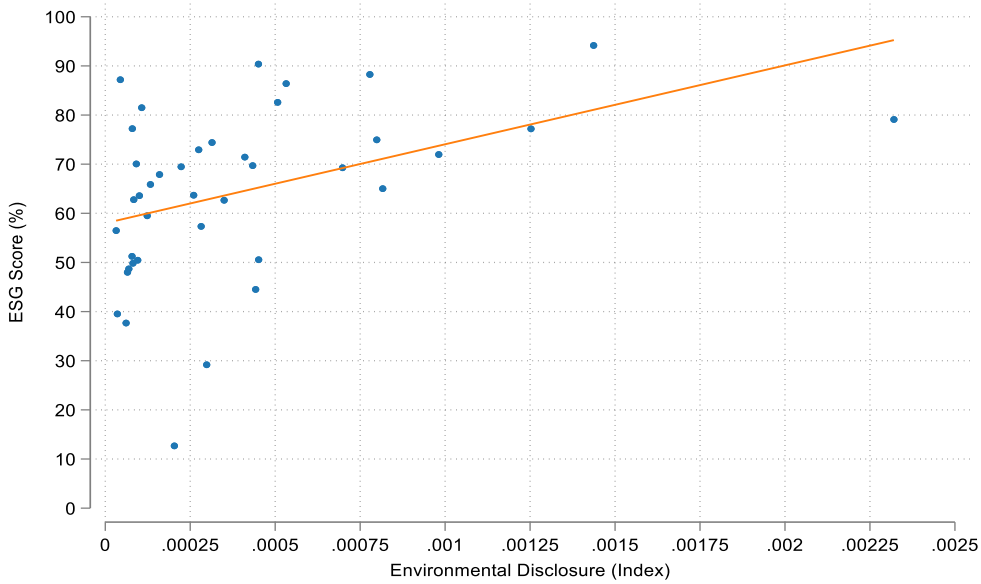
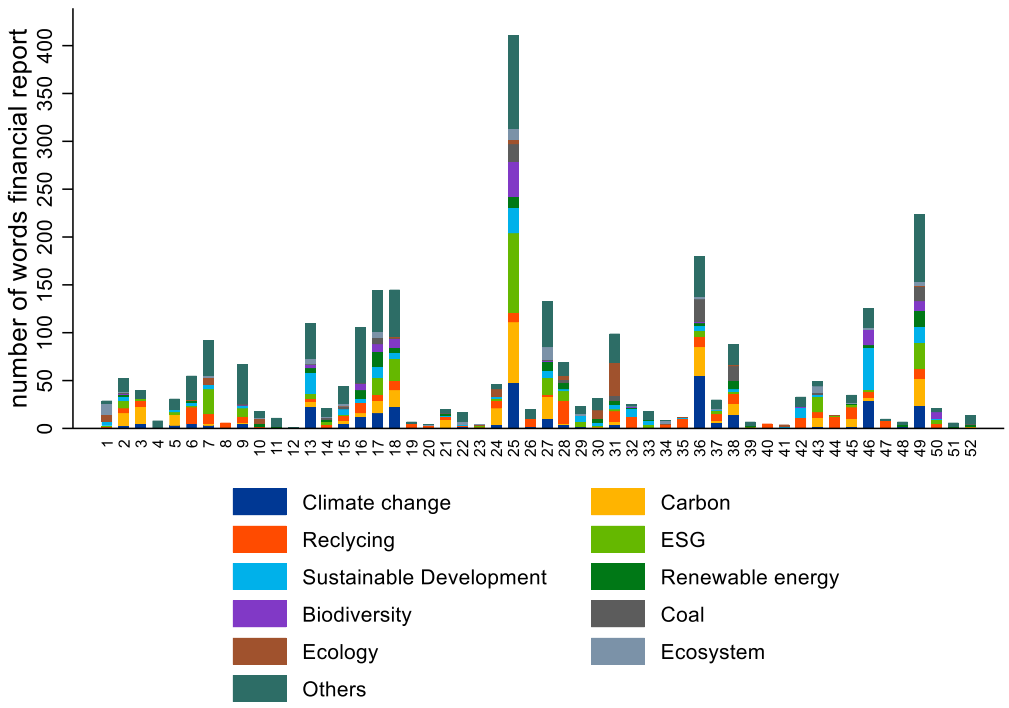
Figure 1: Correlation between the ESG score and the Environmental Disclosure index



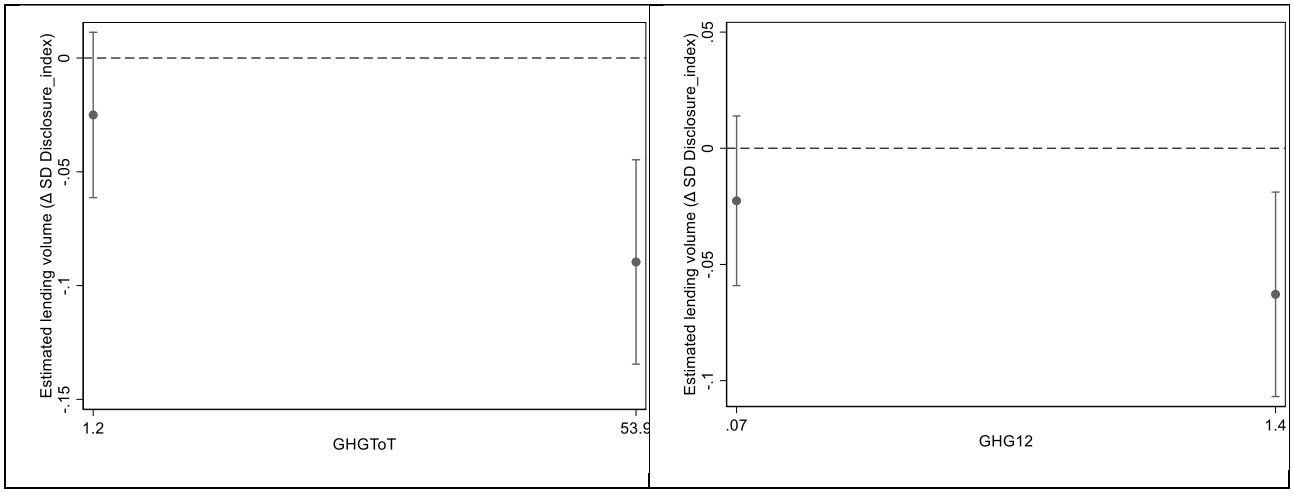
Note: Authors' elaborations. The disclosure index has been computed according to the methodology described in Section 3. The ESG scores have been collected from Thomson Reuters Eikon.

