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Do banks price environmental risk? Only when local beliefs are binding!

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Abstract

We study the environmental footprint of firms on their cost of bank credit. We document that at loan origination, banks charge higher rates and reduce their stakes in firms with more greenhouse emissions, pollution, waste, and/or natural damage, especially when weakly capitalized and borrowers operate in "greener" states. The price penalty intensifies during local heating shocks and interacts with regional biodiversity risk. Following Trump's withdrawal from the Paris Agreement, banks reduce their environmental risk pricing in "browner" states. In sum, the environmental sensitivity in bank lending is also driven by local attitudes and regulatory enforcement.

Key words: Climate change, biodiversity risk, bank credit, personal beliefs.

JEL classification: G12, G18, G21

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1 Introduction

The last decade has seen an increasing awareness in environmental sustainability including biodiversity. Environmental concerns have also taken centre stage among both academics and policymakers. Almost two hundred countries have to date signed the Paris Agreement and committed to reaching the net zero targets. The severity and vulnerability of environmental damage however remains subject to a heated debate. Climate change supporters and deniers support very different courses of regulatory action. In the March 2023 Gallup Survey, only 39% of Americans believe that global warming poses a threat to their way of life; on the other hand, already 62% of Americans believe that global warming is due to the pollution from human activities[1]. And in June 2017, then-president Trump even called global warming a "hoax" and announced the withdrawal of the United States from the Paris Agreement. Yet in 2020, Biden based his successful presidential campaign on environmental sustainability and reversed the withdrawal from the Paris Agreement on the first day of his presidency.

Given all this widespread disagreement on causes and differences in actions on the environment, how can and do banks actually reflect environmental harm in their lending decisions, and thereby reconcile these diverse perspectives? What is the role of biodiversity risk?

In this paper, we investigate whether and how banks price the environmental footprint of their borrowers. We rely on a sample of U.S. syndicated loans during the period 2004-2019. We document salient stylized empirical facts on the sensitivity of the loan rates to the direct and indirect environmental impact of the borrowers. We also examine how environmental sensitivity interacts with biodiversity risk.

We start by documenting that banks charge higher loan rates to those borrowers that have a higher impact and damage on the environment, including water, air, land, natural resource use, and waste. In particular, we establish that the same lender in the same year, after controlling for borrower and non-price deal characteristics, charges a 0.9 percentage point (pp) higher rate relative to the mean to borrowers with a one-standard-deviation higher level of total impact on the environment.

[1] https://news.gallup.com/poll/474542/steady-six-say-global-warming-effects-begun.aspx

Then we also exploit the heterogeneity of these effects across the lenders, and document the sensitivity to be greater among the banks with weaker capitalization, suggesting that lowly capitalized banks perceive the environmental damage of their borrowers as an additional source of risk. This effect is robust to controlling for both borrower characteristics and other loan term features, including but not limited to the loan size, loan maturity, and the type of the loan (*i.e.*, the presence of covenants and collateral, and non-bank participation). Consistent with the regulatory capital motive, we find that banks also reduce their "skin-in-the-game" to environmental harm.

To investigate what drives the pricing of environmental footprint, we focus on the role of personal beliefs and preferences in the local environment of the borrower. Using the Yale Survey of Climate Change beliefs, we classify states as "green" and "brown" and we document that lenders penalize firms for their environmental impact only in green states, where the public shows a high level of awareness of global warming based on their personal experiences. This suggests that the environmental risk perception is related to the beliefs and preferences in the local area of the borrowers. We also test whether banks are more likely to penalize borrowers for environmental damage in the regions where the public believes that global warming will harm them personally. We document that the loan-environmental impact sensitivity only arises in the areas where climate change denial is low. These results suggest that banks consider the personal beliefs in the local areas of their borrowers and especially whether the public may perceive global warming as a personal threat.

One identification challenge is that lenders may penalize borrowers for their environmental impact not only because they are seen as riskier, but because lenders are environmentally conscious and have an ESG-driven and socially responsible business model. We thus analyse the sensitivity of the loan prices to the environmental impact of the borrowers with a lender $\times$ year FE, looking at the cross-section of loan rates across the borrowers with different levels of environmental impact for the same lender and in the same year, insulating our effects from the business model and attitudes of the bank. In addition, we exploit short-term local shocks to environmental beliefs. To this end, we use local abnormal temperatures and find that banks are even more likely price the environmental footprint of their borrowers at the times of local heating shocks. For the average U.S. rate of global warming, a one standard deviation increase in environmental impact results in a 32 basis point additional spread penalty.

We then study the role of biodiversity risk. It may be possible that banks penalize borrowers for their environmental damage due to biodiversity risk concerns. For example, the harm that a borrowing firm creates on the environment can be irreversible and lead some species at a high risk of extinction to disappear. Thus, we explore the regional (and also firm-level) dispersion in the biodiversity risk exposures. We observe that the biodiversity risk exposure of firms is unlikely to explain why banks demand compensation for the environmental damage of their borrowers.

We also show novel evidence that biodiversity risk is also priced and it has an impact on the cost of bank credit. Especially negative 10-K news of biodiversity has an important impact whereas other variables such as 10-K mentions with respect to biodiversity issues and regulatory developments are insignificant. A singular negative biodiversity news item results in a 10 basis points (bps) increase in the loan rates which is both statistically significant and economically meaningful (involving a 4.44% increase in the loan rate relative to the mean). These results suggest that banks especially price negative biodiversity news rather than merely their relevance.

Furthermore, the species extinction risks are very strongly priced. We find that a 1% increase in the share of endangered species in the state of the borrower increases the loan rates by 2.37 pp relative to the mean (88.69 $\times$ 0.06 / 224). If firms are in the states where local biodiversity is at a high risk of extinction, lenders demand higher compensation for that risk exposure. Our results suggest that there may be complementary: if banks penalize borrowers for their biodiversity risk exposure, they are less likely to charge additional spreads for their environmental impact.

We finally study the surprise withdrawal of Trump from the Paris Agreement that represented an idiosyncratic reversal of commitment from the net-zero targets. Our set-up gives us a distinction between the firms that are affected and unaffected by the deregulation, as a series of states and cities did immediately sue the Trump administration in Court. We also expect the borrowers in the states with a Republican majority that have a political mindset similar to the Trump government to be more affected as they were unlikely to challenge the government *ex post*. Similarly, our conjecture is that banks are more likely to relax their sensitivity to environmental damage if environmental denial in the local area is low.

We find that the environmental deregulation led banks to reduce the sensitivity of their loan pricing to the environmental footprint of the borrowers in the areas that did not sue the Trump government and in the Republican states. To gain deeper insights, we study the role of beliefs and find that the reduction in the price sensitivity to the environmental impact is stronger in the brown states, suggesting that local beliefs are reflected in the response of the cost of bank credit to environmental deregulation. Our results suggest that lenders are more likely to demand compensation for environmental risk if they anticipate higher social pressure and regulatory enforcement. We again control for the lender × year fixed effects in all our specifications to absorb the time-varying changes in the green attitudes and preferences of the banks themselves. Moreover, we find that the pricing effects appear only in the types of environmental impact covered by the deregulatory initiatives of the Trump government, such as the land and water impact, air pollution, and GHG emissions. Overall, our results suggest that the environmental deregulation led banks to relax their environmental sensitivity in the cost of bank loans, but only if the local beliefs and attitudes are likely to be supportive.

We aim to make a contribution to four distinct strands of the literature. First, we contribute to the literature on the implications of the environmental impact of firms on the cost of financing. Several papers show that investors require a premium for holding the stock of firms with high levels of carbon emissions (Bolton and Kacperczyk (2021a)[2] and Bolton and Kacperczyk (2021b)[3]). A nascent and growing literature also investigates the impact of climate change on bank lending and has found

[2]Bolton and Kacperczyk (2021a) for example document a carbon premium in the cross-section of U.S. stock returns, and show that stocks of firms with higher emissions earn higher returns, controlling for size, book-to-market, and other return predictors. The carbon premium is not explained by known risk factors, suggesting that investors demand compensation for exposure to carbon emission risk.

[3]Bolton and Kacperczyk (2021b) also find that the carbon premium is global and captures the carbon transition risk. They show that the short-term transition risk is greater in the countries with greater reliance on fossil energy and lower economic development whereas the long-term transition risk is higher in the countries with stricter domestic climate policies.

evidence of pricing effects (Degryse et al. (2023) and Delis et al. (2024)). Giannetti et al. (2023) document with confidential data that there is a discrepancy between the bank disclosures and their green lending and that banks are reluctant to sever ties with brown borrowers in financial difficulties. However, there has been relatively little effort to understand what drives banks to price environmental risks in the cost of bank credit. Our contribution to this literature is two-fold. First, rather than focusing on the carbon emissions, we consider the overall and different types of environmental impact and damage on the loan rates. Second, we investigate what drives the loan pricing behaviour of banks and our focus is on the role of local personal beliefs and attitudes.

We also aim to contribute to the new literature on biodiversity. Biodiversity risk has received surprisingly little attention in the finance literature. Our paper is the first study that looks at the impact of biodiversity risk on the loan prices. We find evidence that banks consider the biodiversity risk exposure of their borrowers in their lending decisions. We also show that biodiversity risk is perceived as a separate risk factor but there is complementarity: banks are less likely to penalize environmental harm once they account for biodiversity risk.

With a conceptual framework on financing biodiversity, Flammer et al. (2023) argue that biodiversity can be financed with pure private capital and blended financing structures in which private capital is blended with public and philanthropic capital to de-risk the private capital investments. Using deal-level data from a leading biodiversity finance institution, they show that projects with higher expected returns tend to be financed by pure private capital while larger-scale projects tend to attract blended financing. A group of recent working papers empirically study whether biodiversity is a priced risk factor. Giglio et al. (2023) construct news-based measures of the U.S. firms' biodiversity risk using the disclosure of biodiversity issues in the 10-K filings. They document that exposures to biodiversity risk significantly differ across industries and affect equity prices as portfolios sorted on biodiversity risk exposure co-varies positively with innovations in aggregate biodiversity risk. Garel et al. (2023) conduct this study for a global sample, and they document that in the aftermath of the Kunming Declaration, investors started to require compensation for firms with a high biodiversity footprint.

The topic has however not been studied in the corporate loan market.

We also relate to the literature concerned with the effects of heterogeneous beliefs on the pricing behaviour. The empirical literature in this area has focused on the role of beliefs for the development of housing prices. Baldauf et al. (2020) for example use transactional data on housing prices and future inundation forecasts, and document that houses projected to be underwater sell at a discount compared to houses in the denier neighbourhoods. They also use the Yale Climate Opinion survey for data on climate beliefs. The role of beliefs has however attracted surprisingly little attention in the banking literature. We provide novel evidence that the heterogeneity of beliefs is reflected in the impact of environmental risk on the cost of bank credit. We also show that belief differences concerning climate change affect the implications of environmental deregulation, suggesting that banks consider local beliefs and preferences as the underlying source of environmental risk. Dursun-de Neef and Ongena (2023) provide complementary evidence on the deposit-side and show with branch-level deposit data from the United States that depositors move their money away from fossil-fuel-financing banks when experiencing warmer-than-usual temperatures.

