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Banks vs. markets: Are banks more effective in facilitating sustainability?

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Abstract

Is bank- versus market-based financing different in its attitudes towards Environmental, Social, and Governance (ESG) risk? Using a novel sample covering 3,783 U.S. public firms from 2007 to 2020, we study how firm-level ESG risk affects its financing outcomes. We find that companies with higher ESG risk borrow less from banks than from markets, potentially to avoid bank monitoring and scrutiny. The Social and Governance components, in particular, matter. Furthermore, firms suffering higher numbers of negative ESG reputation shocks are less likely to continue to rely on bank credit in response to lenders' threats to end the lending arrangements. Finally, our results indicate that firms' ESG risk reduces after borrowing from banks but increases after bond issuance, suggesting that banks are more effective than public bond markets in shaping borrowers' ESG performance.

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1   Introduction

Financial intermediaries and institutional investors worldwide are under growing pressure to adjust their responsibilities in allocating funding resources towards the sustainable development of economies. Banks and non-bank financial institutions play a key role in the transition to a low-carbon, sustainable economy by funding and supporting projects and enterprises considered environmentally and socially responsible. In 2020, David Solomon, the CEO of Goldman Sachs, stated that sustainability is a core company objective, not an afterthought. Until 2021, over 250 banks representing more than 40% of global banking assets have committed to aligning with the vision for society's future outlined in the UN Sustainable Development Goals and the Paris Climate Agreement.[1] Acting responsibly appears to have become the consensus in the financial sector in recent years. In addition to the efforts of financial institutions, regulators have acted swiftly to address an increasing number of urgently identified sustainability crises, focusing on sustainability disclosure requirements for financial products, sustainable funding, and the goal of establishing a new, sustainable financial system. In the American Jobs Plan, the Biden Administration announced plans to spend $27 billion on the Clean Energy and Sustainability Accelerator.[2] This non-profit national green bank will use public funds to mobilize more private money and inject funding into state green banks, with the aim of sparking economic recovery and sustainable growth. At the same time, central banks have begun to align their corporate bond purchase program with the climate change goals set out in the Paris Agreement.[3]

Since ESG (Environmental, Social, and Governance) factors have become more integrated into financial institutions' investment and capital allocation frameworks, lenders are more likely to incorporate ESG criteria into credit granting. Consequently, firms with lower ESG performance will tend to incur higher lending spreads. Prior literature shows evidence that ESG related concerns are linked to the loan spread, with higher ESG risk associated with higher loan spreads (e.g., Chava, 2014; Hauptmann, 2017). The positive relationship between ESG risk and loan spread is even stronger when lenders are committed as responsible banks (Degryse et al., 2021). ESG-related risk is also reflected in bond spreads. Seltzer et al., (2020) examine the relationship between climate regulatory risks and corporate bonds and find that firms with poor environmental profiles suffer higher yield spreads, especially if firms are located in states with stricter environmental laws. To

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[1] https://www.unepfi.org/banking/bankingprinciples/more-about-the-principles/.
[2] Clean Energy and Sustainability Accelerator Act, US Congress, February 4, 2021.
[3] Greening our Corporate Bond Purchase Scheme (CBPS), Bank of England, 2021.

avoid more expensive debt financing, firms have incentives to hide negative ESG incidents, especially in an environment where mandated ESG disclosure legislation does not exist (Krueger et al. 2021). The incentive to hide may consequently influence a firm's debt choice.

As financial intermediaries, banks can acquire a constant flow of information from their borrowers. The comparative cost advantages in information production enable them to undertake superior debt-related monitoring (Diamond 1984, 1991). Conversely, diffused public debt ownership and the associated free-rider problem reduce bondholders' incentives to engage in costly information production and monitoring. Since banks are able to efficiently monitor borrowers and detect firms' misbehaviours easily through strict monitoring compared with public debtholders (Ben-Nasr, 2019), firms with high ESG risk, (particularly those not easily detected) have strong incentives to hide their misbehaviours by avoiding the reliance on bank loans.

In addition to explaining firms' debt choice from the demand-side, their decisions are also related to the supply side. On the one hand, the availability of bank loans directly impacts a firm's capital structure. The contraction in the supply of bank loans increases firms' reliance on the public bond market (Leary, 2009). Lending to borrowers who have received adverse media coverage is likewise a negative shock to banks. Banks are concerned that lending to borrowers with poor ESG reputations may harm their own reputations, resulting in depositor base volatility (Houston et al., 2021) and outflow of deposits (Homanen, 2018). Therefore, bankers exposed to such reputation shocks may be hesitant to finance borrowers with poor ESG reputations. On the other hand, poor ESG performance may be associated with higher credit risk (e.g., Jiraporn et al., 2014), legal risk (e.g., Schiller 2018; Hong et al., 2019), and downside risk (Hoepner et al., 2018). We should expect that those risks affect the likelihood of loan repayment and the existing lending relationship. In contrast, diffuse ownership, arm's length monitoring, and collective action problems associated with public debt can lead to low credit standards and less stringent ESG risk screening. Concerned about the disruption of lending relationships and the loss in credit availability, firms with unfavourable ESG-related reputations may choose public bonds as their primary debt type to minimise the uncertainty of an unexpected withdrawal from the lending relationship.

To better understand the role of ESG risk in a firm's financing decision, we directly investigate how ESG risk affects a firm's debt choice and what are the mechanisms behind debt choice. Only a few studies have been conducted to investigate how ESG risk influences enterprises' debt contracts and how financing decisions may help firms move towards more sustainable growth (Degryse, et al., 2021; Delis et al., 2021; Houston et al., 2021). The significance of different types of debt in shaping enterprises' sustainable transformation has remained unknown, as does the extent

to which debt finance may be used to address concerns about sustainable development. In this paper, our aim is to shed light on whether high ESG risk increases or reduces firms' reliance on bank debt and the potential mechanisms behind this choice. In addition, we examine how a firm's ESG risk exposure may be reduced by the use of different types of financing.

We conduct our empirical analysis on a sample of 71,341 firm-year-quarter observations covering 3,783 U.S. public firms from 2007 to 2020. We use the RepRisk Index (RRI) to measure firms' risk exposure related to ESG issues and provide strong evidence that a higher RRI is positively associated with less reliance on bank loans and greater dependence on public bonds. Specifically, a one-standard-deviation increase in the RRI reduces bank debt to total debt by 17 percentage points (pp). It increases the ratio of public debt to total debt by 14 pp. Further, we break down the RRI into "E, " "S," and "G" components based on the number of incidents with the respective "E," "S," or "G" issues. We show that the S and G components have a greater influence on firms' debt choices than the E component.

We consider two economic forces driving the outcomes. Firstly, firms with higher ESG risk choose public bonds over private bank loans as a way of avoiding bank scrutiny and monitoring ("Avoid Bank Monitoring Hypothesis"). Firms with higher ESG related risks (e.g., unemployment risk) have incentives to hoard negative news to maintain a better image and hence avoid borrowing from banks to avoid their misbehaviours to be detected (Ji and Tian, 2016; Ben-Nasr, 2019). In addition, Lin and Paravisini (2011) suggest that banks that have suffered a reputation loss may exert more monitoring efforts to re-establish their reputation. Borrowers would switch from bank loans to public bonds to avoid this stricter monitoring after the negative incidents. Another underlying driver influencing corporate debt selection is the desire to avoid sudden termination of loan relationships ("Disrupted Lending Relationship Hypothesis"). Lin and Paravisini (2011) demonstrate that the reputation shock has a substantial effect on the supply of loans from banks linked to fraudulent borrowers. After the reputation shock, the supply of loans drops rapidly by over 25% during the two years following the shock. Consequently, banks, especially those linked to borrowers with ESG negative incidents, have a strong incentive to cut credits with poor ESG performance borrowers to avoid scandals and protect their reputations and social capital. Hence, firms facing high ESG risk are concerned that banks will terminate loan contracts in case of adverse ESG incidents.

We find that the frequency of ESG-related incidents considerably lowers the proportion of bank debt in total debt while increasing the proportion of public bonds in total debt. We use a logit model to quantify the influence of ESG risk-related incidents on the decision to move from bank

debt to public debt. Our findings suggest that companies who reported more ESG risk-relate incidents in the previous quarter are less likely to continue borrowing from bank loans in the current quarter.