Figure 2: Number of environmental words in bank reports



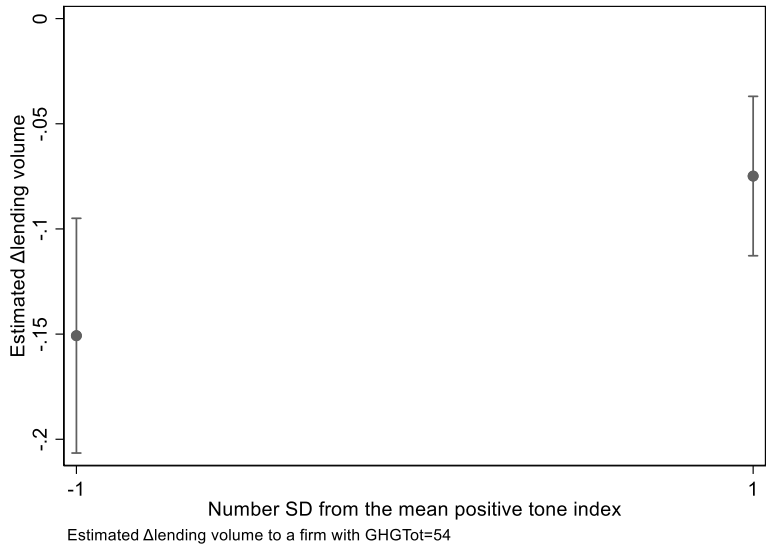
Note: Authors' elaborations. The word occurrences are computed considering both the annual financial report and the sustainability reports (when available).

Figure 3: Relationship between disclosure index and change in estimated lending volume for least and most polluting borrowers



Note: Authors' elaborations.

Figure 4: Relationship between the triple interaction (disclosure index * positive tone index * GHG intensity) and change in estimated lending volume



Note: Authors' elaborations.

Table 1: Descriptive statistics

	Obs	Mean	SD	Min	Max
Panel A. Dependent variable					
Lending (log)	910,895	12.15	1.39	10.12	16.16
Lending (€)	910,895	648,453	1,614,857	25,000	10,500,000
New lending (log)	243,948	12.88	1.35	10.19	15.23
Panel B. GHG emission variables					
GHGtot (%)	910,895	772.96	888.31	126.11	5,395.31
GHG12 (%)	910,895	60.80	134.88	5.47	928.37
GHG3 (%)	910,895	707.10	769.65	107.85	4,529.76
Panel C. Bank-specific variables					
logTotass (log total assets)	910,895	26.64	1.19	23.78	28.23
Totass (€bn)	910,895	647.00	571.00	21.30	1,830.00
dep_tl (%)	910,895	76.79	10.17	44.41	96.24
NPL_r (%)	910,895	7.07	7.47	1.20	45.52
ROA (%)	910,895	0.48	0.30	-0.49	1.01
Cash_ta (%)	910,895	6.99	3.29	0.72	14.62
Fee_opInc (%)	910,895	39.09	9.39	15.82	56.85
CET1_r (%)	910,895	12.74	1.49	11.02	18.35
Panel D. Firm-specific variables					
Firm_ta(log total assets)	910,895	14.72	1.42	11.42	18.91
Firm size (€ml)	910,895	9.56	26.20	0.09	163
Firm_cash (%)	910,895	22.16	53.13	0.03	411.00
Firm_debt (%)	910,895	73.00	20.46	14.19	148.40
Firm_ROA (%)	910,895	3.81	6.90	-28.23	30.84
Firm_WC (%)	910,895	24.87	21.59	-22.93	85.06
Firm_gearing (%)	910,895	43.30	22.67	-151.87	194.51
Panel E. Bank corporate governance and ESG variables					
Board_size (level)	910,895	15.19	2.42	9.00	21.00
Board_size (log)	910,895	2.70	0.16	2.19	3.04
CSRcomp (dummy)	910,895	0.48	0.49	0.00	1.00
Board_tenure (years)	910,895	1.76	12.15	5.64	2.60
Ind_board (%)	910,895	65.17	18.19	16.66	100.00
ESGscore	910,895	75.75	13.83	37.68	94.11
ESGcontroversies	910,895	70.97	29.92	0.61	100
Stakeholders	910,895	0.98	0.11	0.00	1.00

Panel F. Disclosure index variables					
Disclosure_index	910,895	0.0004	0.0004	0.0000	0.0023
Disclosure_index (standardised)	910,895	0.0000	1.0000	-1.1130	3.6475
BT disclosure index	910,895	0.0002	0.0001	0.0000	0.0008
BT disclosure index (standardised)	910,895	0.0000	1.0000	-1.1394	2.9148
Sust disclosure index	910,895	0.0007	0.0005	0.0000	0.0023
Sust disclosure index (standardised)	910,895	0.0000	1.0000	-1.6187	2.9331
Negative tone	910,895	0.0150	0.0021	0.0004	0.0210
Negative tone (standardised)	910,895	0.0000	1.0000	-6.9425	2.9962
Positive tone	910,895	0.0067	0.0015	0.0003	0.0126
Positive tone (standardised)	910,895	0.0000	1.0000	-4.3720	4.0317
Sust negative tone	910,895	0.0059	0.0046	0.0000	0.0143
Sust negative tone (standardised)	910,895	0.0000	1.0000	-1.2791	1.9105
Sust positive tone	910,895	0.0074	0.0056	0.0000	0.0184
Sust positive tone (standardised)	910,895	0.0000	1.0000	-1.1670	1.8971

Note: Variables are defined in Table C1 in Appendix C.