We finally add to the growing literature that studies the role of bank regulation on climate finance. Kacperczyk and Peydró (2022) show that banks that committed to carbon neutrality reduced their credit to firms with higher carbon emissions. Delis et al. (2024) find that after the Paris Agreement, banks started to charge higher rates to brown firms with larger fossil fuel reserves. Degryse et al. (2023) document that after the Paris Agreement, banks rewarded firms that voluntarily disclose their carbon emissions to the Carbon Disclosure Project (CDP) in the form of cheaper loans. A related line of work investigates the impact of the cap-and-trade policies. Antoniou et al. (2020) find that the 2013 EU Emissions Trading System led banks to reduce their loan spreads, driven by the expected reduction in carbon emissions. Using the discontinuities in the California cap-and-trade programme, Ivanov et al. (2023) show that high emission firms face higher interest rates and that the effects are concentrated among private firms [4]. The novelty of our paper is our focus on environmental deregulation. We

[4]Bartram et al. (2022) provide evidence of geographic arbitrage using U.S. plant-level data. They find that in response to the California- cap-and-trade program, financially constrained firms shifted emissions and output to states

provide novel evidence that the surprise withdrawal of Trump from the Paris agreement in the U.S. has reduced the sensitivity of the loan prices to the environmental damage of the borrowers. The effects only operate on the non-challenger and non-denier states, consistent with our interpretation that local enforcement and beliefs affect the environmental risk perception.

We structure our paper as follows. We describe the Data in Section 2 and present the empirical design in Section 3. We report the results in Section 4 and conclude in Section 6.

2 Data

We extract our data from the Reuters Dealscan Database where each observation corresponds to a facility loan agreement in the syndicated loans provided to the U.S. firms. Syndicated lending is characterized by the presence of multiple lenders: lead arranger (s) that screen and monitor the borrowers, and participants that rely on the information provided by the lead arranger (s) (Ivashina (2009) and Sufi (2007)). Since the loan pricing decisions are taken by the lead arrangers, we focus our sample on the lead arrangers as in previous literature (Degryse et al. (2023)).

We obtain our climate change data from the S&P Trucost Database. Trucost provides granular information on the environmental damage of firms. We provide information on the data variables and the summary statistics in Table 1. The key variable of interest in our analysis is the total environmental impact, that is defined by Trucost as the environmental costs that a company has on the environment through its own activities as a percentage of revenue. The total environmental impact measures the sum of the direct and indirect environmental impact ratios. The direct environmental impact is defined as the direct environmental costs that a company has on the environment through its own activities as a percentage of revenue. The indirect environmental impact is on the other hand the environmental impact that a firm has on the environmental through the goods and services that it purchases.

Our data sample covers the period 2004-2019. Dealscan provides us with information on the loan characteristics, such as the interest rate, loan size, and loan maturity. We also have data on the non-

with under-utilized plants while not reducing the overall level of their total emissions.

pricing characteristics of the loans, such as the covenant and the collateral status, and the syndicate structure such as the presence of a non-bank investor. We report the summary statistics in Table 1. Our key left-hand-side variable of interest is the all-in-spread-drawn measure, which we winsorize at the 1% level to remove outliers, has an average value of 224 basis points (bps). The all-in-spread-drawn captures the interest rate paid by the borrower over LIBOR at the loan origination, including any annual and upfront fees.

Graph 1 presents the histogram of the total environmental impact of the U.S. firms in our sample. The distribution shows that most firms have a total environmental impact ratio as a proportion of their total revenue that ranges between 0 and 10 %. The average value of the total environmental impact of the U.S. firms has remained persistent over time and is around 4-8 % (Graph 2) even though it has declined slightly after 2015. As also shown in the Summary Statistics (Table 1), we observe a substantial dispersion in the environmental impact of the firms: while on average the total environmental impact as a percentage of revenue 4% percent, the distribution is heavily right-skewed, with a standard deviation of 8 %.

Trucost decomposes the total environmental impact of firms into six different categories: the natural resources, air pollutants, green house gas (GHG) emissions, water, land and water, and waste impact ratio. They also classify firms into six different sectoral groups. Based on the Trucost sectoral categorisation, we document the average total and direct environmental impact of firms in different sectors (Graph 4). We observe that the total environmental impact of the U.S. firms is more concentrated among certain sectors, such as Consumer Staples, Energy, Materials, and Utility. We also observe that whereas the *direct* environmental impact is the main source of the *overall* environmental impact, some sectors such as Consumer Staples and Materials have higher *indirect* environmental impact ratios. This suggests that some firms have a greater impact on the environment through their own activities relative to their impact through the goods and services that they purchase through the third parties. We winsorize all the impact ratios at the 1% level to mitigate the impact of the potential outliers.

We obtain data on the environmental beliefs and attitudes of the U.S. society from the Yale Climate Opinion surveys. From these surveys, we obtain, at the state level, the percentage of the respondents who somewhat/strongly agree that they have personally experienced the effects of global warming and the estimated percentage who think global warming will harm them a moderate amount/great deal. The Yale Climate Opinion surveys are conducted almost every year and span our entire sample.

We draw our biodiversity risk measures from a number of available sources. First, we use the biodiversity risk measures constructed by Giglio et al. (2023). The authors develop both firm and industry-level measures of biodiversity risk and have made the data publicly available. They propose three corporate-measures of biodiversity: (i) *count* that is an indicator that equals one if the company mentions biodiversity in at least two sentences in the 10-K statements, (ii) *negative* that is the number of negative biodiversity sentences minus the number of positive biodiversity sentences, and (iii) *regulation* which is an indicator variable that is one if the company mentions biodiversity in at least two sentences and at least one of them is about regulation in the 10-K statements. Second, Giglio et al. (2023) propose industry-based measures of biodiversity risk: (i) *the gdp-biodiversity risk* is the average industry-based biodiversity risk weighted by the GDP of each industry, (ii) *the employment-based biodiversity risk* is the average industry-based biodiversity risk weighted by the employment in each industry, (iii) *the area-biodiversity risk* is the share of protected areas, and (iv) the *the species biodiversity risk* is the share of endangered species. Second, we use the state biodiversity risk rankings from the 2002 April NatureServe Report. The rankings are based on the status and distribution of 21395 plant and animal species drawn from the NatureServe Central Databases and attempt to provide a complete picture of the extinction risk across America. NatureServe constructs the biodiversity risk rankings in terms of percentage of the state's plants and animals that are at risk of extinction due to rarity or other conservation challenges and consist of species classified as extinct, endangered, and vulnerable. Both the data and rankings are publicly available. We also cross-check our findings with alternative biodiversity risk measures.

Finally, we use the Dealscan-Compustat Linking Database (Chava and Roberts (2008)) and obtain the financial statement data for the borrowers from Compustat. As consistent with the prior literature, we use the accounting data of the borrowers to control for their credit risk and add a variety of measures such as firm size, cash holdings, profitability, and leverage ratios.

3 Empirical Design

We use a simple loan pricing model to study whether banks penalize firms for their environmental impact. The baseline regression specification we run is the following:

$$loan\ rate_{ijt} = \beta \times impact_{it} + \alpha \times X_{it-1} + \gamma \times Z_{ijt} + \eta_{j \times t} + \epsilon_{ijt} \quad (1)$$

where i indexes firms, j indexes lender, and t year of the loan origination. The loan rate refers to the annual interest rate spread over $LIBOR$ paid by the borrower i to the lender j in basis points for each dollar drawn down, including the fees. $Impact_{ijt}$ is the impact that the borrowing firm has on the environment as a percentage of total revenue at the time of the loan origination. We use a variety of dependent variables to capture the environmental impact, such as the direct impact ratio, indirect impact ratio, and total impact ratio (the sum of the direct and indirect impact ratio). We also study the different types of environmental impact separately and replace the impact variable with the natural resources, air pollutants, GHG emissions, water, land and water, and waste impact ratio.

As our aim is to capture the impact of the environmental footprint on the loan prices, we control for other factors that may affect the cost of debt. X_{it-1} are the borrower controls such as log(assets), log(total debt), and ebitda/assets in the year prior to the loan origination controlling for the borrower characteristics that have been shown to affect loan prices. Smaller, more indebted, and less profitable firms pay higher rates on their borrowing (Ivashina (2009), Lim et al. (2014), and Berg et al. (2016)). In our baseline specification, we include $FE_{j \times t}$ to control for any time-varying and unobservable heterogeneity across the lenders. The interpretation is that we compare, for the same lender and in the same year, the penalty imposed on a borrower with a higher environmental footprint. However, in other specifications, we add FE_j as the lender fixed effects and separately control for the lagged lender-specific characteristics such as capitalization, log(total assets), and return on assets. Larger, more capitalized, and more profitable lenders may lend at more favourable rates at the loan origination. The lender controls are consumed when $FE_{j\times t}$ is included. As the loans issued by the same lender may have correlated spreads, we cluster the standard errors by lender.

All our specifications include state and sector fixed effects to absorb the average impact of the borrower state and industry on the loan rates. We control for the sector by adding the sectoral classification dummies. Z_{ijt} is the set of controls for the non-price loan terms such as the loan size and maturity as larger and longer-maturity loans have been shown to have lower spreads (see for example Carey and Nini (2007)). This may be due to the greater transparency of the larger borrowers who take larger loans, and the fixed costs of issuing a loan. We also add dummy variables for the loan purpose[5], the presence of covenants, and non-bank participation. Ivashina (2009) and Lim et al. (2014) have shown that loan facilities with non-bank institutional investors are associated with higher spreads than similar bank-only facilities. We also control for the relationship lending by adding a variable that captures the number of past interactions with the lender. Thus, our coefficient of interest β captures the rate penalty imposed on a borrower with a higher environmental impact ratio across the loans originated by the same lender, controlling for borrower characteristics and non-price loan terms.

We then propose to use the sudden Trump withdrawal from the Paris Agreement as a shock to the environmental riskiness of the borrowers. Our key identification feature lies in the fact that the environmental deregulation was suddenly challenged by a group of green and left-wing states, and it is thus unlikely to equally affect all borrowers. Borrowers in the non-green states are unlikely to face green social and political pressure and thus more likely to relax their environmental attitudes in response to the deregulatory moves of the Trump administration. Most importantly, the environmental deregulation is likely orthogonal to the lender characteristics such as bank capitalization, or borrower demand. We augment our baseline specification in a triple differences-and-differences specification

[5] Loans for acquisitions and LBOs tend to lead to higher spreads due to risk

as follows. Our deregulation indicator takes one after Trump has announced the withdrawal from the Paris Agreement and zero otherwise. We classify a borrower as treated if it is in a state that has challenged the environmental deregulation in the court or in a state unlikely to challenge the government as it is predominantly Republican. We run the following specification.

$$\begin{aligned} \textit{loan rate}_{ijt} = \beta \times \textit{impact}_{it} + \mu \times \textit{no-lawsuit-state}_i + \delta \times \textit{no-lawsuit-state}_i \times \textit{deregulation}_t \\ +\kappa \times \textit{impact}_{it} \times \textit{deregulation}_t + \lambda \times \textit{deregulation}_t \times \textit{impact}_{it} \times \textit{no-lawsuit-state}_i \\ +\alpha \times X_{it-1} + \gamma \times Z_{ijt} + \eta_{j\times t} + \epsilon_{ijt} \end{aligned} \quad (2)$$

where μ captures the time-invariant characteristics of the firms in the states that have not challenged the deregulation relative to the other states and δ reflects the relative change in the loan rates in the non-challenger states after the deregulation. κ is the average change in the price of the environmental impact after the deregulation. Finally, λ is our triple difference-in-differences-in-differences coefficient of interest that captures the change in the sensitivity of the loan rates to the environmental impact after the deregulation in the affected states relative to the unaffected states. Our full specifications also control for the borrower characteristics that affect demand and the non-price features such as loan size and maturity that may also be affected by the deregulation. We also control for lender × year FE, to account for the time-varying changes in the lender green attitudes and preferences.