Finally, to investigate the potential consequences of the two financing sources on facilitating sustainable transformation, we present evidence supporting the role of bank monitoring in shaping borrowers' ESG performance. We find that borrowing from banks is negatively associated with future ESG risk. This is consistent with Houston and Shan (2019), who suggest that the bank relationship is a mechanism for promoting corporate ESG policies. We also find that issuing public bonds in the last quarter is positively associated with firms' ESG risk in the current quarter. This is because, in comparison with banks, bondholders have less motivation to monitor borrowers' ESG reputations and shape borrowers' ESG performance due to the diffused debt ownership.

Our results contribute to the literature in several ways. To begin, whereas prior corporate finance theories have generated a large body of theoretical and empirical study on Corporate Social Responsibility (CSR) or ESG issues, there is little research on the impact of a company's sustainability performance in the banking area. Goss and Roberts (2011) are the first to examine the link between loan contracts and corporate social responsibility. They find that firms with more serious CSR concerns are charged higher loan spreads. In a similar vein, Chava (2014) finds that firms with environmental concerns face greater margins on bank loans. Supporting this finding, Degryse et al. (2021) show that "green" firms can only get lower-cost loans when borrowing from an "eco-consortium" of lenders and only after ratification of the Paris Agreement in 2015. Hauptmann (2017) also find that firms with strong sustainability pay lower loan spreads than borrowers with weak sustainability performance, if the lending bank also exhibits strong sustainability performance. We extend this literature by investigating whether high ESG risk increases or reduces firms' reliance on bank debt and whether banks are more effective at disciplining and shaping borrowers' ESG performances. Our results show that the bank monitoring avoidance incentives and the concern of disrupted lending relationships are two potential mechanisms behind firms' reliance on public bonds when facing high ESG risk exposure.

In a paper closest to ours, Beyene et al. (2021) examine the potentially different roles of market- versus bank-based credit in the allocation of resources to fossil fuel. They do so by investigating fossil fuel firms' cost of corporate bond versus syndicated bank loan financing, and the consequent composition of these two debt types along these fossil fuel firms' risk of seeing part of their assets stranding. In striking contrast to our findings here, they find that bank financing on

average has not decreased along stricter climate policies, and that stranded assets risk is increasingly concentrated in a few large exposures present on the balances sheets of some very large banks. While most banks may increasingly avoid ESG risk, very large banks seem to hide behind their too-big-to-strand status and/or may aim to delay the stranding of fossil fuel reserves by "working the political system."

Our findings also add to an extant literature on bank monitoring (e.g., Diamond, 1984; Rajan, 1992; Bolton, 2000; Park, 2000), debt choice (e.g., Lin et al., 2013; Boubaker et al., 2018; Li et al., 2019), and lending relationships (e.g., Chernenko et al., 2019; Prilmeier, 2019; Houston and Shan, 2021).

The remainder of the paper proceeds as follows. We discuss the sample construction process and variable definitions in Section 2. Section 3 presents the empirical results on ESG risk and debt choices. Section 4 discusses the empirical results on negative ESG news and disrupted lending relationship. Section 5 provides further evidence on the potential consequence of debt choice. We conclude the paper in Section 6.

2 Data

2.1 Sample construction

To investigate the impact of a firm's ESG risk on its choice between bank loan and public debt, we construct a comprehensive dataset on ESG risk, controls, and debt structures for U.S. public firms over the period 2007-2020. We obtain debt structures data from S&P Capital IQ, which provides data on corporate debt structure for public debt and private debt from 2002 onwards (Colla et al. 2013; Choi et al., 2018). Our paper follows recent literature (e.g., Boubakri, et al., 2019; Li et al., 2019) that uses debt structure from Capital IQ instead of investigating debt choice by acquiring loan deals and public bond deals from Dealscan and SDC databases.[4] This is because the Dealscan database only provides syndicated loan data, which does not cover all of a firm's loan transactions. Due to the missing observations, the SDC database is also unable to give the most comprehensive public bond data. We extract ESG data from RepRisk. The RepRisk database provides a monthly unbroken time-series ESG rating and coverage on ESG news incidents, which spans from the start

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[4] Prior literature (e.g., Denis and Mihov 2003; Morellec, et al., 2015) investigates the choice of financing by acquiring bond issuance data from Fixed Income Securities Database (FISD) or SDC database and acquiring loan issuance from DealScan database. More recently, an increasing number of studies started to investigate the debt choice directly with the availability of debt structure data.

of 2007 through the end of 2020. Houston and Shan, (2019) compared different ESG databases and find that the ESG data from RepRisk database provides unparalleled granularity. It employs a monthly, continuous ESG rating ranging from 0 to 100, while the KLD and Eikon database both provide annual ESG ratings with many missing observations. Second, RepRisk provides event-based data that evaluates the outcome of ESG activities. Compared with self-reported ESG databases (Bloomberg, Refinitiv Eikon, and MSCI), RepRisk is more likely to avoid greenwashing biases and the manipulation of self-disclosure. Third, monthly ESG data provided by RepRisk database can be aggregated to quarterly ESG data which is more suited for matching with the quarterly level debt structure provided by S&P Capital IQ in order to better evaluate the impact of ESG risk changes on firms' debt structures. Last but not least, to our best knowledge, RepRisk is the only database that systematically identifies and assesses material ESG risks by analysing information from external sources. Different from other ESG data providers, RepRisk aims to provide firm-level ESG risk exposure, instead of ESG performance rating. Our paper uses the RRI to measure firms' risk exposure related to ESG issues.[5] The RRI calculation is based on the reach of information sources, the frequency, the timing of ESG risk incidents, and the content of risk incidents. It ranges from 0 (lowest) to 100 (highest). The higher the RRI, the higher the risk exposure. The RRI increases in proportion to the severity, reach, and novelty of the incident, and it decays if there is no new risk incident that happened for a given day. In addition, we use the RepRisk Rating (RRR) to measure firms' ESG performance, which is calculated based on the RRI and the Country-sector ESG risk. It ranges from AAA (highest) to D (lowest); the higher the RRR denotes better ESG performance and lower ESG risk exposure.

We obtain firms' financial information from Compustat for the most recent fiscal quarter that ended before the period end date of debt structure. We exclude all financial firms (SIC Code 6000-6999) and observations with missing firms' financial statement information at the end of the quarter before the current period end date of debt structure. The final sample contains 71,341 firm-year-quarter observations and 3,783 U.S. public firms from 2007 to 2020.

In addition to the firm-year-quarter level debt structure sample, we construct the new debt issuance sample of loans and bonds with corresponding deal characteristics as well as firm

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[5] RepRisk relies on AI and machine learning technologies to search and screen 28 ESG issues related to risk incidents, on a daily basis, from over 100,000 public sources and stakeholders in 23 languages. These sources range from international to the regional, national, and local levels. More detailed information on the 28 ESG issues and the calculation process of either RRI or RRR are available at https://www.reprisk.com/news-research/resources/methodology.

characteristics and ESG data. Our sample of bank loans is obtained from the Refinitiv Eikon and WRDS-Thomson Reuters DealScan LPC for 2007-2019. The bank loan coverage at Refinitiv Eikon is provided by Refinitiv Loan Pricing Corporation (LPC), which consists of detailed information on bank loans made to public firms. We obtain detailed information on public bonds issued by U.S public companies from Refinitiv Eikon and collect the reference firms' financial characteristics from Compustat for the most recent fiscal quarter ending prior to the loan start date (bond start date). We match the borrower and / or borrower's parent name to Compustat following Chava and Roberts (2008). The current DealScan-Compustat only includes matches at the end of 2017. Following Newton et al. (2020), we extend the present version of the link table until the end of 2019. Again, we exclude all financial firms (SIC Code 6000-6999) and all observations with missing firms' financial statement information at the end of the quarter prior to the current loan (current bond). In the final sample, we have 14,383 loan facilities and 5,569 public bonds. To merge the ESG data from the RepRisk database (this database only provides the private ID of RepRisk and ISIN), we construct a link table of ISIN and GVKEY through Capital IQ and manually check the link table. This Dealscan-SDC combined sample is applied to investigate whether the ESG risk is priced in bond contract terms and loan contract terms.[6]

2.2   Overview of sample

Table 1 presents summary statistics for the main variables of the full sample. To reduce the effects of outliers, we winsorize all of our continuous variables at 1% and 99% levels. Panel A presents the summary statistics for the firm-quarter level sample. The mean value for the percentage of *Bank Debt* financing is 39%, and the mean value for the percentage of *Public Debt* financing is 49% in our full sample. The mean value for bank debt financing in the subsample of high RRI businesses is 30%, which is lower than the mean value for bank debt financing (48 percent) in the subsample of low RRI enterprises. Firms with a high RRI are more likely to use public debt financing than firms with a low RRI, with an average of 58% vs 40% for low RRI firms. These preliminary findings are consistent with our primary hypothesis that higher ESG risk reduces firms' reliance on bank debt. In addition, in the whole sample, the average firm size is 7.71, the mean value of firm leverage ratio is 0.345, the mean value of Tobin's Q is 1.803, and about 50% of firms have debt rating. The statistics of those control variables are consistent with previous literature (e.g., Lin et al., 2013;

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[6] We include the results of loan pricing and bond pricing in the online Appendix.