Table 2: Baseline Results

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Lending	Lending	Lending	Lending	Lending	Lending
Disclosure_Index	-0.05190	-0.02355	-0.05094	-0.02047	-0.05095	-0.02263
	(0.036)	(0.028)	(0.038)	(0.028)	(0.036)	(0.028)
GHGTot		0.00275***				
		(0.001)				
GHG12				0.04780*		
				(0.028)		
GHG3						0.00310**
						(0.001)
Disclosure_Index*GHGTot	-0.00077***	-0.00123***				
	(0.000)	(0.000)				
Disclosure Index*GHG12			-0.01713*	-0.03027**		
			(0.010)	(0.014)		
Disclosure_Index*GHG3					-0.00097***	-0.00148***
					(0.000)	(0.000)
L.TotAss	0.17596***	0.09142*	0.17568***	0.09083*	0.17598***	0.09144*
	(0.042)	(0.051)	(0.042)	(0.051)	(0.042)	(0.051)
L.Dep_tl	0.01109**	0.00477	0.01109**	0.00476	0.01109**	0.00477
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
L.NPL_r	0.00970**	0.00348	0.00969**	0.00347	0.00969**	0.00347
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
L.ROA	-0.39219***	-0.29911***	-0.39180***	-0.29829***	-0.39218***	-0.29911***
	(0.090)	(0.105)	(0.090)	(0.105)	(0.090)	(0.105)
L.Cash_ta	-0.02238***	-0.02171***	-0.02240***	-0.02176***	-0.02238***	-0.02170***
	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)
L.Fees_opinc	0.00968***	0.00586*	0.00969***	0.00585*	0.00968***	0.00586*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
L.Tier1_r	0.00575	0.02956	0.00572	0.02964	0.00575	0.02956
	(0.023)	(0.020)	(0.023)	(0.020)	(0.023)	(0.020)
L.ESGscore	0.00006	0.00260	0.00007	0.00264	0.00006	0.00260
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
L.ESGcontroversies	0.00357***	0.00280***	0.00356***	0.00279***	0.00356***	0.00280***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
L.Stakeholders	-0.01739	-0.28405*	-0.01803	-0.28604*	-0.01723	-0.28376*
	(0.191)	(0.167)	(0.191)	(0.167)	(0.191)	(0.167)
L.Firm_ta		0.58437***		0.58447***		0.58440***
		(0.022)		(0.022)		(0.022)
L.Firm_cash		0.00057***		0.00057***		0.00057***
		(0.000)		(0.000)		(0.000)
L.Firm_debt		0.00779***		0.00778***		0.00779***
		(0.000)		(0.000)		(0.000)
L.Firm_ROA		0.00505***		0.00503***		0.00505***
		(0.000)		(0.000)		(0.000)
L.Firm_WC		-0.00007		-0.00007		-0.00007
		(0.000)		(0.000)		(0.000)
L.Firm_gearing		0.00030***		0.00030***		0.00030***
		(0.000)		(0.000)		(0.000)
L.Board_size	0.53015***	0.50750***	0.53049***	0.50853***	0.53005***	0.50732***
	(0.181)	(0.169)	(0.181)	(0.169)	(0.181)	(0.169)
L.CSR_comp	-0.09025**	-0.09458**	-0.09034**	-0.09508**	-0.09024**	-0.09451**
	(0.042)	(0.040)	(0.042)	(0.040)	(0.042)	(0.040)
L.Board_tenure	0.05092***	0.02744	0.05089***	0.02727	0.05093***	0.02746
	(0.016)	(0.017)	(0.016)	(0.017)	(0.016)	(0.017)
L.Ind_board	0.00130	0.00275	0.00131	0.00277	0.00130	0.00275
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	607,445	910,895	607,445	910,895	607,445	910,895
R-squared	0.7332	0.6341	0.7332	0.6341	0.7332	0.6341
Firm FE	Yes	No	Yes	No	Yes	No
ILS FE	No	Yes	No	Yes	No	Yes
N banks	52	52	52	52	52	52
N firms	236478	539928	236478	539928	236478	539928

Note: This table reports the results of the baseline model. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively. Two-way clustered (bank-firm level) robust standard errors in parentheses. Variables are defined in Table C1 in Appendix C.