4 Empirical Results

We first study whether banks consider the environmental damage of their borrowers in their lending decisions. We find that they charge higher rates to the borrowers with a higher impact on the environment, such as water, air, and land pollution, use of natural resources, and waste. The effects are robust to the inclusion of borrower fundamentals, and non-price deal characteristics. In all our specifications, we control for the lender × year FE to account for the time-varying changes in the green attitudes and preferences of the lender. We then go on to study the borrower- and lender-level heterogeneity to understand the underlying mechanism behind the price response.

4.1 Pricing of Environmental Damage

In this section, we report the baseline results on the impact of environmental footprint on the cost of bank credit. We run our main specification 3 and analyse the relationship between the loan prices and environmental damage (the ratio of environmental costs as fraction of total revenue). All our columns have lender $\times$ year FE, as we compare for the same lender in the same year the differential rates charged to the borrowers with a greater environmental footprint. This is important as in our pricing regressions, we aim to insulate our pricing effects from time-varying unobserved shocks and lender characteristics that determine the credit supply. We also want to control for the green attitudes and preferences of the lenders and focus on the risk management motive, *i.e.*, demand compensation for bearing more environmental risk.

The premise of our empirical design lies on the hypothesis that lenders account for the environmental impact of the borrowers in their credit origination. We report the baseline results in Table 2. In column 1, our coefficient of interest is both statistically and economically significant. For a one-standard deviation increase in the total environmental impact, lender charge a 2 percentage points (pp) higher interest rate on the loan relative to the mean (8.32×0.555 / 224). In Column 2, we control for the borrower characteristics that have been shown to affect the cost of credit. We control for the size, leverage, and profitability of the borrower as these characteristics affect the informational asymmetry and riskiness of the borrower. We also control for the sector and state of the borrower to control for the time-invariant sectoral and geographical factors affecting borrower demand and absorb the cross-sectional differences across different states and industries. We find a small reduction in our coefficient of interest to 0.9 percentage point (pp) (8.32×0.555 / 224), consistent with our interpretation that banks perceive environmental damage as a material risk factor.

As we aim to capture the impact on the price of credit, we also include the non-price loan characteristics such as loan size and loan maturity, in addition to the dummies that classify the loan type and loan purpose to control for any mechanical cross-sectional differences that may arise due to the riskiness of the loan. We control for the size and maturity of the loan, non-bank participation, presence of covenants, and deal purpose. Our results remain qualitatively unchanged. This suggests that banks demand compensation for their exposure to the environmental risk in the form of higher interest rates.

One question that arises is whether lenders price all sources of environmental impact or rather focus on the short-term and salient risks. We therefore analyse the direct and indirect environmental impact separately. The direct impact is the direct costs on the environment whereas the indirect impact captures the environmental impact that arises through the goods and purchases purchased by the firm from the third parties. Column 4-6 replaces the total impact with the direct impact measure in our baseline specification 3. We find that the impact-price relationship is mainly due to the direct impact as our coefficient of interest is only slightly reduced. In economic terms, for a one-standard deviation increase in the direct environmental damage, lender charge a 3 percentage points (pp) higher rate on the loan. The effects again remain robust to the addition of borrower and loan-level controls. When we replace our impact variable with the indirect impact measure, our results become statistically insignificant in our most complete specifications. These results suggest that lenders scrutinize borrowers mainly based on their direct exposure to the environment. This may be because the indirect effects are less salient and thus seen as less material.

However, the total environmental damage seems to be most important priced factor in the data both economically and statistically. The most likely explanation is that banks may potentially screen their borrowers on the total impact that they have on their environment.

Trucost categorizes the environmental footprint of firms into six main categories: natural resources, air pollutants, GHG emissions, water, land and water, and waste. These groups reflect the environmental reliance and damage of borrowers in a variety of categories: Natural resources impact (the use of natural resources such as minerals, metals, natural gas, oil, coal, forestry, and agriculture), air pollutants (the costs of air pollutants), GHG emissions (the value of GHG emissions), water use (the dollar value of the use of water), land and water pollutants (the value of land and water pollutants), and waste generation (the dollar value impact of the waste generation). All variables are scaled by revenue and thus reflect to what extent the production and revenues of the firm depend on and affect the environment. To understand the pricing sensitivity to these different types of environmental impact, we replace our impact measure with these six different categories and replicate our baseline analysis with 3. We report the results in 1. We find that even though the total environmental impact of firms is reflected in the cost of credit, only certain types of impact is priced. In Panel A, we find that the reliance and use of natural resources is seen as a material risk factor, but the economic magnitude is small. For a one-standard deviation increase in the direct environmental impact on natural resources, lenders charge a 0.5 percentage points (pp) higher interest rate on the loan.

We then extend our analysis to the water pollution, and the impact on the land and water in Column 4 and 9. We find that our coefficient of interest is significant in our most complete specifications in Column 6 and 9. In terms of the economic magnitudes, a one-standard deviation increase in the total environmental impact on the water (the land and water), lenders charge a 1.6 (5.6) percentage points (pp) higher interest rate on the loan relative to the mean. Surprisingly, the impact on the land and water pollution is seen as the most material risk factor. One potential interpretation is that in the U.S., the water and land remain among the most controversial environmental regulations. For example, the Waters of the United States (WOTUS) rule frequently updates the scope of the federally protected waters under the Clean Water Act and changes the protections for the protected land and the threatened species.

In Panel B, we also investigate the pricing implications of air pollution and GHG emissions. Remarkably, we find that lenders fail to account for air pollution in the loan prices. One potential explanation is that banks account for air pollution at the extensive margin rather than in the form of higher interest rates. For example, after the Paris Agreement, many firms committed to net-zero targets and reduced their carbon emissions. The U.S. has also introduced a variety of regulations that limit air pollution. Ivanov et al. (2023) study the impact of the cap-and-trade policies on the

GHG emitting firms and show that the California and Waxman-Markey cap-and-trade bills led to a reduction in the loan maturities, a lower access to term loans, and higher interest rates[6]. In a related paper, Kacperczyk and Peydró (2022) show that in response to the commitment to the net-zero targets of the Paris Agreement, banks have reduced their total lending to firms with high scope-1 emission levels and reallocated credit towards the green firms.

We finally consider the impact of waste generation. Our coefficient of interest is negative and statistically significant in Columns 7-9, suggesting that waste is perceived as a natural outcome of production that is not a material risk factor. Broadly taken, our results indicate that lenders demand compensation for the environmental risk in the form of higher interest rates, but the effects mask substantial heterogeneity as lenders only scrutinize salient and certain types of environmental risk.

4.2 Lender-Based Heterogeneity

We now raise the question why banks price the environmental damage of their borrowers. Banks may require higher prices for lending to environmentally reliant firms more heavily exposed to the physical or regulatory transition risk. If this is the case, we would expect the pricing effects to apply more forcefully to the weakly capitalized banks. Equity issuance is costly due to asymmetric information as bank investors may interpret a bank's decision to issue equity as a signal that the stock is overvalued. In the presence of asymmetric information, banks that are weakly capitalized may be more risk averse as they are less likely to issue new equity and able to absorb losses in the face of unexpected environmental losses.

A large body of literature has studied the impact of low capital on bank pricing behaviour. In an early study, Boot et al. (1993) study the trade-off between reputational and financial capital and theoretically show that low capital makes banks more willing to exploit borrowers to raise their short-term earnings. In Froot and Stein (1998), banks with low capital become more risk averse and charge a higher risk premium to their riskier and bank-dependent borrowers. In Diamond and Rajan (2000),

[6]The cap-and-trade programs cap the GHG emissions at a threshold, and requires firms to use the allocated emission permits or purchase the permits at auctions, leading to a market price for carbon.

the risk of bank runs leads weakly capitalized banks to extract higher rents from their borrowers as it makes liquidation threat more credible and increases their bargaining position. Motivated by these theories, a large body of empirical work has documented that bank capital impacts loan rates. In a sample of U.S. bank loans to public firms, Hubbard et al. (2002) show that low-capital banks charge higher rates to borrowers with high-switching costs. Mattes et al. (2013) provide evidence from the U.K. that low capital firms charge higher rates to privately firms than publicly held firms. In a more recent study, Santos and Winton (2019) study the publicly traded U.S. firms and show that banks charge higher prices to their borrowers with low cash flow.

We therefore conjecture that compared to the high capital banks, low capital banks would be more likely to penalize borrowers for their environmental impact. More specifically, brown borrowers are more exposed to environmental risk that may for example affect their cash flows, asset volatility, reputation, and profitability. Lenders would then anticipate higher expected losses from these borrowers with a larger drain on their capital reserves.

We divide our sample between loans extended by banks with low and high capitalization. We categorize banks as weakly capitalized based on whether they have lower equity to asset ratios than the sample median in any given year. We then re-run our baseline regression specification 3 on these two sub-samples separately in Table 3. All our specifications are fully saturated and include both lender $\times$ year FE and borrower and loan controls. The coefficient of interest is positive and statistically significant, and its economic magnitude significantly increases relative to our baseline regressions. Most importantly, the effect is small and statistically insignificant in the sub-sample of weakly capitalized banks. Turning to direct environmental impact, we find similar results. These results suggest that banks consider the environmental impact of their borrowers in their loan pricing, but only if they are weakly capitalized, consistent with theoretical predictions that low bank capital leads banks to charge higher rates to their riskier borrowers (Froot and Stein (1998)).

We also add direct evidence on the regulatory capital motive by looking at the lead shares. Banks reduce their skin-in-the-game to the borrowers that have higher default risk and require more regulatory capital (Irani et al. (2021) and Erten (2022)). We report our finding in Table 4. We find that controlling for borrower and deal fixed effects, lead arrangers reduce their loan shares to borrowers that create environmental harm. This lends further support to our key conjecture that bank sensitivity to environmental damage is driven by considerations of borrower risk[7]. This is consistent with the survey evidence in Krueger et al. (2020) that institutional investors acknowledge the financial and regulatory implications of climate risk.

4.3 Borrower-Based Heterogeneity

Having established the risk-based motive behind the bank behaviour, we aim to understand how banks estimate the significance of environmental risks. To gain better insights, we use a cross-sectional analysis and study what drives the environmental risk perception. We consider three different channels: local beliefs, biodiversity risk, and environmental regulation.

4.4 Personal Beliefs

Personal Beliefs Heterogeneity

To gain deeper insights into what drives the price response to environmental risk, we study the beliefs and preferences in the local area of the borrowers. Regulators in the states prone to climate change denial may be less likely to enforce climate change rules as they face less political pressure.[8] It may also be the case that the local state-level regulators are more likely punish the borrowers for their environmental harm in the "green" states. Firms that damage the environment are also less likely to face unexpected disruptions in demand from the climate activists and pro-climate consumers. Our conjecture is that lenders are less likely to price environmental risk if the borrower is in a "climate-denier" (brown) state.

[7]Reputational concerns are unlikely to drive this response as lead arrangers maintain a higher share of the loans that they originate for reputational purposes

[8]Climate change denial is also subject to a global policy debate. van der Ploeg and Rezai (2019) study the price of carbon with an agnostic approach that assigns a positive probability that climate change deniers are right, and show that the price of carbon is only marginally reduced.