Boubaker et al., 2017, 2018; Choi et al., 2018; Li et al., 2019; Chen et al., 2020). Panel B reports the summary statistics of the loan facility level sample. The average All-in-Spread Drawn (AISD) of the bank loans in our full sample is 227.773 basis points, and the average AISD of the bank loans for firms with high RRI is 210.515 basis points, which is lower than bank loan spreads for low RRI (245.613 basis points). Panel B shows that the average spread of public bonds for firms with high RRI is lower than the average spread for firms with low RRI (186.039 basis points vs. 299.81 basis points). To further test our hypothesis, we explore the impact of RRI on loan spreads and bond spreads, respectively, after controlling firm characteristics, loan information, bond information and fixed effects in OA 5. The results of OA 5 confirm that the RRI is positively associated with loan spreads and bond spreads, respectively, which are consistent with previous literature (e.g. Hauptmann, 2017; Seltzer et al., 2021).

Table 1: Summary Statistics

This table presents summary statistics for our sample firms over the 2007-2019 period. We split our sample into two subsamples based on the median value of *RRI*. In Panel A, *Bank Debt* is the percentage of bank debt scaled by the total amount of debt. *Public Debt* is the percentage of public bond debt scaled by the total amount of debt. *RRI* is the firm's quarterly reputational exposure to ESG risk. *RRR* is the firm's quarterly level ESG rating. Other variable definitions are listed in Appendix OA1. Panel B and Panel C present the summary statistics for our bond level sample and our loan facility-level sample, respectively. All variables are winsorized at the 1% and 99% levels.

Sample:	All Observations			High RRI Observations			Low RRI Observations		
Variable:	Obser-vations	Mean	S.D.	Obser-vations	Mean	S.D.	Obser-vations	Mean	S.D.
Panel A: Firm Level Data									
Bank Debt (%)	71,341	0.390	0.387	35,818	0.305	0.350	35,523	0.476	0.404
Public Debt (%)	71,341	0.494	0.399	35,818	0.583	0.376	35,523	0.403	0.402
Other (%)	71,341	0.116	0.248	35,818	0.111	0.230	35,523	0.121	0.265
RRI	71,341	10.446	12.911	35,818	20.770	10.855	35,523	0.036	0.212
RRR	71,341	8.106	1.560	35,818	7.276	1.667	35,523	8.943	0.833
Firm Size	71,341	7.711	2.182	35,818	8.691	1.881	35,523	6.720	2.011
Firm Leverage	71,341	0.345	0.460	35,818	0.339	0.352	35,523	0.351	0.548
Tobin's Q	71,341	1.803	3.069	35,818	1.603	1.871	35,523	2.007	3.912
MtoB	71,341	2.916	6.962	35,818	3.031	6.791	35,523	2.799	7.129
PPE Ratio	71,341	0.320	0.261	35,818	0.335	0.253	35,523	0.304	0.267
Firm RoA	71,341	-0.007	0.245	35,818	0.002	0.138	35,523	-0.018	0.318
Debt Rating Indicator	71,341	0.503	0.500	35,818	0.653	0.476	35,523	0.352	0.478

Investment Grade Indicator	71,341	0.247	0.431	35,818	0.388	0.487	35,523	0.105	0.307
Firm Profit	71,341	0.019	0.093	35,818	0.027	0.055	35,523	0.011	0.119
Cash Ratio	71,341	0.107	0.125	35,818	0.094	0.100	35,523	0.120	0.145
HHI	71,341	0.681	0.265	35,818	0.662	0.260	35,523	0.701	0.268
Excel 90	71,341	0.386	0.487	35,818	0.361	0.480	35,523	0.411	0.492
Panel B: Loan Level Data									
Loan Spreads	11,970	227.773	145.218	5516	210.515	150.327	6,454	245.613	150.852
Loan Maturity	14,383	3.838	0.629	7,181	3.761	0.706	7,202	3.916	0.529
Panel C: Bond Level Data									
Bond Spreads	5,260	236.691	185.595	2,918	186.039	158.799	2,342	299.801	204.049
Bond Maturity	5,569	4.684	0.714	3,138	4.700	0.800	2,431	4.664	0.564

Table 2 presents the correlation matrix of the main variables in our empirical analysis and all of the correlation coefficients are statistically significant at the 1% level. It shows that *RRI* is negatively linked to *Bank Debt*, and positively related to *Public Debt*, which provides univariate evidence that firms with higher ESG risk exposure tend to use less bank debt over public debt. We also find that *RRR* is positively related to *Bank debt* and negatively related to *Public debt*, which provides univariate evidence that firms with higher ESG ratings rely more on bank debt than public debt.

Table 2: Correlation Matrix

This table presents the correlation matrix for the main variables in our sample. Bank Debt is the percentage of bank debt scaled by the total amount of debt. Public Debt is the percentage of public bond debt scaled by the total amount of debt. RRI is the firm's quarterly reputational exposure to ESG risks. RRR is the firm's quarterly ESG rating. Other variable definitions are listed in Appendix OA1. We can see that RRI is negatively associated with bank debt and positively associated with public debt. All variables are winsorized at the 1% and 99% levels.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Bank Debt	1													
(2) Public Debt	-0.801*	1												
(3) RRI	-0.249*	0.236*	1											
(4) RRR	0.154*	-0.133*	-0.708*	1										
(5) Firm Size	-0.295*	0.328*	0.538*	-0.449*	1									
(6) Tobin's Q	-0.030*	0.009	-0.061*	0.059*	-0.286*	1								
(7) MtoB	-0.024*	0.011*	0.019*	0	0.053*	0.112*	1							
(8) Firm Leverage	-0.024*	0.094*	-0.035*	0.048*	-0.164*	0.268*	-0.069*	1						
(9) PPE Ratio	-0.012*	0.026*	0.048*	-0.074*	0.066*	-0.126*	-0.078*	0.047*	1					
(10) Firm RoA	0.004	-0.005	0.041*	-0.034*	0.167*	-0.181*	0.035*	-0.115*	0.009	1				
(11) Debt Rating Indicator	-0.368*	0.457*	0.329*	-0.200*	0.557*	-0.135*	0.006	0.050*	0.049*	0.066*	1			
(12) Firm Profit	-0.002	0.013*	0.089*	-0.074*	0.350*	-0.291*	0.057*	-0.204*	0.058*	0.488*	0.153*	1		
(13) Cash Ratio	-0.060*	-0.047*	-0.100*	0.063*	-0.300*	0.232*	0.074*	-0.007	-0.293*	-0.063*	-0.213*	-0.200*	1	
(14) Investment Grade Indicator	-0.382*	0.406*	0.419*	-0.321*	0.533*	-0.038*	0.059*	-0.078*	-0.071*	0.057*	0.569*	0.118*	-0.100*	1

3 ESG risk and debt choice

3.1 The effect of ESG risk on firms' choice of debt

While Table 2 demonstrates a negative association between firms' ESG risk exposure and reliance on bank debt, we are unable to alleviate the concern that company debt structure is connected with other firm characteristics relevant to firms' ESG risk exposure. In this section, we conduct a multivariate analysis to better gauge the effect of a firm's ESG risk exposure on its debt choices. we primarily estimate the following models:

$$Debt\ Choice_{i,t} = \alpha_1 RRI_{i,t-1} + \beta_t X_{it-1} + v_t + \eta_i + \epsilon_{i,t} \qquad (1)$$

Where the dependent variable is the debt choice measures, capturing a firm's reliance on bank debt or bond debt. It is proxied by either $Bank\ Debt_{i,t}$ or $Public\ Debt_{i,t}$. $Bank\ Debt_{i,t}$ measures the proportion of bank debt in a firm's total debt and $Bond\ Debt_{i,t}$ measures the proportion of public debt in a firm's total debt. Our main interest is the size, sign and statistical significance of the coefficients $RRI_{i,t-1}$, which captures the firm's ESG risk exposure at the end of the quarter prior to the period end date of debt structure. X_{it-1} is a set of control variables that may influence the choice of debt. All of the independent variables are lagged by one quarter. In addition, we include year-quarter, firm-fixed effects in our model to account for potential changes in the reliance on a particular type of debt through time and among firms.