Table 3: Analysis of bank disclosure tone

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending
Disclosure Index	-0.02843	-0.06314*	0.00071	-0.02995	-0.02250	-0.05963*	0.01030	-0.02383	-0.02741	-0.06211*	0.00144	-0.02892
	(0.034)	(0.032)	(0.040)	(0.032)	(0.034)	(0.034)	(0.038)	(0.033)	(0.034)	(0.032)	(0.040)	(0.032)
GHGTot			0.00252**	0.00257**								
			(0.001)	(0.001)								
GHG12							0.04314	0.03985				
							(0.030)	(0.028)				
GHG3											0.00285**	0.00288**
											(0.001)	(0.001)
Disclosure Index*GHGTot	-0.00100***	-0.00092***	-0.00166***	-0.00153***								
	(0.000)	(0.000)	(0.000)	(0.000)								
Disclosure Index*GHG12					-0.03492***	-0.02746***	-0.05568***	-0.04590***				
					(0.007)	(0.010)	(0.011)	(0.011)				
Disclosure Index*GHG3									-0.00122***	-0.00114***	-0.00191***	-0.00180***
									(0.000)	(0.000)	(0.000)	(0.000)
Negative Tone	0.01276		0.00982		0.02649		0.02413		0.01246		0.00925	
	(0.020)		(0.023)		(0.020)		(0.023)		(0.020)		(0.023)	
Positive Tone			0.01334		0.00827		0.01328		0.00440		0.01284	
			(0.013)		(0.013)		(0.013)		(0.014)		(0.013)	
Disclosure Index*Negative Tone	0.01280		0.01855		0.01208		0.01941		0.01292		0.01833	
	(0.016)		(0.016)		(0.016)		(0.016)		(0.016)		(0.016)	
Disclosure Index*Positive Tone		0.01334		0.00827		0.01328		0.00440		0.01284		0.00783
		(0.013)		(0.013)		(0.013)		(0.014)		(0.013)		(0.013)
Disclosure Index*GHGTot *Negative Tone	-0.00041**		-0.00050**									
	(0.000)		(0.000)									
Disclosure Index*GHG12*Negative Tone					-0.00648		-0.01099*					
					(0.005)		(0.007)					
Disclosure Index*GHG3*Negative Tone									-0.00046**		-0.00052*	
									(0.000)		(0.000)	
Disclosure Index*GHGTot*Positive Tone		0.00046***		0.00047***								
		(0.000)		(0.000)								
Disclosure Index*GHG12*Positive Tone						0.00893*		0.01765***				
						(0.005)		(0.006)				
Disclosure Index*GHG3*Positive Tone										0.00057***		0.00058***
										(0.000)		(0.000)
Observations	607,445	607,445	910,895	910,895	607,445	607,445	910,895	910,895	607,445	607,445	910,895	910,895
R-squared	0.7333	0.7333	0.6342	0.6342	0.7333	0.7333	0.6342	0.6342	0.7333	0.7333	0.6342	0.6342
Firm FE	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
ILS FE	No	No	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes
N banks	52	52	52	52	52	52	52	52	52	52	52	52
N firms	236478	236478	539928	539928	236478	236478	539928	539928	236478	236478	539928	539928
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Absorbed	Absorbed	Yes	Yes	Absorbed	Absorbed	Yes	Yes	Absorbed	Absorbed	Yes	Yes
Corporate governance controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the results of the analysis of bank disclosure tone (positive and negative). ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively. Two-way clustered (bank-firm level) robust standard errors in parentheses. Variables are defined in Table C1 in Appendix C.

Table 4: Robustness tests

VARIABLES	(1) Lending	(2) Lending	(3) Lending	(4) Lending	(5) Lending	(6) Lending
BT_Disclosure index	-0.05567*	-0.02721	-0.05401*	-0.02316	-0.05471*	-0.02630
	(0.029)	(0.029)	(0.030)	(0.029)	(0.029)	(0.029)
GHGTot		0.00273**				
		(0.001)				
GHG12				0.04637		
				(0.028)		
GHG3						0.00307**
						(0.001)
BT_Disclosure index*GHGTot	-0.00084***	-0.00132***				
	(0.000)	(0.000)				
BT_Disclosure index*GHG12			-0.02021**	-0.03481**		
			(0.009)	(0.013)		
BT_Disclosure index*GHG3					-0.00104***	-0.00158***
					(0.000)	(0.000)
L.TotAss	0.18015***	0.09419*	0.17980***	0.09349*	0.18018***	0.09421*
	(0.042)	(0.050)	(0.042)	(0.050)	(0.042)	(0.050)
L.Dep_tl	0.01156**	0.00511	0.01156**	0.00511	0.01156**	0.00511
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
L.NPL_r	0.00958**	0.00348	0.00956**	0.00346	0.00958**	0.00347
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
L.ROA	-0.39554***	-0.30230***	-0.39501***	-0.30131***	-0.39553***	-0.30230***
	(0.090)	(0.105)	(0.090)	(0.105)	(0.090)	(0.105)
L.Cash_ta	-0.02201***	-0.02137***	-0.02202***	-0.02140***	-0.02201***	-0.02136***
	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)
L.Fees_opinc	0.00990***	0.00606*	0.00991***	0.00605*	0.00990***	0.00606*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
L.Tier1_r	0.00492	0.02898	0.00489	0.02907	0.00492	0.02898
	(0.023)	(0.020)	(0.023)	(0.020)	(0.023)	(0.020)
L.ESGscore	-0.00009	0.00253	-0.00007	0.00258	-0.00009	0.00253
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
L.ESGcontroversies	0.00348***	0.00274***	0.00347***	0.00273***	0.00348***	0.00274***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
L.Stakeholders	-0.01858	-0.28184*	-0.01917	-0.28358*	-0.01845	-0.28163*
	(0.186)	(0.164)	(0.186)	(0.164)	(0.186)	(0.164)
L.Firm_ta		0.58439***		0.58450***		0.58443***
		(0.022)		(0.022)		(0.022)
L.Firm_cash		0.00057***		0.00057***		0.00057***
		(0.000)		(0.000)		(0.000)
L.Firm_debt		0.00779***		0.00778***		0.00779***
		(0.000)		(0.000)		(0.000)
L.Firm_ROA		0.00505***		0.00503***		0.00505***
		(0.000)		(0.000)		(0.000)
L.Firm_WC		-0.00007		-0.00007		-0.00007
		(0.000)		(0.000)		(0.000)
L.Firm_gearing		0.00030***		0.00030***		0.00030***
	(0.000)	(0.000)		(0.000)		(0.000)
L.Board_size	0.51527***	0.49506***	0.51562***	0.49591***	0.51517***	0.49494***
	(0.179)	(0.166)	(0.179)	(0.166)	(0.179)	(0.166)
L.CSR_comp	-0.08380*	-0.08919**	-0.08389*	-0.08965**	-0.08380*	-0.08914**
	(0.043)	(0.042)	(0.043)	(0.042)	(0.043)	(0.042)
L.Board_tenure	0.05160***	0.02838*	0.05155***	0.02820*	0.05160***	0.02839*
	(0.016)	(0.017)	(0.016)	(0.017)	(0.016)	(0.017)
L.Ind_board	0.00124	0.00270	0.00124	0.00270	0.00124	0.00270
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	607,445	910,895	607,445	910,895	607,445	910,895
R-squared	0.7333	0.6342	0.7333	0.6341	0.7333	0.6342
Firm FE	Yes	No	Yes	No	Yes	No
ILS FE	No	Yes	No	Yes	No	Yes
N banks	52	52	52	52	52	52
N firms	236478	539928	236478	539928	236478	539928