We then split our sample into different groups based on the environmental attitudes in the state in which the borrower is located. We aim to capture the dispersion across borrowers in terms of their climate change attitudes. We use two different measures: personal experience (the estimated percentage who somewhat/strongly agree that they have personally experienced the effects of global warming), and personal harm (the estimated percentage who think global warming will harm them personally a moderate amount/a great deal). Personal experiences undoubtedly increase the awareness of global warming and thus the personal experience measure can proxy for climate awareness. Personal harm, on the other hand, can capture the extent to which the local population is concerned about global warming. We classify the states as climate deniers if the proportion of the respondents who agree that they have experienced the effects of global warming or think that global warming will harm them personally is lesser than the country median.

The Yale survey evidence reveals substantial geographic dispersion in the beliefs and attitudes towards global warming. We draw the histogram of these two measures to understand the distribution of the climate change awareness and concerns in Graph 5. The above figure presents the histogram of the average estimated percentage who think global warming will harm them personally in the Yale Climate Opinion Survey during our sample period. As can be seen, there is substantial variation in the social attitudes, and climate change denial is surprisingly common as on average, as only half the local population tends to have pro-climate preferences and the distribution is heavily right-skewed. In the below figure, we show the average estimated percentage who agree that they have personally experienced the effects of global warming in the Yale Climate Opinion Survey. The distribution of the two measures is strikingly similar, and they have a correlation of 81% in our data, suggesting that both measures capture very similar aspects of the local pro-climate attitudes.

To study the role of the climate beliefs and preferences, we split our sample into two different sub-samples and run our baseline regression 3 in the states that are (not) climate deniers separately. In Column 1-3, we do our sample splits based on the percentage of borrowers who reported that global warming will harm them personally. We report our results in Table 5. Column 1 shows that the coefficient on the total environmental impact is insignificant for the borrowers located in the climate denier states. In the pro-climate states, however, our coefficients are all statistically significant and more than doubles in magnitude relative to our baseline specifications (Column 2). We obtain similar effects when we look at the direct environmental impact of the borrowers.

In Column 4-6, we do our sample splits based on the personal experiences, and the proportion of the survey respondents who responded yes to having personally experienced global warming. Our coefficient of interest is again positive and statistically significant for the pro-climate states. The effects and magnitudes on the sub-samples based on personal experience remain consistent. The effects on the climate denier sub-sample remain insignificant and the pricing sensitivities only appear in the green states. Thus, in the cross-section, the dispersion of environmental attitudes are reflected in the loan prices demanded by the lenders. Overall, our findings suggest that lenders tend to penalize borrowers for their environmental risk only in the pro-climate states.

Shocks to Personal Beliefs: Abnormal Temperatures

As the sensitivity of loan rates to environmental impact is significantly affected by the pro-global warming attitudes, we examine weather changes and global warming more closely. Specifically, we consider short-term abnormal weather conditions as an exogenous shock to personal beliefs. It may be the case that banks become more likely to account for the environmental impact of their borrowers at loan origination if there are abnormal heat waves. Our idea is that local weather anomalies may surprise local community and make environmental threat more credible. To that end, we use data on the abnormal weather conditions at the state-level that may affect the environmental risk response of the lenders.

We obtain the abnormal weather data from the National Centres for Environmental Information (NOAA) that provide historical time-series for every month on the average temperatures observed in that state. The time-series also provide us with data on whether these temperatures can be perceived as abnormal, or a deviation based on the historical state-level data that covers the 1901-2000 monthly averages. We use the data on the local temperatures in two ways. First, we take the abnormal temperatures at the year-month level as local surprises are likely to make the environmental risk more salient. Second, we create an indicator variable that takes one if the abnormal temperature is positive, *i.e.*, the abnormal weather at the time is consistent with global warming. Our conjecture is that the weather surprises consistent with global warming make environmental risk more credible and affect the implications of environmental impact on the total cost of bank credit. Thus, we expect lenders to become more likely to penalize borrowers for their environmental damage in the months where global warming is more plausible.

To this end, we augment our baseline specification by interacting our total environmental impact measure with abnormal weather deviations and indicators that take one if the weather deviation is positive and consistent with global warming. We report the results in Table 6.

In Column 1, we see that in the unconditional specifications, even though the interaction term on the impact and abnormal weather is positive, it is insignificant. However, when we add borrower controls in Column 2 and deal controls in Column 3, the coefficient on the interaction terms becomes both economically and statistically significant. Across all these specifications, the total impact variable remains of similar quantitative magnitude to our baseline estimates. This suggests that accounting for the borrower and non-price deal characteristics, banks become even more likely to penalize borrowers for their environmental harm when environmental risk becomes more salient and plausible. Thus, there is an additional risk premium demanded by the banks at the times of weather anomalies. In particular, for the average rate of abnormal warming in a U.S., there is an additional spread penalty of 32 basis points.

The weather anomalies are short-term in nature and exogenous to both lenders and borrowers. Most importantly, they are unlikely to affect the borrower demand in our regressions as firms have applied for the loans weeks in advance and the syndication process and the deal rates take time to materialize. Our total impact measures are also very persistent in the data and driven by the borrower FE (95% R-Squared). Thus, we view our results as direct evidence on the presence of a lender-driven channel that local beliefs and attitudes impact the pricing of the environmental footprint of the borrowing firms.

In Column 4-6, we also replace abnormal temperatures with an indicator that takes one if they are positive or if the weather is consistent with global warming. With this alternative specification, we find that interaction terms are all significant and positive. Thus, the environmental sensitivity is more likely iat times when global warming are locally more salient and plausible.

We also replicate our analysis with the level of short-term temperature fluctuations at the state level, controlling for state FE. We see that even when we examine the absolute value of temperature fluctuations (rather than surprises), the interaction terms with environmental impact are positive and statistically significant once borrower and deal characteristics are accounted for. Specifically, for the average temperature across the U.S. states, a one standard deviation increase in the total environmental impact raises loan rates by 2.74 pp. In Column 3-6, we also create an indicator variable that takes one if the temperatures are in the upper 25% based on the state averages during the sample period. When we interact this indicator variable with our impact measures, our environmental sensitivity measures more than double relative to our baseline specifications.

4.5 Biodiversity Risk

A key question that arises from our earlier analysis is the role of biodiversity risk. Biodiversity loss concerns may be a key factor that may lead banks to demand compensation for the environmental damage of the borrowers that we observe.

Biodiversity refers to the variety of life on Earth, including animals, plants, bacteria, and fungi. The 2022 United Nations Biodiversity Conference in Montreal (COP15), the United Nations Assessments documented that 80% of the world species are threatened by economic activity, and that 40% of global land surfaces are degraded. Based on the 2023 NatureServe report, 34% of plant species and 41% of animal species are at a risk of extinction in the United States.

Firms that are environmentally reliant may face adverse consequences from global warming that increasingly threatens ecological biodiversity. For example, drought spells may lead food companies to stop or to reallocate production. The extinction of certain species may increase social and moral pressure on the fossil fuel firms, leading to stricter limits on the carbon emissions. Extreme weather events from global warming can harm agriculture and displace workers, resulting in labour shortages. Firms may also anticipate stricter regulations that preserve biodiversity, in the light of the recent global initiatives such as the 2021 Kunming Declaration and the 2022 Montreal Agreement. If banks consider biodiversity risk, we expect their lending to be more sensitive to the environmental harm of their borrowers in the areas subject to greater biodiversity risk exposure.

Giglio et al. (2023) construct news-based measures of biodiversity risk for the U.S. firms and show that it varies substantially across sectors and it affects equity returns. Garel et al. (2023) introduce a measure of biodiversity and show that in an international sample of stocks, the biodiversity footprint is not priced in the cross-section of stock returns. They however find that in the aftermath of the Kunming Declaration, stocks with large biodiversity footprints have lost value, consistent with investors starting to demand a risk premium for biodiversity risk. We examine whether banks price biodiversity risk in the loan rates at loan origination.

Our first question is whether biodiversity risk drives our earlier findings on environmental harm. For this analysis, we exploit a number of different biodiversity risk measures. First, we use the state-level biodiversity index developed by NatureServe. The index ranks the 51 U.S. states based on the extinction risk of local biodiversity, using data from more than 21000 plant and animal species. To facilitate the interpretation, we re-arrange the index so that higher ranks relate to greater biodiversity risk. We augment our baseline specification 3 by interacting our total and direct impact measures with the biodiversity risk rank of the state in which the borrower is located. We report the results in Table 7. We find that being in a state subject to higher biodiversity risk is associated with higher loan rates. Most importantly, the interaction term is positive and statistically significant, suggesting that the sensitivity to environmental impact rises the larger the state-level biodiversity risk.

To explore the cross-sectional variation in the bio-diversity risk more cleanly, we also use the bio-diversity risk time-series measures proposed by Giglio et al. (2023). The advantage of these measures is that they are firm-level and constructed from corporate disclosures. *Count* is an indicator that takes one if the company mentions biodiversity at least twice in the 10-K disclosures whereas *regulation* is a dummy variable that is one if at least one of these disclosures is about biodiversity regulation. *Negative* is the number of negative biodiversity sentences minus the number of positive biodiversity sentences in the 10-K filings. We interact these biodiversity exposure indicators with our impact measures and report the findings from our augmented specifications in Column 3-5. In all three columns, we find that banks demand higher rates from the firms that are subject to greater biodiversity risk and those with a larger total environmental impact. Very interestingly, controlling for the total environmental impact, biodiversity risk is associated with higher rates, and an increase in the biodiversity risk measure is associated with a 20 to 30 bps increase in the loan rates.

The interaction term is however negative and statistically significant in all three specifications. This means that a lender is less likely to price the environmental harm of a firm subject to biodiversity risk compared to another firm without such biodiversity risk exposure. The individual coefficients on the biodiversity risk and the total environmental impact are both significant, however. In Columns 5-8, we show that all our results warrant a similar interpretation when we replace total environmental impact with direct environmental impact. Furthermore, the differential sensitivity to the environmental impact increases with all three firm-level measures of biodiversity risk – regardless of whether we consider the number of biodiversity mentions, and account for regulatory or negative news, and the magnitudes also go up to 26 to 36 bps (Column 6-8). Overall, the results again suggest that lenders differentiate between the environmental harm and the biodiversity risk exposure their borrowers. It is unlikely that biodiversity risk can account for the pricing sensitivities to the total environmental impact that we have documented.

Thus, we turn our attention to the pricing of biodiversity risk individually. We consider both firm-level and regional exposures to biodiversity risk. In our baseline specification, we replace the total impact variable with a variety of biodiversity risk measures: count, regulation, negative, employment biodiversity state, GDP biodiversity state, area biodiversity state, and species biodiversity state. We run the following specification:

$$Loan\ Rate_{ijt} = \beta \times biodiversity\ risk_{it} + \alpha \times X_{it-1} + \gamma \times Z_{ijt} + \eta_{j \times t} + \epsilon_{ijt} \tag{3}$$

where i indexes firms, j indexes lender, and t year of the loan origination. The loan rate refers to the annual interest rate spread over $LIBOR$ paid by the borrower i to the lender j in basis points for each dollar drawn down, including the fees. $biodiversity\ risk_{ijt}$ is the biodiversity risk of the borrowing firm at the time of the loan origination.

We report the results in Table . We find that the coefficient of count and regulation are statistically insignificant (Column 1 and 2) whereas the negative biodiversity news in the 10-K statements are strongly priced (Column 3). One negative biodiversity news results in a 10-basis point increase in the loan rates and it is statistically significant and economically meaningful (4.44% increase in the loan rates relative to the mean). These results suggest that banks especially price the negative biodiversity news rather than merely their relevance at the loan origination.