Table 3 reports the baseline regression results of Equation (1). Standard errors are clustered at the firm level and are heteroskedasticity-robust. Column (1) of Table 3 shows a negative and statistically significant relationship between a firm's ESG risk exposure and the proportion of bank debt in a firm's debt structure. Column (3) of Table 3 indicates a positive and statistically significant relationship between a firm's ESG risk exposure and a firm's reliance on public debt. Based on the estimates from Column (1) and Column (3) of Table 3, a one-standard-deviation increase in the ESG risk exposure reduces the ratio of bank debt to total debt by 16.57 pp and increases the ratio of public debt to total debt by 13.96 pp. In addition, we find a firm's ESG rating (measure by RRR) is positively related to the proportion of bank debt to total debt (Column (2) of Table 3) and is negatively associated with the proportion of public debt to total debt (Column (4) of Table 3). These findings support the results from Column (1) and Column (3). In addition, although the increase of ESG risk exposure reduces the reliance on bank debt, we cannot pin down whether the total debt

goes down followed by reducing bank debt. Therefore, we further investigate the impact of ESG risk on firms' total debt. We demonstrate that that ESG risk exposure has no effect on overall debt. With an increase in ESG risk exposure, the drop in bank debt is compensated for by an increase in public debt. We include control variables on firm-specific characteristics to isolate other potential effects on the firm's debt choice. In line with previous literature (e.g., Houston and James, 1996; Denis and Mihov, 2003; Lin et al., 2013; Boubaker et al., 2017, 2018), we show that larger firms, those with a greater market value, and those with a higher leverage ratio depend less on bank loans and more on public debt. Additionally, asset tangibility, cash ratio, market-to-book ratio, and profitability are all positively correlated with a higher dependence on bank debt and less reliance on public debt. Overall, these results indicate that the relationship between ESG risk exposure and debt choice is consistent with the hypothesis that firms with higher ESG risk exposure choose public bonds to avoid scrutiny and insulate themselves from bank monitoring.

While our results from Table 3 show that ESG risk is negatively associated with the reliance on bank debt and positively associated with the dependence on public debt, we still lack information on which component of ESG risk is driving a firm's less reliance on bank debt. Therefore, we split RRI into three components (E, S, and G), which represent environmental risk exposure, social risk exposure, and governance risk exposure, respectively. Our findings suggest that firms' less reliance on bank debt is mainly driven by "S" and "G" rather than "E". The results are robust even when we include the three components into one specification (Columns (4) and (8) in Table 4). Debt holders as external financiers are unable to efficiently detect firms' misconduct and irresponsible behaviours caused by social and governance risk. Due to this severe information asymmetry between firms and debt holders, firms that face significant social and governance risks avoid borrowing from banks to conceal their misconduct from bank monitoring. These results are consistent with the previous literature that firms with poor social or governance performance have strong incentives to hide their behaviours. For example, Ben-Nasr (2019) shows that firms with higher unemployment risk tend to rely on public bonds for avoiding banks' monitoring on misconduct. Also, Lin et al., (2013) demonstrate that large shareholders with excess control rights have incentives to extract the private benefits of control and they choose public bonds as a way of avoiding bank monitoring. Taken together, the results of Table 4 further support our findings that ESG risk exposure, particularly "S" and "G" risk exposure, motivates corporations to borrow less from banks in order to escape scrutiny and avoid bank supervision.

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Table 3: Debt structure and ESG risk

This table presents our baseline results regarding the impact of ESG risk on debt structure. The dependent variable, Bank Debt, is the percentage of bank debt scaled by the total amount of debt. Public Debt is the percentage of public bond debt scaled by the total amount of debt. Columns (1) and (3) report regression results of Bank Debt and Public Debt on ESG risk (RRI), respectively. Columns (2) and (4) report regression results of Bank Debt and Public Debt on ESG rating (RRR), respectively. Columns (5) and (6) report regression results of Total Debt on RRI and RRR, respectively. The independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level and are reported in parentheses.

Dependent Variable:	Bank Debt (%)		Public Debt (%)		Total Debt	
	(1)	(2)	(3)	(4)	(5)	(6)
RRI	-0.064***		0.056**		0.095	
	(0.02)		(0.02)		(0.07)	
RRR		0.976***		-0.579**		-1.325
		(0.26)		(0.26)		(0.84)
Firm Size	-0.017**	-0.017**	0.018**	0.018**	0.849***	0.849***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.06)	(0.06)
Tobin's Q	-0.042	-0.043	-0.154	-0.154	-1.479**	-1.480**
	(0.12)	(0.12)	(0.12)	(0.12)	(0.74)	(0.74)
MtoB	0.060**	0.061**	-0.043*	-0.044*	-0.017	-0.018
	(0.03)	(0.03)	(0.03)	(0.03)	(0.08)	(0.08)
Firm Leverage	-0.027*	-0.027*	0.069***	0.069***	0.903***	0.903***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.24)	(0.24)
PPE Ratio	-0.161***	-0.160***	-0.023	-0.024	0.291	0.290
	(0.05)	(0.05)	(0.05)	(0.05)	(0.22)	(0.22)
Firm RoA	0.516**	0.519**	-0.726**	-0.727**	-3.102	-3.099
	(0.24)	(0.24)	(0.33)	(0.33)	(2.67)	(2.67)

Debt Rating Indicator	-0.132*** (0.02)	-0.132*** (0.02)	0.167*** (0.02)	0.167*** (0.02)	0.451*** (0.06)	0.452*** (0.06)
Firm Profit	0.076*** (0.02)	0.077*** (0.02)	-0.059*** (0.02)	-0.060*** (0.02)	-0.262* (0.15)	-0.263* (0.15)
Cash Ratio	-0.314*** (0.04)	-0.314*** (0.04)	0.147*** (0.04)	0.147*** (0.04)	-0.756*** (0.18)	-0.756*** (0.18)
Investment Grade Indicator	-0.036* (0.02)	-0.035* (0.02)	0.038* (0.02)	0.038* (0.02)	0.017 (0.06)	0.015 (0.06)
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	62,540	62,540	62,540	62,540	62,540	62,540
Adj. R2	0.699	0.699	0.741	0.741	0.942	0.939

Table 4: The impact of each component of ESG risk on Debt choice

This table shows the impact of each component of ESG risk on debt choice. The dependent variable, Bank Debt is the percentage of bank debt scaled by the total amount of debt. Public Debt is the percentage of public bond debt scaled by the total amount of debt. We split ESG risk into three components:" E", "S", and "G". Our results show that firms' debt choice is driven by Social, Governance factors rather than the Environmental factor. The independent variables are lagged one period. Column (4) and Column (8) report the estimation results of specification including "E", "S" and "G" together. The coefficients of "E" remain insignificant in all specifications, and "S" and "G" remain significant in all specifications. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level and are reported in parentheses.