Note: This table reports the results of the robustness test of the baseline model in which we use the adjusted disclosure index as proposed by Brown & Tucker (2011). ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively. Two-way clustered (bank-firm level) robust standard errors in parentheses. Variables are defined in Table C1 in Appendix C.

Table 5: Robustness test – bank disclosure tone

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending	Lending
BT_Disclosure index	-0.03040	-0.06244**	-0.00219	-0.03115	-0.02419	-0.05860*	0.00761	-0.02475	-0.02941	-0.06146**	-0.00155	-0.03019
	(0.032)	(0.030)	(0.037)	(0.031)	(0.032)	(0.032)	(0.036)	(0.032)	(0.032)	(0.031)	(0.038)	(0.031)
GHGTot			0.00248**	0.00256**								
			(0.001)	(0.001)								
GHG12							0.04232	0.03940				
							(0.030)	(0.028)				
GHG3											0.00280**	0.00287**
											(0.001)	(0.001)
BT_Disclosure index*GHGTot	-0.00108***	-0.00093***	-0.00174***	-0.00153***								
	(0.000)	(0.000)	(0.000)	(0.000)								
BT_Disclosure index*GHG12					-0.03700***	-0.02846***	-0.05777***	-0.04675***				
					(0.000)	(0.000)	(0.001)	(0.000)				
BT_Disclosure index*GHG3									-0.00130***	-0.00115***	-0.00198***	-0.00180***
									(0.000)	(0.000)	(0.000)	(0.000)
Negative Tone	0.00994		0.00800		0.02369		0.02251		0.00961		0.00733	
	(0.019)		(0.022)		(0.020)		(0.022)		(0.019)		(0.022)	
Positive Tone		-0.00481		-0.00279		-0.01013		-0.00317		-0.00460		-0.00309
		(0.033)		(0.025)		(0.034)		(0.027)		(0.033)		(0.025)
BT_Disclosure index* Negative Tone	0.02548		0.02816		0.02451		0.02834		0.02557		0.02783	
	(0.020)		(0.020)		(0.020)		(0.019)		(0.020)		(0.019)	
BT_Disclosure index* Positive Tone		0.01452		0.00989		0.01464		0.00551		0.01398		0.00941
		(0.015)		(0.014)		(0.015)		(0.015)		(0.015)		(0.014)
BT_Disclosure index* GHGTot*Negative Tone	-0.00046**		-0.00054*									
	(0.000)		(0.000)									
BT_Disclosure index* GHG12*Negative Tone					-0.00681		-0.01031					
					(0.006)		(0.009)					
BT_Disclosure index* GHG3*Negative Tone									-0.00051*		-0.00055	
									(0.000)		(0.000)	
BT_Disclosure index* GHGTot*Positive Tone		0.00047***		0.00046**								
		(0.000)		(0.000)								
BT_Disclosure index* GHG12*Positive Tone						0.00890		0.01860**				
						(0.006)		(0.007)				
BT_Disclosure index* GHG3*Positive Tone										0.00059***		0.00058**
										(0.000)		(0.000)
Observations	607,445	607,445	910,895	910,895	607,445	607,445	910,895	910,895	607,445	607,445	910,895	910,895
R-squared	0.7334	0.7333	0.6343	0.6342	0.7334	0.7333	0.6343	0.6342	0.7334	0.7333	0.6343	0.6342
Firm FE	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No	No
ILS FE	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
N banks	52	52	52	52	52	52	52	52	52	52	52	52
N firms	236478	236478	539928	539928	236478	236478	539928	539928	236478	236478	539928	539928
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Absorbed	Absorbed	Yes	Yes	Absorbed	Absorbed	Yes	Yes	Absorbed	Absorbed	Yes	Yes
Corporate governance controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the results of the robustness test of the bank disclosure tone analysis in which we use the adjusted disclosure index as proposed by Brown & Tucker (2011). ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively. Two-way clustered (bank-firm level) robust standard errors in parentheses. Variables are defined in table C1 in Appendix C.