We also study the regional measures of biodiversity risk. The coefficient on the GDP-weighted biodiversity scores is statistically insignificant (Column 4) and negative and barely significant for the employment weighted biodiversity scores (Column 5). Thus, banks do not price the industry-based measures of biodiversity risk, that may for example arise if the borrower is in an area that heavily relies on the energy dependent industries, such as oil and gas production and mining both in terms of GDP and employment. Such risks are likely absorbed by the industry and state fixed effects. The price impact of the area-biodiversity-state that captures the share of protected areas is also insignificant (Column 6). This is not surprising, as once the government restricts an area as protected, very little industrial activity and biodiversity harm can arise in the area. Column 7 however suggests that the share of endangered species has a very strong impact on the loan rates. A one percentage increase in the share of endangered species in the state of the borrower increases the loan rates by 2.37 percentage points (pp) relative to the mean (88.69 $\times$ 0.06 / 224). This effect is comparable in terms of the economic magnitudes to the environmental impact measure.

Overall, these results suggest that on average, banks price biodiversity risks that may appear more substantial and threatening such as negative biodiversity news and extinction risks.

5 Trump Withdrawal from Paris

Our analysis documents that banks penalize borrowers for their environmental harm in the form of higher rates. In this section, we study the role of environmental regulation and we investigate the sudden and idiosyncratic withdrawal of Trump from the Paris Agreement. We propose that the environmental deregulation represents a shock to the perceived environmental risk of the borrowers, leaving the borrower fundamentals and the bank characteristics unchanged. This setting allows us to focus on one specific type of borrower risk – regulatory risk – in determining the lender response to the environmental impact of the borrowers and understanding more deeply how it varies across different states with different local attitudes.

The Paris Agreement is a global and coordinated effort to tackle climate change which was signed in December 2015 at the UN Climate Change Conference (COP21) in Paris and came into force in November 2016. The agreement is a legally binding international treaty. With the objective of combating climate change, the treaty requires the signatory countries to commit to reducing their global greenhouse emissions and submit, every five years, a national climate action plan known as Nationally Determined Contribution (or NDC). It also provides a framework for disclosing and monitoring emissions to reach the net-zero targets. During 2016-2023, 194 countries, including the European Union, joined the Paris Agreement. The operational details for the practical implementation were released in December 2018, and finalized in November 2021.

The U.S. withdrew from and recommitted to the Paris Agreement during the 2017 and 2021. During his presidential campaign, Donald Trump called climate change a “hoax” and vowed to withdraw from the Paris agreement. He called for eliminating the restrictions on the energy explorations and opening more federal lands to drilling to reduce the dependency on the foreign energy and to create more U.S. jobs. He also stated that he would push for the approval of the controversial Keystone XL oil pipeline from Canada and withdraw any funding for the United Nations programs. During his presidency, however, he advocated a mixed position, and he stated that he had "an open mind" about climate change. Despite delays and ambivalent statements, Trump announced his decision to withdraw from the Paris Agreement on the June 1st, 2017.

The surprise withdrawal of Trump from the Paris Agreement presents an ideal setting to investigate the impact of the environmental regulation and the local attitudes on the lender behaviour. The set-up gives us a distinction between treated and untreated firms, as several cities and states have unexpectedly sued against the government for withdrawing from the Paris agreement, making it less likely to be enforced. It is also natural to expect the states with a Republican majority to be more likely to support the deregulation *ex post*. We present the challenger and Republican states in Graph 6, and Table A2-A3. As can be seen in Graph 6 (a-b), the states that have sued the government are predominantly Left-wing and non-Republican. We conjecture that the environmental deregulation led banks to perceive environmental risk to be less material, but only in brown states. If this is the case, we would see a reduction in the response of the loan prices to environmental risks.

To test this hypothesis, we augment our baseline specification 3 by interacting our coefficient of interest with an indicator variable that takes one after Trump has announced his decision to withdraw his commitment from the Paris Agreement in June 2017. In our triple difference-in-differences-in-differences (DIDID) specification, we define treated as an indicator variable that takes one if the borrower is in a state that has not sued the Trump government for having withdrawn from the Paris Agreement. We run the specification 2 and report the results in Table 9. Our DIDID coefficient of interest is the interaction term on the total environmental impact, the deregulation event dummy, and the non-challenger state indicator. We find that controlling for the borrower- and deal-level characteristics, the coefficient on the interaction term is negative and statistically significant. The results suggest that after the deregulation, banks have reduced the sensitivity of their loan pricing to the environmental impact of their borrowers. For a borrower with an average total impact ratio, the deregulation is associated with a 4.9 bps decline in the sensitivity to a one percentage point increase in the total environmental impact ratio in the non-challenger-states relative to the states that have sued the Trump government. In Column 2, we replace the treated dummy with an indicator that is one if the borrower is in a state that has consistently voted for the Republican party during our sample period. The coefficient on the interaction term remains statistically significant and increases slightly to 5.27.

To further understand the mechanism driving these results, we investigate the heterogeneity by the area in which the borrower is located. In our augmented specification 2, we replace the treated indicator with other dummy variables that take one if the state is heavily prone to climate scepticism. In Graph 6 (c) we present the states with a higher than median climate denial measure in the year prior to the environmental deregulation, and we see that many of these climate-denier-states include the Republican states. Column 3 and 4 re-define the treatment group based on the personal harm and personal experience measures of climate denial. Our results in Table A4 have a similar interpretation, as the effects appear more forcefully to the climate-denier-states. This is unsurprising as lenders likely consider the possibility that the borrowers located in the climate-denier-states are unlikely to face political pressure and regulatory scrutiny. Thus, our results are driven by the non-challenger and non-denier states, again suggesting that the price of environmental risk depends on the local beliefs and attitudes.

We then move on to the robustness tests. We test for the presence of pre-trends and add indicators for the years before and after the environmental deregulation. We also add interaction terms to our specification 2 where we define a treated firm as one if it is located in a state that has sued the Trump administration, or in a Republican state more likely to support the environmental deregulation, respectively. We plot the coefficient terms of these interaction terms in Graph 7. We find that the interaction terms with the year dummies before the deregulation are all insignificant, whereas the coefficients on the interaction terms with the years after the deregulation are all large and statistically significant. We find no evidence of pre-trends – which mitigates concerns around reverse causality and suggests that the Trump environmental deregulation led banks to reduce the sensitivity of their loan rates to the environmental impact of their borrowers.

We also acknowledge the fact that the withdrawal of the Trump administration has not applied equally to all environmental regulations. The focus has been on the air pollution, and the protection of the nation's biodiversity and wetlands. For example, the Clean Power Plan was replaced, with weaker restrictions on the GHG and mercury emissions. Other decisions limited the protection of sensitive lands. We acknowledge the different types of restrictions and anticipate that the price of environmental risk may have declined more substantially for land and water impact, air pollution, and GHG emissions. We contemplate this possibility in our Appendix and we replace our total impact measure with measures for different types of environmental impact.

We report our findings in Table A4. Our results are consistent with our predictions. We find that environmental deregulation is associated with a reduction in the price of environmental risk for land and water impact, air pollution, and GHG emissions. The interaction term on our triple DIDID specification is negative and statistically significant in Column 3-5. We find that relative to lawsuit states, firms in no-lawsuit-states have reduced their sensitivity of their loan prices by 8 to 25 bps after the environmental deregulation, controlling for the borrower and deal characteristics. The effects are however insignificant for the natural resources, water, and waste (Column 1, 2, and 6). The results suggest that the withdrawal from the Paris Agreement has significantly reduced the price of environmental risk in the cross-section of the loan rates. In unreported tables, the regressions in A4 warrant a similar interpretation when the treated indicator is instead replaced with other dummy variables that take one if the firm is located in a Republican or climate-denier-state.

6 Conclusion

The rising awareness of global warming and biodiversity risk have increased the transition costs of firms, but the impact on the bank behaviour is largely unknown. In this paper, we document that banks penalize borrowers for environmental damage with higher loan rates, but only when they are weakly capitalized and borrowers operate in "green" states. Abnormal local heat waves result in additional spread penalties. Consistent with the capital motive, banks reduce their skin-in-the-game to environmental harm. We also find that biodiversity risk exposure is also priced but unlikely to explain the environmental harm sensitivities that we observe.

We also show that the Trump withdrawal from the Paris agreement has reduced the sensitivity of the cost of credit to the environmental impact of firms. We again find these effects in the areas that have not sued the government for deregulation and in the "browner" states prone to environmental denial. An important implication of our study is that the pricing adjustments of transition may potentially depend on the local beliefs and enforcement rather than on the rules. In a regulatory environment where firms are unlikely to face local pressure and climate risk is seen as dubious, our paper shows that banks are also less likely to adjust their cost of credit!

Table 1: Summary Statistics

Variable	definition	mean	median	st.dev.
all-in-spread	The amount the borrower pays in basis points over LIBOR for each dollar drawn down including the annual fees	224.67	187.5	160.82
deal size	The amount the deal received commitments for (in USD)	440.2	1149.39	2519.97
maturity	How long (in months) the facility will be active from the signing date to the expiration date	55.47	60	38.93
covenant	Dummy indicator whether or not the facility has financial or net worth covenants	0.21	0	0.41
secured	Dummy indicator whether or not the facility is secured or collateral is held against the loan	0.38	0	0.49
non-bank presence	Dummy indicator whether or not the facility has non-bank participants or lead arrangers (corporation, finance company, investment firm, insurance company and mutual fund)	0.39	0	0.49
log(total assets)	The natural logarithm of total assets	5.63	5.77	2.85
log(total debt)	The natural logarithm of total debt	3.18	2.43	3.14
log(cash)	The natural logarithm of total cash	3.11	2.94	2.28
ebitda/assets	Earnings before interest divided by total assets	-1.47	0.05	39.88
personal experience	Estimated percentage who somewhat/strongly agree they have personally experienced the effects of global warming	34.23	33.56	6.63
personal harm	Estimated percentage who think global warming will harm them personally a moderate amount/a great deal	36.21	35.17	6.25
biodiversity harm	Estimated percentage who think global warming will harm plants and animal species a moderate amount/a great deal	68.04	67.89	5.42