Dependent Variable:	Bank Debt (%)				Public Debt (%)			
	（1）	（2）	（3）	（4）	（5）	（6）	（7）	（8）
RRI_E	-0.038 (0.05)			-0.023 (0.05)	0.004 (0.05)			-0.007 (0.05)
RRI_S		-0.091** (0.04)		-0.094** (0.04)		0.074** (0.04)		0.079** (0.04)
RRI_G			-0.084** (0.04)	-0.089** (0.04)			0.094** (0.04)	0.098** (0.04)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	62,540	62,540	62,540	62,540	62,540	62,540	62,540	62,540
Adj.R2	0.699	0.699	0.699	0.699	0.741	0.741	0.741	0.741

3.2   The effect of negative ESG news on debt choice

As noted previously, we argue that firms with higher ESG risk exposure rely less on bank loans to avoid stringent covenants and tight monitoring imposed by banks. In an extended analysis, we retrieve the number of exogenous ESG-related incidents for a firm in each quarter and examine the impact of exogenous negative ESG news on firms' debt choices. RepRisk database collects and screens ESG related risk incidents from over 100,000 public sources and shareholders. Each risk incident is analysed according to the severity (harness) of risk incident or criticism, the reach of the information source, and the novelty of the issues.[7]

Reputation shock from borrowers would make it harder for banks to extend their business in the future (Homanen, 2018) and lead to the outflow of deposits (Houston et al., 2021). Banks, especially those exposed to reputation shocks have a strong incentive to shrink their loan supply to firms with more ESG risk incidents and exert more monitoring efforts to re-establish their reputation (Lin and Paravisini, 2011). Apparently, it is hard to directly investigate the composition of lenders' loan portfolios due to a lack of data available. However, the shrink of loan supply is consequently reflected in borrowers' debt structure. If the concern of disrupted lending relationship is the driving force, the number of ESG-related incidents will negatively relate to the bank debt reliance. Hence, we use the ESG-related incidents as exogenous reputation shocks to investigate the change on borrowers' debt structure. The findings may give indirect evidence of bank lending contraction following the reputation shock. We anticipate that firms' bank debt will decline promptly in the current quarter, following a prior quarter increase in the number of ESG-related incidents. To examine this hypothesis, we estimate the following model:

$$Debt\ Choice_{i,t} = \alpha_1 Nr\_News_{i,t-1} + \beta_t X_{it-1} + \upsilon_t + \eta_i + \epsilon_{i,t} \qquad (2)$$

Dependent variable $Debt\ Choice_{i,t}$ is the firm's debt choice, it is proxied by either $Bank\ Debt_{i,t}$ or $Bond\ Debt_{i,t}$. $Nr\_News_{i,t-1}$ is the natural logarithm of one plus the total number of negative ESG issues, reported in the media. X_{it-1} is a vector of control variables specified under Eq. (1). We

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[7] The severity is determined in a rule-based way along three dimensions: 1. what are the consequences of the risk incident (e.g., whether there is a further injury or death after the incident); 2, what is the extent of the risk incident (how many people are affected by this incident); 3. whether the risk incident caused by accident or in a systematic way. The reach is determined by whether the information sources are local media, national media, or international media. The novelty is determined by whether it is the first time the company has been exposed to the incident. More information is available at https://www.reprisk.com/approach#process.

also controlled the year-quarter fixed effects and firm fixed effects. All independent variables are lagged one period.

We report our regression results in Table 5. Columns (1) to (4) show negative and statistically significant relations between bank debt reliance and the number of negative ESG news events. Furthermore, a negative association exists between bank dependency and the number of unfavourable ESG news events that are the most original, as well as the number of negative ESG news events that are of the greatest reach. However, we didn't find a significant relationship between the bank debt and the number of ESG news events that are the highest severity. From Columns (5) to (8) of Table 5, we repeat our regressions by replacing $Bank\ Debt_{i,t}$ as $Bond\ Debt_{i,t}$ and investigate the impact of negative ESG news on the bond debt reliance. Our results show that as the frequency of unfavourable ESG news items grow in the previous quarter, the share of public debt in the firm's debt financing increases in the current quarter, while the firm's dependence on bank loan drops. Our findings suggest that the frequency of negative ESG-related news stories acts as an exogenous reputation shock, lowering the share of bank debt in the firm's debt structure and increasing the amount of public debt. Overall, our findings support our "Disrupted Lending Relationship" hypothesis, which states that lenders may reduce their loan supply in reaction to a borrower's reputation shock.

Table 5: Negative news and Debt structure

This table reports the OLS regression results between negative ESG news incidents and the debt structure. *Ln_Nr_News* is the number of negative ESG news coverage at quarter t-1. *Ln_Nr_Highseveristy* is the natural logarithm of one plus the total number of negative ESG issues with high severity at quarter t-1. *Ln_Nr_Highnovelty* is the natural logarithm of one plus the total number of ESG issues with high novelty at quarter t-1. *Ln_Nr_Highreach* is the natural logarithm of one plus the total number of ESG issues with high reach at quarter t-1. Controls include numerous borrowers' financial characteristics. Detailed control variable definitions are available in the OA1. All regressions control for firm and time fixed effects. The independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses.

Dependent Variable:	Bank Debt (%)				Public Debt (%)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln_Nr_News	-0.683*** (0.23)				0.722*** (0.22)			
Ln_Nr_Highseveristy		-0.120 (1.15)				-4.126*** (1.33)		
Ln_Nr_Highnovelty			-0.867** (0.36)				0.890*** (0.33)	
Ln_Nr_Highreach				-1.253** (0.57)				0.834 (0.55)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	62,540	62,540	62,540	62,540	62,540	62,540	62,540	62,540
Adj. R2	0.699	0.699	0.699	0.699	0.737	0.736	0.736	0.736

3.3   ESG risk and debt instruments

The bank monitoring avoidance hypothesis suggests that firms with higher ESG risk exposure borrow more from public debt and less from bank loans. S&P Capital IQ classifies total debt into seven mutually exclusive debt types, enabling us to investigate the impact of ESG risk exposure on the composition of debt structure. Colla et al., (2013) use the classification of debt from the S&P Capital IQ database and find that about two-thirds of enterprises rely on senior bonds and notes, one-fifth on subordinated bonds and notes, and about 5% on commercial paper. Therefore, we can expect that that the growth in public debt with increased ESG risk exposure (RRI) is more pronounced in senior bonds and notes and subordinated bonds and notes. In addition, if the bank monitoring avoidance hypothesis dominates, we can expect firms with higher ESG risk exposure to borrow less on term loans than revolvers. This is because term loans are typically used to finance long-term projects with longer maturities and greater credit risk and are normally imposed with stricter financial covenants and higher monitoring requirements (Angbazo et al., 1998; Harjoto et al., 2006, Newton, 2020). As a result, the firms with higher ESG risk exposure take actions to avoid stringent scrutiny by reducing the reliance on term loans. In Table 6, we report the regression results of the impact of ESG risk on different components of the debt structure. The results in Columns (1) and (2) of Table 6 indicate that as ESG risk exposure (as defined by RRI) increases, bank loans reduce mostly owing to a decline in the proportion of term loans, with no statistically significant change in revolvers, which further support our "Avoid Bank Monitoring Hypothesis". We report the impact of ESG risk exposure on the instruments of bond debt in Columns (3), (4) and (5). There is a statistically substantial correlation between ESG risk and the reliance on senior debt and notes. Additionally, we find that ESG risk is positively correlated with reliance on subordinated bonds and notes, but not on commercial paper. Overall, the results confirm our hypothesis that firms with significant ESG risk rely more on senior bonds and notes, as well as subordinated bonds and notes, rather than term loans to avoid the strict monitoring from banks.

Table 6: Debt instruments and ESG risk

This table shows the OLS regression results for the impact of ESG risk on different types of debt and which types of debt are more sensitive to the ESG risk. Specifically, we split bank debt into term loans and revolvers; split bond debt into three components (senior bonds and notes, subordinated bonds and notes, and commercial paper) by following Colla et al., (2013). All of the independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level and are reported in parentheses.