Table 6. Robustness test - disclosure index including the sustainability reports

VARIABLES	(1) Lending	(2) Lending	(3) Lending	(4) Lending	(5) Lending	(6) Lending
GHGTot		0.0027***				
		(0.001)				
GHG12				0.0498		
				(0.031)		
GHG3						0.0031**
						(0.001)
Disclosure_Index_merge_sust * GHGTot	-0.0008***	-0.0009***				
	(0.000)	(0.000)				
Disclosure Index_merge_sust *GHG12			-0.023**	-0.023		
			(0.009)	(0.015)		
Disclosure_Index_merge_sust * GHG3					-0.0011***	-0.0012***
					(0.000)	(0.000)
L.TotAss	0.19086***	0.10937**	0.19050***	0.10877**	0.19088***	0.10942**
	(0.039)	(0.049)	(0.039)	(0.049)	(0.039)	(0.049)
L.Dep_tl	0.01477***	0.00818	0.01477***	0.00817	0.01477***	0.00818
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)
L.NPL_r	0.00950**	0.00408	0.00942*	0.00403	0.00950**	0.00408
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
L.ROA	-0.39586***	-0.31571***	-0.39587***	-0.31553***	-0.39561***	-0.31550***
	(0.077)	(0.094)	(0.077)	(0.095)	(0.077)	(0.094)
L.Cash_ta	-0.01026	-0.01214*	-0.01036	-0.01225*	-0.01023	-0.01209*
	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)
L.Fees_opinc	0.01580***	0.01103***	0.01580***	0.01101***	0.01580***	0.01103***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
L.Tier1_r	0.01408	0.03680**	0.01399	0.03677**	0.01406	0.03682**
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
L.ESGscore	-0.00107	0.00185	-0.00104	0.00190	-0.00108	0.00185
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
L.ESGcontroversies	0.00280***	0.00217**	0.00279***	0.00216**	0.00280***	0.00217**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
L.Stakeholders	0.04903	-0.20176	0.04782	-0.20411	0.04928	-0.20147
	(0.170)	(0.169)	(0.170)	(0.169)	(0.170)	(0.169)
L.Firm_ta		0.58508***		0.58513***		0.58513***
		(0.022)		(0.022)		(0.022)
L.Firm_cash		0.00057***		0.00057***		0.00057***
		(0.000)		(0.000)		(0.000)
L.Firm_debt		0.00780***		0.00779***		0.00780***
		(0.000)		(0.000)		(0.000)
L.Firm_ROA		0.00505***		0.00503***		0.00505***
		(0.000)		(0.000)		(0.000)
L.Firm_WC		-0.00008		-0.00008		-0.00008
		(0.000)		(0.000)		(0.000)
L.Firm_gearing		0.00030***		0.00030***		0.00030***
		(0.000)		(0.000)		(0.000)
L.Board_size	0.48614***	0.44343***	0.48581***	0.44328***	0.48605***	0.44320***
	(0.154)	(0.153)	(0.155)	(0.153)	(0.154)	(0.153)
L.CSR_comp	-0.04872	-0.05490	-0.04880	-0.05525	-0.04872	-0.05480
	(0.043)	(0.041)	(0.043)	(0.041)	(0.043)	(0.041)
L.Board_tenure	0.06244***	0.04022**	0.06235***	0.04002**	0.06244***	0.04025**
	(0.016)	(0.018)	(0.016)	(0.018)	(0.016)	(0.018)
L.Ind_board	0.00172	0.00260	0.00171	0.00260	0.00172	0.00260
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	607,445	910,895	607,445	910,895	607,445	910,895
R-squared	0.7338	0.6346	0.7338	0.6346	0.7338	0.6346
Firm FE	Yes	No	Yes	No	Yes	No
ILS FE	No	Yes	No	Yes	No	Yes
N banks	52	52	52	52	52	52
N firms	236478	539928	236478	539928	236478	539928

Note: This table reports the results of the robustness test in which we compute our disclosure index after merging the annual financial report with the sustainability report (when available). ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively. Two-way clustered (bank-firm level) robust standard errors in parentheses. Variables are defined in table C1 in Appendix C.

APPENDIX A

Sources employed to select the words of the dictionary:

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APPENDIX B

List of words of the dictionary

- Acid rain
- Acid soil
- Air quality
- Alluvial
- Alternative energy
- Alternative fuel
- Biodegradable
- Biodiversity
- Carbon
- Chemical agent
- Chemical emergency
- Chemical weathering
- Climate action
- Climate change
- Climate neutral
- Chlorofluorocarbon (CFC)
- Coal
- Compostable
- Contamination
- COP21
- Critical habitat
- Deforestation
- Desertification
- Deoxygenation
- Ecology
- Ecosphere
- Ecosystem
- Energy transition
- Environmental accounting
- Environmental assessment
- Environmental conservation
- Environmental law
- Environmental preservation
- Environmental protection
- Environmental quality

- Environmental regulation
- Environmental reporting
- Environmental risk
- Environmental standard
- Environmental strategy
- Environmental sustainability
- Environmental, Social and Governance (ESG)
- European Environment Agency
- Eutrophication
- Extinction
- Extremely hazardous substance
- Fauna
- Flocculation
- Flood
- Flora
- Forest conservation
- Fossil fuel
- Glacial ice
- Glacial retreat
- Glacier
- Global Environmental Monitoring System
- Global warming
- Greenhouse effect
- Greenhouse gas (GHG)
- Habitat conservation plan
- Habitat loss
- Habitat preservation
- Habitat restoration
- Hydrosphere
- International energy agency
- Kyoto protocol
- Life cycle analysis
- Life cycle assessment
- Marine protection
- Marine system
- Marine resource
- Natural disaster

- Natural ecosystem
- Natural resources
- Nitrification
- Nuclear waste
- Ocean dumping
- Overharvesting
- Overexploitation
- Ozone
- Paris agreement
- Permafrost
- Pesticide
- Petroleum
- Planned obsolescence
- Plastic
- PM10
- PM2.5
- Pollution
- Radioactive waste
- Recycling
- Renewable energy
- Renewable resource
- Resource depletion
- Reuse
- Sea levels
- Sea dumping
- Soil acidification
- Soil conservation
- Sustainable development
- Toxic
- Transuranic waste
- Waste reduction
- Waste management
- Waste minimization
- Water conservation
- Weather
- Wildlife
- Wild animal.