Table 1 Continued

Variable	definition	mean	median	st.dev.
total impact	The sum of all the direct and indirect external environmental costs of the company as a percentage of revenue	4.02	1.51	8.32
direct impact	The sum of all the direct external environmental costs of the company as a percentage of revenue	1.81	0.12	6.23
indirect impact	The sum of all the indirect external environmental costs of the company as a percentage of revenue	2.01	1.19	2.85
natural resources impact	The sum of the direct and indirect use of natural resources as a percentage of revenue	0.19	0.04	0.89
water impact	The dollar value of the direct and indirect water pollutant quantities as a percentage of revenue	0.93	0.34	2.09
land and water impact	The dollar value of the direct and indirect land and water pollutant quantities as a percentage of revenue	0.18	0.06	0.45
air pollutants impact	The direct and indirect air pollutant costs as a percentage of revenue	0.59	0.24	1.11
ghg emissions impact	The value of direct and indirect ghg emissions as a percentage of revenue	1.53	0.58	3.02
waste impact	The dollar value impact of the direct and indirect waste generation by the company as a percentage of revenue	0.09	0.05	0.20
count	10K-Biodiversity-Count Score does the company mention biodiversity in at least two sentences in the 10-K statements?	0.03	0	0.16
negative	10K-Biodiversity-Negative Score the number of negative biodiversity sentences minus the number of positive biodiversity sentences	0.02	0	0.26
regulation	10K-Biodiversity-Regulation Score does the company mention biodiversity in at least two sentences and at least one of them is about regulation in the 10-K statements?	0.02	0	0.13
gdp bio risk	The average industry biodiversity scores weighted by GDP of each industry	13.25	13.05	1.26
emp bio risk	The average industry biodiversity scores weighted by employment in each industry	11.25	11.20	0.69
area bio risk	The share of protected areas	0.07	0.05	0.06
species bio risk	The share of endangered species	0.06	0.05	0.04
biodiversity news	The number of NYT-negative biodiversity articles minus the number of positive biodiversity articles on a given day (yearly average)	0.33	0.27	0.28
climate news	The number of NYT-negative climate articles minus the number of positive climate articles on a given day (yearly average)	0.09	0.07	0.09
biodiversity attention	The sum of the Google search index series for biodiversity loss, ecosystem services, and species loss in a given month (yearly average)	61.26	51	44.79

Table 2: Sensitivity of Loan Rates to Environmental Impact

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
total impact	0.555***	0.456***	0.248**						
	(0.129)	(0.143)	(0.116)						
direct impact				0.866***	0.444**	0.280*			
				(0.143)	(0.187)	(0.152)			
indirect impact							-0.665	1.630**	0.244
							(0.429)	(0.824)	(0.705)
No. obs.	31055	8658	8638	31055	8658	8638	31055	8658	8638
R-squared	0.40	0.47	0.60	0.40	0.46	0.60	0.39	0.46	0.60
Lender × Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Borrower controls	N	Y	Y	N	Y	Y	N	Y	Y
Deal controls	N	N	Y	N	N	Y	N	N	Y

This table reports the sensitivity of the loan rates to the environmental impact of the borrowers. The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), log(cash) and ebitda/assets. Deal controls include deal size and maturity, secured and covenant status, and non-bank participation. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table 3: Environmental Impact and Lender Capitalization

	weak capitalization (1)	high capitalization (2)	weak capitalization (3)	high capitalization (4)
total impact	0.462**	-0.0334		
	(0.191)	(0.152)		
direct impact			0.554**	-0.0539
			(0.255)	(0.190)
No. obs.	4312	4322	4312	4322
R-squared	0.56	0.64	0.56	0.64
Lender × Year FE	Y	Y	Y	Y
State FE	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y
Borrower controls	Y	Y	Y	Y
Deal controls	Y	Y	Y	Y

This table reports the sensitivity of the loan rates to the environmental impact of the borrowers for banks with high and low capitalization. The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), log(cash) and ebitda/assets. Deal controls include deal size and maturity, secured and covenant status, and non-bank participation. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table 4: Environmental Impact and Lender Capitalization: Skin-in-the-game

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
total impact	-0.0251	-0.0596*	-0.0671**						
	(0.0219)	(0.0355)	(0.0293)						
direct impact				-0.0517**	-0.0786**	-0.0910***			
				(0.0218)	(0.0390)	(0.0293)			
indirect impact							-0.0335	0.137	0.227
							(0.0650)	(0.211)	(0.188)
No. obs.	7047	1638	1637	7047	1638	1637	7047	1638	1637
R-squared	0.31	0.41	0.56	0.31	0.41	0.56	0.30	0.41	0.55
Lender × Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Borrower controls	N	Y	Y	N	Y	Y	N	Y	Y
Deal controls	N	N	Y	N	N	Y	N	N	Y

This table reports the sensitivity of the lead arranger shares to the environmental impact of the borrowers. The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), log(cash) and ebitda/assets. Deal controls include deal size and maturity, the secured and covenant status, and non-bank participation. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table 5: Environmental Impact and Local Beliefs

	Climate Denial (Personal Harm)				Climate Denial (Personal Experience)			
	brown (1)	green (2)	brown (3)	green (4)	brown (5)	green (6)	brown (7)	green (8)
total impact	-0.110	0.973***			-0.0911	0.883***		
	(0.282)	(0.253)			(0.248)	(0.275)		
direct impact			-0.121	0.885***			-0.261	0.848***
			(0.298)	(0.290)			(0.249)	(0.324)
No. obs.	1369	3650	1369	3650	1536	3473	1536	3473
R-squared	0.65	0.55	0.65	0.54	0.63	0.56	0.63	0.56
Lender × Year FE	Y	Y	Y	Y	Y	Y	Y	Y
State FE	N	N	N	N	N	N	N	N
Sector FE	Y	Y	Y	Y	Y	Y	Y	Y
Borrower controls	Y	Y	Y	Y	Y	Y	Y	Y

This table studies the sensitivity of the loan rates to the environmental impact of the borrowers across U.S. states with different environmental beliefs. In Columns 1-4 (5-8), green is one if the borrower operates in a state with an above-country-median percentage of individuals who think that global warming will harm them personally (or who agree that they personally experienced it). The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), log(cash) and ebitda/assets. Deal controls include deal size and maturity, secured and covenant status, and non-bank participation. Standard errors correct for clustering at the lender-level and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table 6: Local Belief Shocks: Abnormal Temperatures

	(1)	(2)	(3)	(4)	(5)	(6)
total impact	0.448***	0.534***	0.405***	0.189*	0.306**	0.059
	(0.111)	(0.138)	(0.124)	(0.100)	(0.138)	(0.130)
abnormal weather	-0.489*	-2.073***	-2.447***			
	(0.254)	(0.333)	(0.272)			
total impact × abnormal weather	0.043	0.051**	0.055**			
	(0.026)	(0.022)	(0.026)			
$\mathbb{1}$ abnormal weather				-5.746***	-9.355***	-10.074***
				(2.158)	(2.919)	(2.355)
total impact × $\mathbb{1}$ abnormal weather				0.508***	0.480***	0.646***
				(0.146)	(0.153)	(0.146)
No. obs.	31040	8658	8638	31219	8710	8690
R-squared	0.328	0.348	0.512	0.329	0.347	0.510
Lender × Year FE	Y	Y	Y	Y	Y	Y
State FE	N	N	N	N	N	N
Sector FE	Y	Y	Y	Y	Y	Y
Borrower controls	Y	Y	Y	Y	Y	Y
Deal controls	N	Y	N	Y	N	Y

This table studies the differential sensitivity of the loan rates to the environmental impact of the borrowers during abnormal temperatures. Abnormal temperature is the abnormal temperature reported by NOAA in that month of the year based on the average temperatures in that state during 1901-2000. temperature is the monthly average temperature in F° seen in the state at the time of loan origination. $\mathbb{1}$ abnormal weather takes one if the temperature anomaly is positive and zero otherwise. The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), and ebitda/assets. The lender controls include log(assets), capitalization, and return on assets. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table 6 Panel B

	(1)	(2)	(3)	(4)	(5)	(6)
total impact	0.468	-0.580	-0.590	0.534***	0.312*	0.0986
	(0.466)	(0.495)	(0.399)	(0.124)	(0.167)	(0.129)
temperature (F°)	0.0947	-0.0953	-0.106			
	(0.0652)	(0.110)	(0.0875)			
total impact × temperature (F°)	0.00138	0.0173**	0.0140**			
	(0.00775)	(0.00751)	(0.00654)			
𝟙 extreme temperature				4.569**	2.298	-0.0965
				(2.152)	(3.189)	(2.469)
total impact × 𝟙 extreme temperature				0.0854	0.575**	0.592**
				(0.215)	(0.271)	(0.248)
No. obs.	31040	8658	8638	31055	8658	8638
R-squared	0.40	0.47	0.60	0.40	0.47	0.60
Lender × Year FE	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y	Y	Y
Borrower controls	Y	Y	Y	Y	Y	Y
Deal controls	N	Y	N	Y	N	Y

This table studies the differential sensitivity of the loan rates to the environmental impact of the borrowers during temperature fluctuations. Temperature is the monthly average temperature in F° seen in the state at the time of loan origination. The bottom of the table provides information about fixed effects. 𝟙 extreme temperature takes one if the absolute value of the temperature is in the upper 25% relative to the state average seen in the sample period. The borrower controls include log(assets), log(total debt), and ebitda/assets. The lender controls include log(assets), capitalization, and return on assets. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table 7: Environmental Impact and Biodiversity Risk

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
total impact	0.128	0.275**	0.258**	0.264**				
	(0.207)	(0.116)	(0.117)	(0.116)				
biodiversity risk	0.292***				0.302***			
	(0.104)				(0.101)			
total impact × biodiversity risk	0.0147*							
	(0.00783)							
count		33.98***				36.68***		
		(11.89)				(10.66)		
total impact × count		-3.026**						
		(1.273)						
regulation			12.13				12.45**	
			(9.175)				(6.092)	
total impact × regulation			-3.659***					
			(1.234)					
negative				20.34***				26.45***
				(6.134)				(7.776)
total impact × negative				-3.492**				
				(6.134)				
direct impact					-0.00263	0.553***	0.546***	0.548***
					(0.243)	(0.138)	(0.138)	(0.138)
direct impact × biodiversity risk					0.0215**			
					(0.00939)			
direct impact × count						-8.833***		
						(1.569)		
direct impact × regulation							-6.776***	
							(1.121)	
direct impact × negative								-13.02***
								(1.894)
No. obs.	8639	8638	8638	8638	8639	8690	8690	8690
R-squared	0.57	0.60	0.60	0.60	0.57	0.57	0.57	0.57
Lender × Year FE	Y	Y	Y	Y	Y	Y	Y	Y
State FE	N	Y	Y	Y	N	Y	Y	Y
Sector FE	Y	Y	Y	Y	Y	Y	Y	Y
Borrower controls	Y	Y	Y	Y	Y	Y	Y	Y
Deal controls	Y	Y	Y	Y	Y	Y	Y	Y

This table investigates whether biodiversity risk may affect or determine the sensitivity of loan rates to the environmental impact of the borrowers. Biodiversity risk is the rank of the borrower state in the Nature Serve on the basis of the extinction risk of its local biodiversity. Count, regulation, and negative are the bio-diversity measures from Giglio et al. (2023). Count is an indicator variable that takes one if the firm has mentioned biodiversity at least twice in its 10-K statements, and regulation is one if at least one of these sentences is about regulation, and zero otherwise. Negative is the number of negative biodiversity sentences minus the number of positive biodiversity sentences in the 10-K filings. The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), log(cash) and ebitda/assets. Deal controls include deal size and maturity, secured and covenant status, and non-bank participation. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table 8: Sensitivity of Loan Rates to Biodiversity Risk

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
count	0.340						
	(5.068)						
regulation		-1.838					
		(5.588)					
negative			9.999**				
			(4.954)				
employment biodiversity state				-3.009			
				(1.961)			
gdp biodiversity state					-1.448*		
					(0.834)		
area biodiversity state						38.701	
						(23.693)	
species biodiversity state							88.689**
							(43.501)
No. obs.	20325	20325	20325	31738	31773	31772	31734
R-squared	0.57	0.57	0.57	0.54	0.54	0.54	0.54
Lender × Year FE	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	N	N	N	N
Sector FE	Y	Y	Y	Y	Y	Y	Y
Borrower controls	Y	Y	Y	Y	Y	Y	Y
Deal controls	Y	Y	Y	Y	Y	Y	Y