Dependent Variable:	Bank Debt (%)		Bond Debt (%)		
	Term Loan (%) (1)	Revolvers (%) (2)	Senior Bonds and Notes (%) (3)	Subordinated Bonds and Notes (%) (4)	Commercial Paper (%) (5)
RRI	-7.231*** (2.25)	0.840 (1.56)	4.057* (2.22)	1.427* (0.85)	0.089 (0.27)
Controls	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Obs.	62,540	62,540	62,540	62,540	62,540
Adj. R2	0.646	0.629	0.743	0.591	0.504

4 Controlling for the endogeneity of ESG risk and debt structure

4.1 ESG risk and new debt issuance

Similar to other studies focusing on firms' debt choices, endogeneity is a potential issue in our empirical setting. Our results may be driven by omitted variables correlated with both firm's ESG risk and bank debt or by reverse causality from bank debt to firms' ESG risk. To alleviate these endogeneity concerns we first employ new debt issuance as a proxy of a company's debt structure to analyse the dynamic influence of a firm's ESG risk exposure on debt selection. We examine the relation between a firm's ESG risk exposure and the likelihood of borrowing from bank debt and public debt, respectively.

$$New\ Debt\ issuance_{i,t} = \alpha_1 RRI_{i,t-1} + \beta_t X_{it-1} + v_t + \eta_i + \epsilon_{i,t} \tag{3}$$

Where the dependent variable $New\ Debt\ issuance_{i,t}$ is a dummy variable, it is either $New\ Bank\ issuance_{i,t}$, a dummy variable that equals one if the change of the outstanding of bank debt at quarter t and at quarter t-1 is positive, and zero otherwise; or $New\ Bond\ issuance_{i,t}$, a dummy variable that equals one if the change of the outstanding of public debt at quarter t and at quarter t-1 is positive, and zero otherwise. The vector X_{it-1} contains firm-specific characteristics to mitigate the impact of omitted factors that are correlated with both the firm attributes of interest and the choice of debt. All of the control variables are lagged one quarter, including the natural logarithm of borrower's total asset (*Firm Size*), the market value of assts minus deferred taxes over the book value of total assets (*Tobin's Q*), the market value scaled by book value (*MtoB*), the ratio of borrower's total book debt to total assets (*Firm Leverage*), the amount of property, plant, and equipment scaled by total assets (*PPE Ratio*), the operating income scaled by total assets Firm (*ROA*), the indicator for S&P long-term credit rating (*Debt Rating Indicator*), the operating income before depreciation scaled by total assets (*Firm Profit*), the cash and equivalents divided by total assets (*Cash Ratio*) and the indicator for S&P investment-grade credit rating (*Investment Grade Indicator*).

Table 7 reports the logit regression results of Eq. (3) with standard errors clustered by the firm to account for heteroskedasticity. We include year-quarter fixed effects, industry fixed effects in all of the specifications. To better capture the impact of ESG risk exposure on debt choice, we

split our sample into two samples. Panel A is the subsample of firms that issue either bonds or loans or both. Columns (1) and (2) in Panel A show that there is a statistically negative relationship between ESG risk and the likelihood of borrowing from banks (Column (1)), and a statistically positive relationship between ESG risk and the potential of issuing public debt (Column (2)). Panel B of Table 7 presents the regression results on the subsample of firms that either issue bonds or loans. The results confirm that the relationship between ESG risk and the likelihood of new loan issuance is statistically negative, whereas the relationship between ESG risk and the likelihood of new bond issuance is statistically positive, providing support for the bank monitoring avoidance hypothesis.

Table 7: Debt new issuance and ESG risk

This table reports estimation results of the impact of ESG risk (*RRI*) on the likelihood of borrowing from bank loans and public bonds, respectively. In Panel A, we estimate our results based on the sample, including firms that issue either bonds or loans, or both. In Panel B, we estimate our results based on the sample including firms that issue either bonds or loans. The independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses.

Panel A:	Sample of firms that issue either bonds or loans, or both	
Dependent Variable:	New Loan Issuance (1)	New Bond Issuance (2)
RRI	-0.494*** (0.15)	0.335* (0.17)
Controls	Yes	Yes
Year-Quarter FE	Yes	Yes
Industry FE	Yes	Yes
Obs.	62,586	62,586
Pseudo R2	0.036	0.039
Panel B:	Sample of firms that issue either bonds or loans	
Dependent Variable:	New Loan Issuance (1)	New Bond Issuance (2)
RRI	-0.486*** (0.17)	0.470** (0.20)
Controls	Yes	Yes
Year-Quarter FE	Yes	Yes
Industry FE	Yes	Yes
Obs.	48,639	48,639
Pseudo R2	0.042	0.051

4.2   Instrumented ESG risk

Although we employed lagged dependent variables in all of our regressions to minimise concerns about reverse causality, this may not entirely eliminate the issue of endogeneity between company ESG risk exposure and debt structure. To further address these endogeneity issues, we perform 2SLS regression analyses using *High Religious* and *Canada Border* as our instrumental variables for the ESG risk. *High Religious* is a dummy variable that equals one if the ratio of religious adherents in the state where the firm's headquarters located is higher than 50%. A higher level of religious adherence is positively associated with stronger social morality (Hilary and Hui, 2009; Callen and Fang, 2015) and attitude towards CSR (Angelidis and Ibrahim,2004, Deng et al., 2013). We could expect that local religious adherence is negatively correlated with a firm's ESG risk exposure but unlikely to correlate with a firm's financing outcomes.

Canada Border is a dummy variable that equals one if the firm's headquarters is located in the state that borders Canada and zero otherwise. Putnam (2001) shows that local social capital is closely related to the depth of slavery in the nineteenth century. The slavery system destroys local social solidary and social norms. The states being closer to the Canadian border, the earlier of becoming free states and therefore have more social capital. Consequently, using the distance to the Canadian border as the instrumental variable for CSR is widely used in several studies (e.g., Hasan et al., 2017; Gupta, 2018; Cornett, 2021). In this paper, we use the dummy variable *Canada Border* as our second instrumental variable for ESG risk. We expect that firms located in the states bordering Canada have lower ESG risk exposure and better ESG performance. Importantly, the distance to the Canadian border is unlikely to be correlated with firms' financing outcomes.[8]

Column (1) of Table 8 presents results from the first-stage regression. The dependent variable is *RRI,* and the independent variables include the two instrumental variables and other control variables. Coefficients on instrumental variables are both negative and statistically significant, which are consistent with our expectation that the firm's ESG risk is negatively associated with their headquarters' distance to Canadian border and local religions level. The F-statistic is highly significant, confirming the relevance of our instrumental variable. In the second stage, the coefficient on *RRI* is statistically significant and negatively related to the bank debt and

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[8] The estimation results of 2SLS are robust to using continuous variables. As a further robustness check we use the ratio of religious adherents in the state where the firm's headquarters is located (measured by the number of religious adherents divided by the state's population), and the distance to the Canadian border measured by the natural logarithm of the distance from the firm's headquarters to the Canadian border.

positively associated with public debt. This result with instrumental variables further confirms that firms with higher exposure to ESG risks rely less on bank loans.

Table 8: 2SLS

The table shows the results from 2SLS estimations using an instrumental variable approach. The dependent variable is *RRI* in the first stage. *RRI* is instrumented by the dummy variables *Canada Border* and *High Religious* in the second stage. All independent variables are lagged by one period. All regressions control for firm and time fixed effects. The independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses.

	1st Stage	2nd Stage	
Dependent Variable:	**RRI**	**Bank Debt (%)**	**Bond Debt (%)**
	(1)	(3)	(4)
Variables of Interest			
RRI		-0.016*** (0.003)	0.036*** (0.004)
Instrumental Variables			
Canada Border	-0.542*** (0.15)		
High Religious	-1.729*** (0.16)		
Cragg-Donald Wald F-stat (Stock-Yogo weak ID test critical value)	60.361 (19.93)		
Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Obs.	71,341	71,341	71,341

5   The consequence of different debt choices on ESG risk

5.1   Negative ESG news and switching debt choice

Houston and Shan (2019) recently demonstrates that the amount of unfavourable ESG news items is adversely and statistically substantially associated with the chance of maintaining the same lead arrangers, implying that reputation shocks may cause firms to switch lenders. The hypothesis of "Disrupted Lending Relationship" naturally raises the question of whether firms who have received more negative ESG-related news may shift away from bank debt and toward public debt in reaction to the possibility of sudden termination of lending relationship. Since switching lenders is costly for borrowers (Petersen and Rajan, 1994), firms may choose public debt in response to the concerns about the disruption of lending arrangements and credit availability. To further test the "Disrupted Lending Relationship" hypothesis, in this section, we estimate the following model to examine the relationship between firms' ESG reputation shocks and the probability of switching debt choices.

$$\Pr\left(Same_{i,t}\right) = \phi\left(\alpha_1 Nr\_News_{i,t-1} + \beta_t X_{it-1} + \upsilon_t + \eta_i + \epsilon_{i,t}\right) \qquad (4)$$

In the logit model Eq. (4), $\phi(.)$ denotes the cumulative distribution function (CDF) of the probability that a firm switch debt choice. $Same_{i,t}$ is a dummy variable that equals one if the new loan issuance happens both at the quarter t and at the quarter t-1. $Nr\_News_{i,t-1}$ is the main explanatory variable that measures the number of negative news coverage on firm i at quarter t-1. X_{it-1} is the vector of borrower's characteristics consistent with the control variables in Eq. (1). We also include year-quarter fixed effects and firm fixed effects. Standard errors are clustered at the firm level.