APPENDIX C

Table C1 – Variable definitions and sources

	Definition	Source
Dependent variable		
Lending (log)	Logarithm of the outstanding amount indebted by a debtor to a creditor.	Anacredit
Lending (€)	Outstanding amount indebted by a debtor to a creditor.	Anacredit
New_Lending	Amount of new lending issued in 2019 by a creditor to a debtor.	Anacredit
GHG emission variables		
GHGtot (%)	Relative GHG emissions (tonnes of GHG equivalent divided by the company's revenues)	Urgentem and Orbis Amadeus
GHG12 (%)	Relative scope 1 and scope 2 GHG emissions.	Urgentem and Orbis Amadeus
GHG3 (%)	Relative scope 3 GHG emissions.	Urgentem and Orbis Amadeus
Bank-specific variables		
logTotass	Logarithm of total assets.	ECB supervisory statistics
dep_tl (%)	Deposit to total liability ratio.	ECB supervisory statistics
NPL_r (%)	Nonperforming loan to gross loan ratio.	ECB supervisory statistics
ROA (%)	Net income to total asset ratio.	ECB supervisory statistics
Cash_ta (%)	Cash and cash equivalent to total asset ratio.	ECB supervisory statistics
Fee_opInc (%)	Fee and commission to operating income ratio.	ECB supervisory statistics
CET1_r (%)	Common equity tier 1 to risk-weighted asset ratio.	ECB supervisory statistics
Firm-specific variables		
Firm_ta (log total assets)	Logarithm of total assets.	Orbis Amadeus
Firm_cash (%)	Cash and cash equivalent to total liability ratio.	Orbis Amadeus
Firm_debt (%)	Current and non-current liability to total asset ratio.	Orbis Amadeus
Firm_ROA (%)	Net income to total asset ratio.	Orbis Amadeus
Firm_WC (%)	Working capital to total asset ratio	Orbis Amadeus
Firm_gearing (%)	Interest paid to earning before interest and tax ratio	Orbis Amadeus
Bank corporate governance and ESG variables		
Board_size (log)	Logarithm of the number of directors in the boardroom.	Thomson Reuters Eikon
CSRcomp (dummy)	Dummy taking the value 1 if a bank has CSR compensation in place, and 0 otherwise.	Thomson Reuters Eikon
Board_tenure (years)	Average number of years that each board member has been on board.	Thomson Reuters Eikon
Ind_board (%)	Percentage of independent board members	Thomson Reuters Eikon
ESGscore	Environmental, Social and Governance (ESG) score.	Thomson Reuters Eikon
ESGcontroversies	Yearly number of ESG-related controversies published in the media.	Thomson Reuters Eikon
Stakeholders	Dummy variable equal to 1 if a bank engaged with its stakeholders, and 0 otherwise.	Thomson Reuters Eikon
Disclosure index variables		
Disclosure_index	Disclosure index computed as follows: $\sum \frac{occurrences\ of\ the\ words\ of\ the\ dictionary}{total\ number\ of\ words\ of\ the\ report}$	Own computation on manually collected data
BT disclosure index	Adjusted disclosure index as suggested by Brown & Tucker (2011).	Own computation on manually collected data
Sust disclosure index	Disclosure index computed for the sustainability report.	Own computation on manually collected data

APPENDIX D

Table D1 – tone of the sustainability report

VARIABLES	(1) Lending	(2) Lending	(3) Lending	(4) Lending	(5) Lending	(6) Lending	(7) Lending	(8) Lending	(9) Lending	(10) Lending	(11) Lending	(12) Lending
GHGTot			0.00507***	0.00006								
			(0.002)	(0.002)								
GHG12							0.22353***	-0.07297				
							(0.054)	(0.049)				
GHG3											0.00580***	-0.00002
											(0.002)	(0.002)
Sust Disclosure index*GHGTot	0.00045	0.00090	0.00140	0.00219**								
	(0.001)	(0.001)	(0.001)	(0.001)								
Sust Disclosure index*GHG12					0.01737	0.05629*	0.07071**	0.13650**				
					(0.013)	(0.029)	(0.034)	(0.059)				
Sust Disclosure index*GHG3									0.00058	0.00105	0.00152	0.00250**
									(0.001)	(0.001)	(0.001)	(0.001)
Sust Positive Tone	-0.24590		-0.22480		-0.21748		-0.16347		-0.24337		-0.22327	
	(0.190)		(0.163)		(0.189)		(0.162)		(0.190)		(0.163)	
Sust Negative Tone		0.22156		0.08049		0.20337		0.03953		0.21923		0.07844
		(0.131)		(0.087)		(0.132)		(0.094)		(0.131)		(0.087)
Sust Disclosure index*Sust Positive Tone	0.01221		-0.02343		0.02755		0.00596		0.01247		-0.02381	
	(0.075)		(0.046)		(0.076)		(0.046)		(0.074)		(0.046)	
Sust Disclosure index*Sust Negative Tone		-0.01555		0.03783		0.00628		0.07708		-0.01514		0.03852
		(0.052)		(0.054)		(0.053)		(0.060)		(0.052)		(0.054)
Sust Disclosure index*GHGTot*Sust Positive Tone	0.00060		-0.00020									
	(0.001)		(0.001)									
Sust Disclosure index*GHGTot*Sust Negative Tone		-0.00045*		-0.00135*								
		(0.000)		(0.001)								
Sust Disclosure index*GHG12*Sust Positive Tone					-0.02286		-0.02377					
					(0.016)		(0.033)					
Sust Disclosure index*GHG12*Sust Negative Tone						-0.06159**		-0.12430**				
						(0.023)		(0.045)				
Sust Disclosure index*GHG3*Sust Positive Tone									0.00064		-0.00015	
									(0.001)		(0.001)	
Sust Disclosure index*GHG3*Sust Negative Tone										-0.00056*		-0.00157*
										(0.000)		(0.001)
Observations	314,455	314,455	526,636	526,636	314,455	314,455	526,636	526,636	314,455	314,455	526,636	526,636
R-squared	0.7369	0.7372	0.6347	0.6348	0.7370	0.7372	0.6348	0.6348	0.7369	0.7372	0.6347	0.6348
Firm FE	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No	No
ILS FE	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Cluster	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm
N banks	25	25	25	25	25	25	25	25	25	25	25	25
N firms	131922	131922	344103	344103	131922	131922	344103	344103	131922	131922	344103	344103