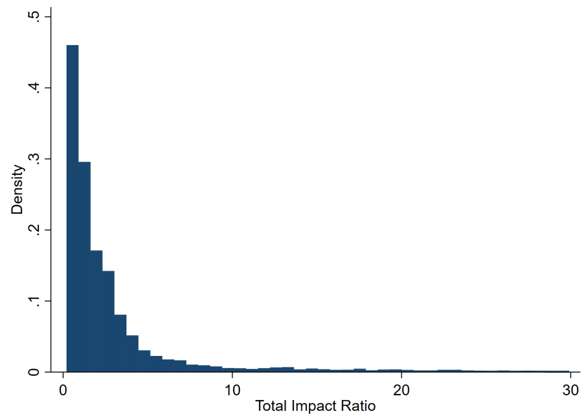
This table studies the impact of biodiversity risk exposure on the loan rates using a variety of firm-level and regional biodiversity risk measures (Giglio et al. (2023)). The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), log(cash) and ebitda/assets. Deal controls include deal size and maturity, the secured and covenant status, and non-bank participation. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table 9: Trump Withdrawal from Paris

	(1)	(2)	(3)	(4)
total impact	0.431***	0.392***	1.113***	1.132***
	(0.153)	(0.132)	(0.193)	(0.194)
deregulation	-11.55***	-12.85***	-12.45**	-8.329
	(4.442)	(4.632)	(5.071)	(5.264)
total impact × deregulation	2.634***	2.536***	1.320**	0.573
	(0.741)	(0.631)	(0.623)	(0.465)
no-lawsuit-state	-1.884			
	(2.198)			
deregulation × no-lawsuit-state	28.69***			
	(4.911)			
total impact × no-lawsuit-state	0.253			
	(0.219)			
total impact × deregulation × no-lawsuit-state	-4.913***			
	(0.719)			
republican-state		-9.529***		
		(3.015)		
deregulation × republican-state		38.98***		
		(5.877)		
total impact × republican state		0.455**		
		(0.212)		
total impact × deregulation × republican state		-5.373***		
		(0.568)		
climate denier (personal harm)			-1.367	
			(3.059)	
deregulation × climate denier (personal harm)			16.06**	
			(7.685)	
total impact × climate denier (personal harm)			-0.677***	
			(0.254)	
total impact × deregulation × climate denier (personal harm)			-3.353***	
			(0.826)	
climate denier (personal experience)				5.199*
				(2.941)
deregulation × climate denier (personal experience)				7.640
				(7.015)
total impact × climate denier (personal experience)				-0.518**
				(0.258)
total impact × deregulation × climate denier (personal experience)				-2.548***
				(0.624)
No. obs.	8690	8690	5261	5261
R-squared	0.57	0.57	0.51	0.51
Lender × Year FE	Y	Y	Y	Y
State FE	N	N	N	N
Sector FE	Y	Y	Y	Y
Borrower controls	Y	Y	Y	Y
Deal controls	Y	Y	Y	Y

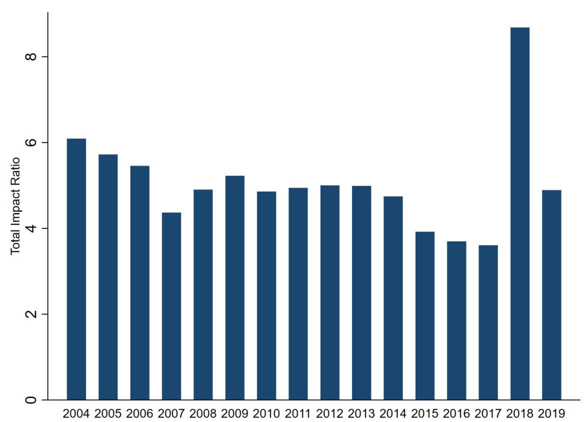
This table studies the impact of the Trump withdrawal on the sensitivity of loan rates to environmental damage. The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), and ebitda/assets. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Figure 1: Total Environmental Impact as a Percentage of Revenue (%)



The graph displays the distribution of the environmental impact of the U.S. firms based on the Trucost total environmental impact measure.

Figure 2: The Yearly Average Total Environmental Impact



The graph presents the yearly average of the total environmental impact of the U.S. firms during the sample period 2004-2019.

Figure 3: Direct and Indirect Impact

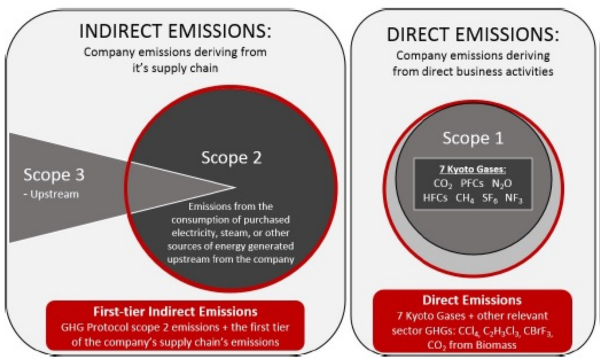
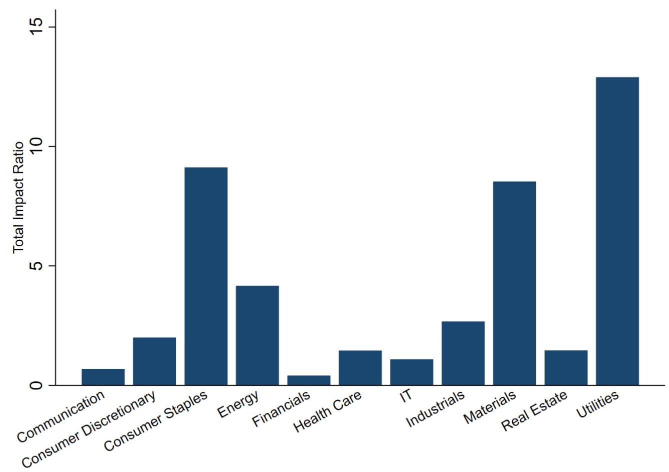
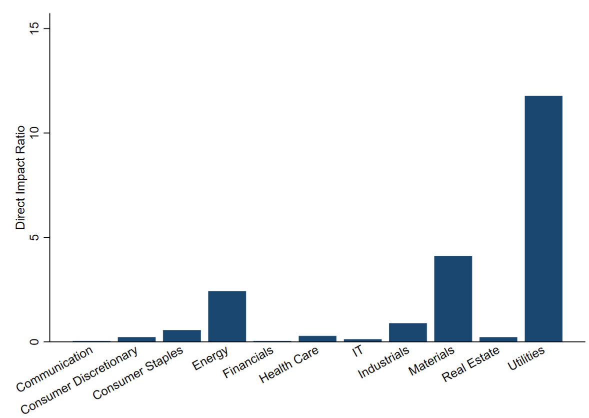


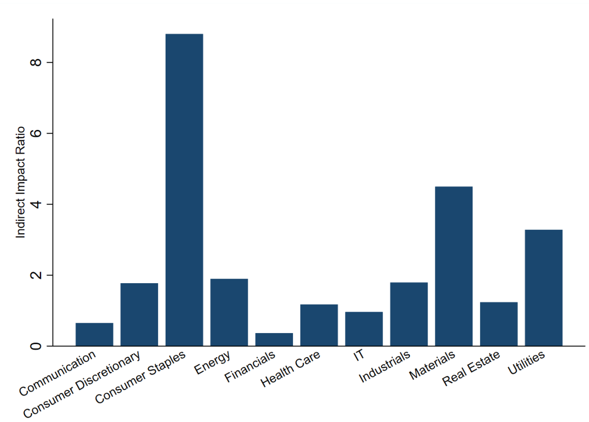
Figure 4: Impact Ratios by Different Sectors



(a) Total Environmental Impact as a percentage of revenue (%)



(b) Direct Environmental Impact as a percentage of revenue (%)



(c) Indirect Environmental Impact as a percentage of revenue (%)

This graph presents the total, direct, and indirect impact ratios for different sectors during our sample period 2004-2019.

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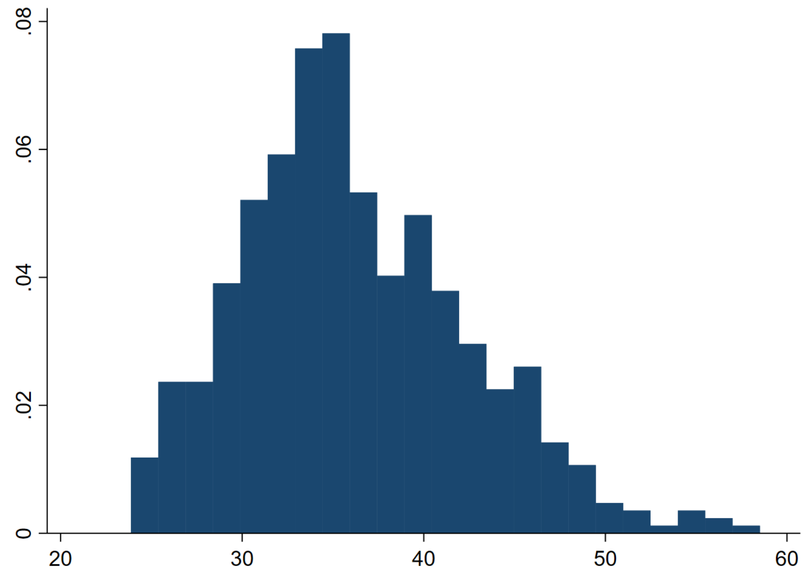
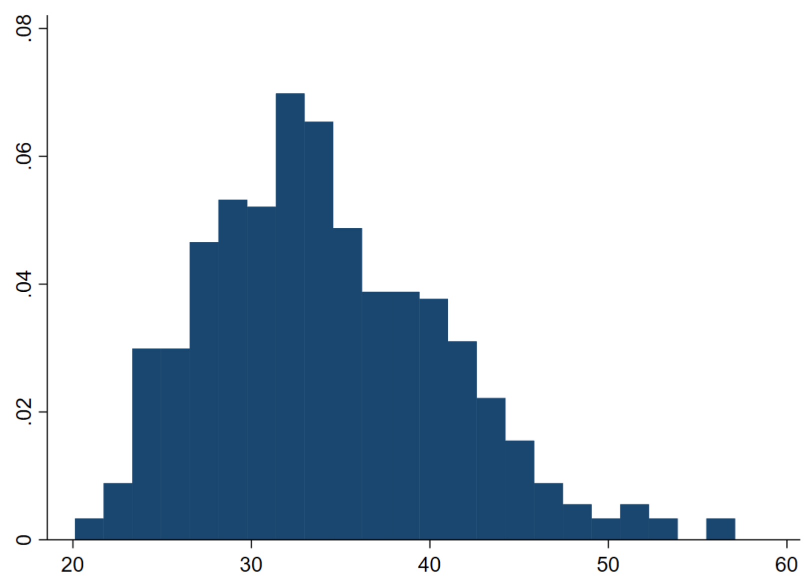
Figure 5: Distribution of Climate Change Denial across the U.S. States