We conduct analysis based on two subsamples. First, we estimate Eq. (4) based on the subsample of firms that issue either bonds or loans or both. Column (1) of Panel A in Table 9 reports that the coefficient estimates of $Nr\_News_{i,t-1}$ is negatively associated with the likelihood of retaining the same loan issuance, indicating that firms with more negative ESG news coverage at quarter t-1 are less likely to keep borrowing from bank loans at quarter t. In addition, the number of news events with the highest severity, the number with the highest novelty and the number with the highest reach are statistically significant and negatively linked to the likelihood of retaining the loan issuance. Furthermore, firms with a greater amount of negative ESG news coverage are less likely to change their bond issuance. This is most likely due to the fact that firms issue public debt to eliminate the risk of unforeseen funding interruptions. Additionally, to account for the influence of

firms that issue both loans and bonds on our results, we undertake a subsample analysis using a subsample of firms that issue either loans or bonds (Panel B). The majority of the estimation findings are consistent with those in Panel A.

Table 9: Negative news and switching debt choices

This table reports the Logit regression of the number of the borrower's negative ESG-related news on the likelihood of initiating new loans and new public bonds. *Same Loan Issuance* is the dummy variable that equals one if the borrower has both new loan issuance at quarter t and quarter t-1, and zero otherwise. *Same Public Issuance* is the dummy variable that equals one if the borrower has both new bond issuance at quarter t and quarter t-1, and zero otherwise. We exclude firms that issue both bonds and loans in Panel B. Controls include numerous borrowers' financial characteristics. Detailed variable definitions are available in the OA1. All regressions control for firm and time fixed effects. The independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses.

Panel A:	Sample of firms that issue either bonds or loans, or both							
Dependent Variable:	Same Loan Issuance				Same Public Issuance			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln_Nr_News	-9.581*** (3.33)				4.258 (3.57)			
Ln_Nr_Highseveristy		-60.047** (28.54)				15.804 (18.09)		
Ln_Nr_Highnovelty			-17.343*** (5.71)				8.429 (5.97)	
Ln_Nr_Highreach				-46.869*** (12.06)				17.05** (7.86)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	62,408	62,408	62,408	62,408	62,470	62,470	62,470	62,470
Pseudo R2	0.050	0.050	0.050	0.051	0.041	0.041	0.041	0.041
Panel B:	Sample of firms that issue either bonds or loans							
Dependent Variable:	Same Loan Issuance				Same Public Issuance			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln_Nr_News	-8.314** (3.41)				5.777 (3.67)			
Ln_Nr_Highseveristy		-59.71** (29.41)				14.651 (17.37)		
Ln_Nr_Highnovelty			-15.23*** (5.87)				10.669* (6.04)	
Ln_Nr_Highreach				-43.69*** (12.24)				19.985** (8.13)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	48,565	48,565	48,565	48,565	48,608	48,608	48,608	48,608
Pseudo R2	0.048	0.048	0.048	0.048	0.045	0.045	0.045	0.045

5.2   Debt choice and future ESG risk

In this subsection, we further investigate the role of bank monitoring in shaping firms' ESG risk by comparing it with the consequence of raising funding from public debt. The empirical analysis is based on the following OLS specification.

$$RRI_{i,t} = \alpha_1 New\ Debt\ issuance_{i,t-1} + \beta_t X_{it-1} + \upsilon_t + \eta_i + \epsilon_{i,t} \tag{5}$$

Where $RRI_{i,t}$ is a firm i's ESG risk exposure at quarter t. $New\ Debt\ issuance_{i,t-1}$ is a dummy variable. It could be $New\ Bank\ issuance_{i,t-1}$ or $New\ Bond\ issuance_{i,t-1}$. X_{it-1} is the vector of borrower's characteristics consistent with the control variables we used in previous models. We also include year-quarter fixed effects and industry fixed effects. Finally, standard errors are clustered at the firm level.

Column (1) of Table 10 presents the estimation results of Eq. (5) for investigating the impact of issuing different debts on the firms' ESG risk exposure. We find the coefficient on $New\ Bank\ issuance_{i,t-1}$ is negative and statistically significant, indicating that firms issuing bank debt at the previous quarter tend to decline ESG risk exposure at the current quarter. On the opposite, Column (2) of Table 10 shows that firms issuing public debt at quarter t-1 have a positive correlation with their ESG risk exposure in quarter t. The results provide indirect evidence that banks promote borrowers' ESG performance and reduce borrowers' ESG risk through the bank monitoring channel. At the same time, public debt investors are less willing and able to monitor borrowers' ESG performance closely. ESG risk inevitably increases after issuing public bonds. Thus, firms with higher ESG risk exposure have a strong incentive to rely more on public debt than on bank debt to avoid tight monitoring posed by banks.

Table 10: Monitoring and ESG Risk

This table presents the results of OLS regression of investigating the impact of different debt sources on ESG risk. *New Loan Issuance* equals one if the borrower has new loan issuance at quarter t-1, and zero otherwise. *New Bond Issuance* equals one if the borrower has new public debt issuance at quarter t-1, and zero otherwise. Controls include numerous borrowers' financial characteristics. Detailed variable definitions are available in the OA1. All regressions control for firm and time fixed effects. The independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses.

Dependent Variable:	RRI	
	(1)	(2)
New Loan Issuance	-0.332** (0.15)	
New Bond Issuance		0.446*** (0.33)
Controls	Yes	Yes
Year-Quarter FE	Yes	Yes
Industry FE	Yes	Yes
Obs.	62,586	62,586
Adj. R2	0.336	0.336

6   Conclusion

This paper closes a gap in the literature by demonstrating that firms with a high ESG risk depend less on bank loans and more on public bonds. We provide robust evidence that firms with high ESG risk rely less on bank loans in order to avoid bank monitoring and scrutiny. Furthermore, we find two potential mechanisms behind the impact of ESG risk exposure on firms' financing choices: "Bank Monitoring Avoidance" and the "Disrupted Lending Relationship" concern. First, firms facing higher ESG risk exposure may prefer public bonds over bank loans to evade scrutiny and to insulate themselves from bank monitoring. Second, firms suffering a greater number of negative ESG reputation shocks are less likely to continue obtaining bank loans in response to lenders' threats to "exit" the lending arrangement. Overall, our work demonstrates a novel channel in which firms' ESG risk can profoundly affect their financing choices.

Financial markets and intermediaries play a pivotal role in allocating resources for investment in the economy. The literature has long discussed the comparative advantages of the

bank-based versus capital market-based financing on effective funding allocation. Banks' comparative advantage stems from their ability to collect private information about borrowers through their lending relationships. Due to their comparative cost advantages in information production, banks are able to conduct improved debt-related monitoring. Conversely, diffused public debt ownership and the resulting free-rider problem limit bondholders' incentives to invest in time-consuming monitoring. Our results suggest that firm ESG risk decreases after borrowing from banks, demonstrating that banks are more successful at shaping and influencing borrowers' ESG performances. In this context, our research has significant policy implications by demonstrating the critical role of financial intermediaries in attaining sustainable development goals.

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Online Appendix for "Bank vs. Market: Are Banks More Effective in Facilitating Sustainability?"