Note: This table reports the results of the robustness test in which we measure the tone of the sustainability reports (when available). ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively. Two-way clustered (bank-firm level) robust standard errors in parentheses. Variables are defined in table C1 in Appendix C

Table D2: The relationship between sustainability reporting and GHG emissions

VARIABLES	(1) Lending	(2) Lending	(3) Lending	(4) Lending	(5) Lending	(6) Lending
GHGTot		0.0034***				
		(0.000)				
GHG12				0.0945***		
				(0.000)		
GHG3						0.0039***
						(0.000)
Sustainability report*GHGTot	-0.0013***	-0.0011*				
	(0.000)	(0.000)				
Sustainability report*GHG12			-0.0892***	-0.0678*		
			(0.0151)	(0.025)		
Sustainability report*GHG3					-0.0015**	-0.0013*
					(0.000)	(0.000)
Observations	607,445	910,895	607,445	910,895	607,445	910,895
R-squared	0.7108	0.6123	0.7108	0.6124	0.7108	0.6123
Firm FE	Yes	No	Yes	No	Yes	No
ILS FE	No	Yes	No	Yes	No	Yes
Cluster	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm	Bank-firm
N banks	52	52	52	52	52	52
N firms	236478	539928	236478	539928	236478	539928
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Absorbed	Yes	Absorbed	Yes	Absorbed	Yes
Corporate governance controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the results of the robustness test in which we replace our disclosure index with the sustainability report dummy, which is equal to 1 for those banks that publish a sustainability report and 0 otherwise. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively. Two-way clustered (bank-firm level) robust standard errors in parentheses. Variables are defined in table C1 in Appendix C.

Table D3: Use of the alternative dependent variable "New_Lending"

VARIABLES	(1) New_Lending	(2) New_Lending	(3) New_Lending
Disclosure_Index	0.00573	0.01983	0.00617
	(0.028)	(0.029)	(0.028)
GHGTot	0.00121		
	(0.002)		
GHG12		0.05013*	
		(0.029)	
GHG3			0.00121
			(0.002)
Disclosure_Index*GHGTot	-0.00143*		
	(0.001)		
Disclosure Index*GHG12		-0.05955***	
		(0.017)	
Disclosure_Index*GHG3			-0.00164*
			(0.001)
L.TotAss	0.03050	0.02987	0.03048
	(0.064)	(0.064)	(0.064)
L.Dep_tl	-0.02182***	-0.02187***	-0.02182***
	(0.005)	(0.005)	(0.005)
L.NPL_r	-0.00515	-0.00511	-0.00516
	(0.006)	(0.006)	(0.006)
L.ROA	-0.21538*	-0.21299*	-0.21547*
	(0.119)	(0.118)	(0.119)
L.Cash_ta	-0.00550	-0.00546	-0.00549
	(0.006)	(0.006)	(0.006)
L.Fees_opinc	-0.00533	-0.00536	-0.00532
	(0.005)	(0.005)	(0.005)
L.Tier1_r	-0.02943	-0.03023	-0.02940
	(0.022)	(0.022)	(0.022)
L.ESGscore	-0.00524	-0.00525	-0.00524
	(0.003)	(0.003)	(0.003)
L.ESGcontroversies	0.00342***	0.00342***	0.00342***
	(0.001)	(0.001)	(0.001)
L.Stakeholders	-0.15421	-0.15459	-0.15414
	(0.172)	(0.172)	(0.172)
L.Firm_ta	0.55483***	0.55483***	0.55486***
	(0.025)	(0.025)	(0.025)
L.Firm_cash	0.00065***	0.00064***	0.00065***
	(0.000)	(0.000)	(0.000)
L.Firm_debt	0.00570***	0.00569***	0.00570***
	(0.000)	(0.000)	(0.000)
L.Firm_ROA	0.00517***	0.00517***	0.00517***
	(0.001)	(0.001)	(0.001)
L.Firm_WC	0.00040	0.00040	0.00040
	(0.000)	(0.000)	(0.000)
L.Firm_gearing	-0.00003	-0.00003	-0.00003
	(0.000)	(0.000)	(0.000)
L.Board_size	0.50612**	0.50706**	0.50613**
	(0.231)	(0.230)	(0.231)
L.CSR_comp	-0.12224*	-0.12318*	-0.12211*
	(0.070)	(0.070)	(0.070)
L.Board_tenure	0.01753	0.01717	0.01757
	(0.026)	(0.026)	(0.026)
L.Ind_board	0.00341*	0.00342*	0.00341*
	(0.002)	(0.002)	(0.002)
Observations	243,948	243,948	243,948
R-squared	0.7601	0.7601	0.7601
ILS FE	Yes	Yes	Yes
Cluster	Bank-firm	Bank-firm	Bank-firm
N banks	41	41	41
N firms	134191	134191	134191

Note: This table reports the results of the robustness test in which we replace our dependent variable with the amount of new lending issued in 2019 (New_Lending). ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively. Two-way clustered (bank-firm level) robust standard errors in parentheses. Variables are defined in table C1 in Appendix C.

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