(a) Distribution of climate change denial based on personal harm

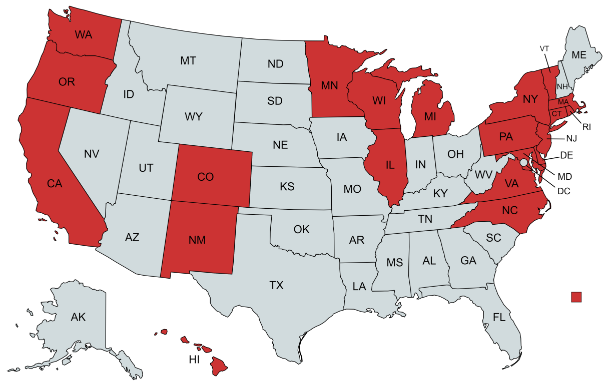
This graph presents the average estimated percentage who think global warming will harm them personally a moderate amount/a great deal in the Yale Climate Opinion Survey



(b) Distribution of Climate Change Denial based on Personal Experience

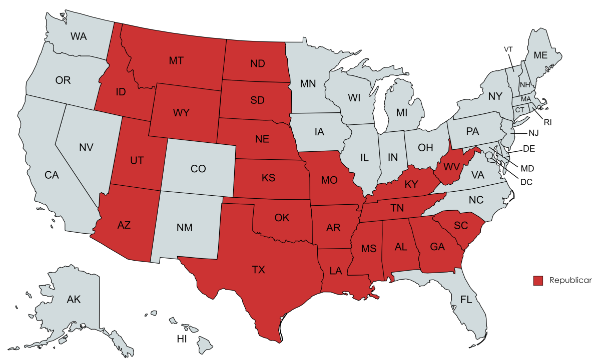
This graph presents the average estimated percentage who somewhat/strongly agree that they have personally experienced the effects of global warming in the Yale Climate Opinion Survey

Figure 6: States that are Climate Change Deniers and Trump Challengers



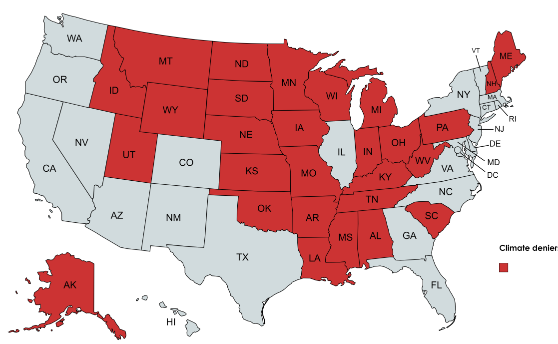
(a) States that challenged the Trump-era Environmental Deregulation

This graph presents the states that appealed the Trump withdrawal from the Paris Agreement and sued the government in the court



(b) Republican States

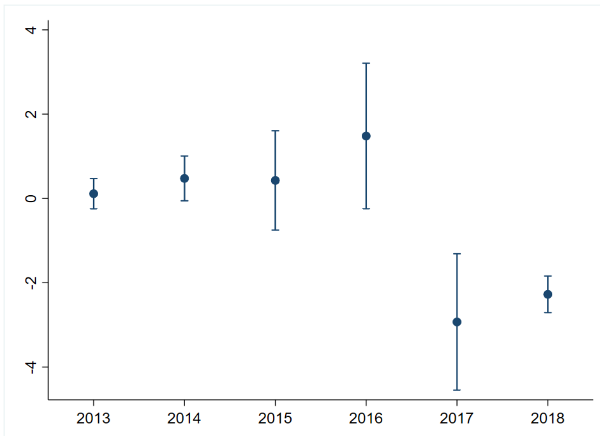
This graph presents the states that have consistently voted as Republican in our sample period



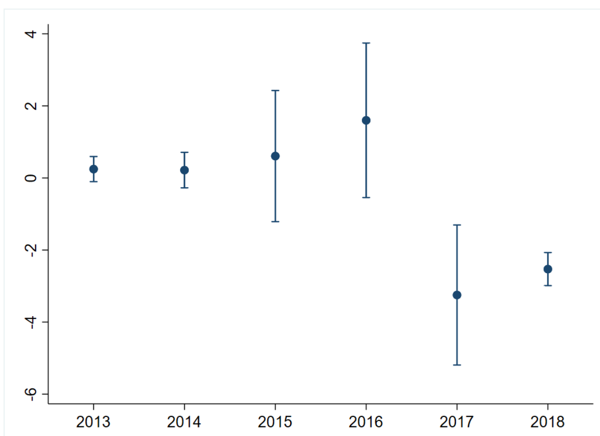
(c) States classified as Climate Deniers based on Personal Harm

This graph presents the states that are classified as climate deniers based on personal harm, *i.e.* with a lower proportion of the public who believes that global warming will harm them personally than the country median in 2016

Figure 7: Paris Withdrawal Dynamic Effects



This graph presents the dynamic regression coefficients λ_{year} from the augmented specification $Loan\ Rate_{ijt} = \beta \times Impact_{ijt} + \sum_{year} \delta_{year} \times$ *no-lawsuit-state* $\times I_{year} + \sum_{year} \lambda_{year} \times Impact_{ijt} \times$ *no-lawsuit-state* $\times I_{year} + \alpha \times X_{it-1} + \gamma \times Z_{ijt} + \eta_{j \times t} + \epsilon_{ijt}$ where the year ranges from 2013 to 2018.



This graph presents the regression coefficients λ_{year} from the augmented specification $Loan\ Rate_{ijt} = \beta \times Impact_{ijt} + \sum_{year} \delta_{year} \times$ *republican-state* $\times I_{year} + \sum_{year} \lambda_{year} \times Impact_{ijt} \times$ *republican-state* $\times I_{year} + \alpha \times X_{it-1} + \gamma \times Z_{ijt} + \eta_{j \times t} + \epsilon_{ijt}$ where the year ranges from 2013 to 2018.

Appendix to Do banks price environmental risk? Only when beliefs are binding!

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Table 1: Sensitivity of Loan Rates to Different Types of Environmental Impact

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
natural resources	5.110***	4.128***	2.462***						
	(0.471)	(0.706)	(0.624)						
water				0.294	1.723***	1.440**			
				(0.358)	(0.527)	(0.580)			
land and water							-2.731	16.25***	23.25***
							(2.342)	(5.760)	(5.037)
N	31055	8658	8638	31055	8658	8638	31055	8658	8638
R^2	0.40	0.47	0.60	0.39	0.47	0.60	0.39	0.47	0.60
Lender × Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Borrower controls	N	Y	Y	N	Y	Y	N	Y	Y
Deal controls	N	N	Y	N	N	Y	N	N	Y
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
air pollutants	-0.385	-1.202	-0.948						
	(1.115)	(1.859)	(1.225)						
ghg emissions				0.979***	0.839	0.492			
				(0.325)	(0.513)	(0.299)			
waste							-19.53***	-27.88***	-20.70***
							(2.725)	(6.046)	(4.794)
No. obs.	31055	8658	8638	31055	8658	8638	31055	8658	8638
R-squared	0.39	0.46	0.60	0.39	0.46	0.60	0.40	0.47	0.60
Lender × Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Borrower controls	N	Y	Y	N	Y	Y	N	Y	Y
Deal controls	N	N	Y	N	N	Y	N	N	Y

This table reports the sensitivity of the loan rates to the different types of environmental impact of the borrowers at the loan facility level. The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), log(cash) and ebitda/assets. Deal controls include deal size and maturity, the secured and covenant status, and non-bank participation. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table A2: States and Cities that Sued the Trump Government for the Paris Agreement Withdrawal

New York
California
Colorado
Connecticut
Delaware
Hawaii
Illinois
Maine
Maryland
Massachusetts
Michigan
Minnesota
New Jersey
New Mexico
North Carolina
Oregon
Pennsylvania
Rhode Island
Vermont
Virginia
Washington
Wisconsin
Washington, D.C.
Boulder
Los Angeles
Chicago
New York
Philadelphia
South Miami

This table reports the states and cities that sued the Trump government in the District of Columbia Circuit after the Paris Agreement withdrawal.

Table A3: Republican States

Alabama
Arizona
Arkansas
Georgia
Idaho
Kansas
Kentucky
Louisiana
Missouri
Mississippi
Montana
Nebraska
North Dakota
Oklahoma
South Carolina
South Dakota
Tennessee
Texas
Utah
West Virginia
Wyoming

This table presents the states that consistently voted for the Republican party in the presidential elections during the sample period.

Table A4: Trump Withdrawal from Paris: Natural Resources, Land, and Water

	(1)	(2)	(3)
deregulation	-1.396	-6.717	-5.289
	(4.758)	(4.704)	(4.883)
no-lawsuit-state	-0.248	-5.899***	-7.820***
	(2.275)	(2.268)	(2.812)
deregulation × no-lawsuit-state	12.17**	17.74***	17.11***
	(5.641)	(5.780)	(5.610)
natural resources	2.967***		
	(0.697)		
natural resources × deregulation	-5.219***		
	(1.203)		
natural resources × no-lawsuit-state	1.475		
	(1.191)		
natural resources × deregulation × no-lawsuit-state	-6.583		
	(6.722)		
water		-1.431***	
		(0.493)	
water × deregulation		4.030***	
		(0.801)	
water × no-lawsuit-state		5.543***	
		(1.261)	
water × deregulation × no-lawsuit-state		-3.887	
		(4.454)	
land and water			-3.814
			(3.754)
land and water × deregulation			16.04***
			(3.717)
land and water × no-lawsuit-state			42.00***
			(12.12)
land and water × deregulation × no-lawsuit-state			-23.97**
			(10.38)
No. obs.	8690	8690	8690
R-squared	0.57	0.57	0.58
Lender × Year FE	Y	Y	Y
State FE	N	N	N
Sector FE	Y	Y	Y
Borrower controls	Y	Y	Y
Deal controls	Y	Y	Y

This table studies the impact of the Trump withdrawal on the sensitivity of loan rates to environmental damage. The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), and ebitda/assets. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

Table A5: Trump Withdrawal from Paris: Emissions and Waste

	(1)	(2)	(3)
deregulation	-12.08***	-18.15***	-1.245
	(4.123)	(5.149)	(5.586)
no-lawsuit-state	4.716	1.833	0.215
	(3.135)	(2.353)	(2.801)
deregulation × no-lawsuit-state	27.13***	29.04***	15.14***
	(6.654)	(5.446)	(5.537)
air pollutants	3.207		
	(2.152)		
air pollutants × deregulation	-5.905**		
	(2.603)		
air pollutants × no-lawsuit-state	-5.878***		
	(2.153)		
air pollutants × deregulation × no-lawsuit-state	-8.303***		
	(2.808)		
ghg emissions		0.975**	
		(0.401)	
ghg emissions × deregulation		13.51***	
		(3.207)	
ghg emissions × no-lawsuit-state		-0.701*	
		(0.421)	
ghg emissions × deregulation × no-lawsuit-state		-16.03***	
		(3.130)	
waste			0.351
			(7.106)
waste × deregulation			-13.47
			(28.27)
waste × no-lawsuit-state			-1.247
			(7.422)
waste × deregulation × no-lawsuit-state			-15.21
			(28.65)
No. obs.	5261	8690	8690
R-squared	0.51	0.57	0.57
Lender × Year FE	Y	Y	Y
State FE	N	N	N
Sector FE	Y	Y	Y
Borrower controls	Y	Y	Y
Deal controls	Y	Y	Y

This table studies the impact of the Trump withdrawal on the sensitivity of loan rates to environmental damage in the form of toxic emissions and waste. The bottom of the table provides information about fixed effects. The borrower controls include log(assets), log(total debt), and ebitda/assets. Standard errors correct for clustering at the lender-level, and are reported in parentheses. ***, ** and * indicate statistical difference from zero at the 1%, 5% and 10% levels, respectively.

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