OA1: Variable definition and data source

This table presents the description of all the key variables in our sample, together with their data sources.

Variable	Definition	Source
Public Debt (%)	Ratio of public bonds to total debt. Public bonds represent the sum of senior bonds and notes, subordinated bonds and notes, and commercial paper. Total debt is the sum of term loans, revolving credit, senior bonds and notes, subordinated bonds and notes, commercial paper, capital leases, and other debt.	Capital IQ
Bank Debt (%)	Ratio of bank loans to total debt. Bank loans is the sum of revolving credit and term loans. Total debt is the sum of term loans, revolving credit, senior bonds and notes, subordinated bonds and notes, commercial paper, capital leases, and other debt.	Capital IQ
RRI	Company's quarterly reputational exposure to ESG risks.	RepRisk
RRR	Company's quarterly ESG rating	RepRisk
Ln_Nr_News	Natural logarithm of one plus the total number of negative ESG issues, as reported in the media.	RepRisk
Ln_Nr_Highseveristy	Natural logarithm of one plus the total number of negative ESG issues with high severity, as reported in the media.	RepRisk
Ln_Nr_Highnovelty	Natural logarithm of one plus the total number of ESG issues with high novelty, as reported in the media.	RepRisk
Ln_Nr_Highreach	Natural logarithm of one plus the total number of ESG issues with high reach, as reported in the media.	RepRisk
Firm Size	The natural logarithm of the borrower's total assets	Compustat
Firm Leverage	The ratio of borrower's total book debt to total assets.	Compustat
Tobin's Q	The ratio of market value of total assets to book value of total assets.	Compustat
MtoB	The market value scaled by book value	Compustat
PPE Ratio	The amount of property, plant, and equipment scaled by total assets.	Compustat
Firm RoA	Operating income scaled by total assets.	Compustat
Debt Rating Indicator	An indicator that equals one if the borrower is rated by S&P long-term credit rating, and zero otherwise	Compustat and Capital IQ
Firm Profit	Operating income before depreciation scaled by total assets	Compustat
Cash Ratio	Cash and equivalents divided by total assets	Compustat
New Loan Issuance	An indicator that equals one if the difference between the outstanding of bank debt at quarter t and at quarter t-1 is positive, and zero otherwise.	Capital IQ
New Bond Issuance	An indicator that equals one if the difference between the outstanding of public debt at quarter t and at quarter t-1 is positive, and zero otherwise.	Capital IQ
Same Loan Issuance	An indicator that equals one if the borrower has both new loan issuance at quarter t and quarter t-1, and zero otherwise.	Capital IQ
Same Bond Issuance	An indicator that equals one if the borrower has both new bond issuance at quarter t and quarter t-1, and zero otherwise.	Capital IQ

OA2: Negative news and debt issuance

This table reports the Probit regression of the number of the borrower's negative reputation news on the likelihood of initiating new loans and new bonds. *Ln_Nr_News* is the number of negative ESG news coverage at quarter t-1. *Ln_Nr_Highseveristy* is the natural logarithm of one plus the total number of negative ESG issues with high severity at quarter t-1. *Ln_Nr_Highnovelty* is the natural logarithm of one plus the total number of ESG issues with high novelty at quarter t-1. *Ln_Nr_Highreach* is the natural logarithm of one plus the total number of ESG issues with high reach at quarter t-1. *New Loan Issuance* is a dummy variable that takes one if the firm borrows from banks at the quarter t, *New Bond issuance* is a dummy variable that equals one if the firm borrows from the bond market at the quarter t. This analysis is conducted based on the sample of firms that issues either bonds or loans, or both. Detailed variable definitions are available in the OA1. All regressions control for firm and year quarter fixed effects. The dependent variables and independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses.

	Sample of firms that issues either bonds or loans, or both							
Dependent Variable:	**New Loan Issuance**				**New Bond Issuance**			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Ln_Nr_News	-6.231*** (2.01)				3.456*** (1.22)			
Ln_Nr_Highseveristy		-24.597* (14.57)				-8.039 (9.80)		
Ln_Nr_Highnovelty			-8.891** (3.48)				4.312** (2.06)	
Ln_Nr_Highreach				-15.131** (6.01)				6.026* (3.18)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	62,586	62,586	62,586	62,586	62,586	62,586	62,586	62,586
Pseudo R2	0.036	0.036	0.036	0.036	0.039	0.039	0.039	0.039

OA3: Negative news and debt issuance

This table reports the Probit regression of the number of the borrower's negative reputation news on the likelihood of initiating new loans and new bonds. *Ln_Nr_News* is the number of negative ESG news coverage at quarter t-1. *Ln_Nr_Highseveristy* is the natural logarithm of one plus the total number of negative ESG issues with high severity at quarter t-1. *Ln_Nr_Highnovelty* is the natural logarithm of one plus the total number of ESG issues with high novelty at quarter t-1. *Ln_Nr_Highreach* is the natural logarithm of one plus the total number of ESG issues with high reach at quarter t-1. *New Loan Issuance* is a dummy variable that takes one if the firms borrow from banks at the quarter t, *New Bond issuance* is a dummy variable that equals one if the firm borrows from the bond market at the quarter t. This analysis is conducted based on the sample of firms that issues either bonds or loans. Detailed variable definitions are available in the OA1. All regressions control for firm and year quarter fixed effects. The dependent variables and independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses.

	Sample of firms that issues either bonds or loans							
Dependent Variable:	**New Loan Issuance**				**New Bond Issuance**			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Ln_Nr_News	-6.321***				4.712***			
	(2.29)				(1.39)			
Ln_Nr_Highseveristy		-24.810				-9.252		
		(16.46)				(11.31)		
Ln_Nr_Highnovelty			-8.342**				6.444***	
			(3.95)				(2.34)	
Ln_Nr_Highreach				-18.000**				7.377**
				(7.06)				(3.61)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	48,639	48,639	48,639	48,639	48,639	48,639	48,639	48,639
Pseudo R2	0.042	0.042	0.042	0.042	0.050	0.050	0.050	0.050

OA4: Debt concentration and ESG risk

This table represents the impact of ESG risk on debt specialization. We follow Colla et al., (2013) and use *HHI* and *Excel 90* to measure the degree of debt specialization. Detailed information of variables is available in the OA 1. The results show that firms with higher ESG ratings are associated with a higher degree of debt specification. But we do not find evidence that supports the relation between firms' ESG risk and the degree of debt specification. All regressions control for firm and year quarter fixed effects. The independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses.

Dependent Variable:	HHI		Excl90	
	(1)	(2)	(3)	(4)
RRI	-0.013 (0.02)		-0.003 (0.03)	
RRR		0.412** (0.21)		0.852** (0.41)
Controls	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Obs.	62,540	62,540	62,540	62,540
Adj. R2	0.571	0.448	0.571	0.448

OA5: Loan, bond spread and maturity comparison and ESG risk

This table represents the impact of ESG risk on loan spreads and bond spreads. This table is designed to alleviate the concern that whether firms' financing choice is affected by the pricing of ESG risk in the two markets. Loan Spread is the basis point spread over LIBOR plus the facility fee. Bond Spread is the difference between the yield on the bond and a treasury bond with the corresponding maturity. Loan Maturity is the natural log of the maturity of the loan facility in months. Bond Maturity is the natural log of the maturity of bonds in months. The results show that ESG risk exposure (measured by RRI) is priced in either loan contract terms or bond contract terms. Firms with higher ESG risk face higher loan spread, shorter loan maturity, higher bond spreads, and shorter bond maturity. Control variables include firm characteristics, loan characteristics or bond characteristics. All regressions control for firm and year quarter fixed effects. The independent variables are lagged one period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Standard errors are robust and clustered at the firm level, and t-statistics are reported in parentheses.

Sample Dependent Variable:	All Loan Facilities		All Bond Facilities	
	Loan spread	Loan Maturity	Bond spread	Bond Maturity
RRI	46.57** (16.23)	-0.280** (-2.40)	108.09*** (21.43)	-0.278** (0.10)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Purpose FE	Yes	Yes	Yes	Yes
Obs.	11,310	13,711	4,932	4,954
Adj. R2	0.414	0.148	0.653	0.039

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