Universität Zürich[UZH]

Department of Finance

University of Zurich
Department of Finance
Plattenstrasse 14
CH-8032 Zurich
www.df.uzh.ch

UZH, Department of Finance
Plattenstrasse 14, CH-8032 Zurich

Thea Kolasa
PhD Candidate in Finance
thea.kolasa@df.uzh.ch

Prof. Caroline Flammer and Prof. Stefano Giglio
c/o National Bureau of Economic Research
1050 Massachusetts Ave
Cambridge, MA 02138

Zurich, August 5, 2025

Dear Professors Flammer and Giglio,

I am writing to express my strong interest in participating in the NBER Dissertation Workshop on Climate Finance, to be held on October 9, 2025. I am a PhD candidate in the Department of Finance at the University of Zurich and the Swiss Finance Institute, and I expect to complete my PhD in June 2027. My research examines how debt markets and financial institutions shape the flow of capital toward climate investments.

My paper, "Climate Investments and Monetary Policy", which I hope to present and receive feedback on at the NBER workshop, examines how monetary policy influences firm-level climate investment decisions. Using granular firm-level data, I find that conventional monetary policy has significantly stronger effects on climate investments than on non-climate investments. The transmission is heterogeneous: financially constrained firms are more sensitive to rate changes, while high-emission firms increase climate investment when rates fall but do not reduce it when rates rise, likely due to regulatory and reputational rigidities. These findings highlight how monetary policy interacts with financial frictions and firm heterogeneity to shape the climate transition.

A second strand of my research continues this focus on climate finance through debt markets by analyzing how multilateral development banks (MDBs) mobilize capital. While major MDBs are expected to preserve AAA credit ratings to secure low-cost financing, there is growing debate over whether this constraint limits their ability to expand lending for sustainable development goals. My current work provides empirical evidence on this question by examining how markets respond to credit rating downgrades of highly rated MDBs.
My current work suggests that markets react counterintuitively to these downgrades. This raises the possibility that relaxing rating constraints could broaden MDB investor bases rather than narrowing them. I plan to expand this research to analyze how such shifts in MDB financing conditions may influence their capacity to scale up lending.

My advisers, Prof. Steven Ongena and Prof. Zacharias Sautner, would be happy to serve as references.

Thank you for considering my application. I have attached my CV and paper draft on "Climate Investments and Monetary Policy". I look forward to the opportunity to engage with the climate finance research community at NBER.

Sincerely

Thea Kolasa

THEA KOLASA

Plattenstrasse 14 ◇ 8032 Zurich, Switzerland
thea.kolasa@df.uzh.ch ◇ Orcid: 0009-0005-6590-0397

RESEARCH INTERESTS

Development Finance, Sustainable Finance, Corporate Finance

EDUCATION

University of Zurich and the Swiss Finance Institute *Sep 2021 - Present*
Ph.D. in Finance
Supervisors: *Steven Ongena, Zacharias Sautner*

Columbia University *Scheduled Sep 2025 - Mar 2026*
Visiting Scholar
Host: *Caroline Flammer*

University of Bonn *Oct 2018 - Jul 2021*
M.Sc. in Economics
Supervisor: *Farzad Saidi*

University of Tübingen *Oct 2014 - Aug 2018*
B.Sc. in International Economics

PROFESSIONAL EXPERIENCE

Norges Bank *Aug 2024 - Dec 2024*
PhD Fellow, Research Department
Host: *Emilia Garcia-Appendini*

University of Zurich *Sep 2021 - Present*
Research Assistant, Department of Finance

REFERENCES

Professor Steven Ongena
University of Zurich
Department of Finance
steven.ongena@df.uzh.ch

Professor Zacharias Sautner
University of Zurich
Department of Finance
zacharias.sautner@df.uzh.ch

PUBLICATIONS

Institutional Investors and the Fight against Climate Change
with Zacharias Sautner
Corporate Governance: An International Review

WORKING PAPERS

Multilateral Development Bank Bonds
with Christopher Humphrey and Steven Ongena

The Resilience of MDB Bonds to Credit Rating Downgrades
with Christopher Humphrey and Steven Ongena

WORK IN PORGRESS

Climate Investments and Monetary Policy
with Solveig Erlandsen and Emilia Garcia-Appendini

Carbon Emissions of Norwegian Firms
with Emilia Garcia-Appendini, Ragnar Juelsrud, and Sjur Nilsen

PRESENTATIONS & CONFERENCES

2025
BBLS University of Zurich, Rising Scholars in Finance

2024
Norges Bank

Prior to 2024
CER-CEPE ETH Seminar, BBLS University of Zurich

INVITED TALKS

"Institutional Investors and the Fight against Climate Change" *2024*
at the 11th Annual Conference of the University Research Priority Program Financial Market Regulation

AWARDS, GRANTS & SCHOLARSHIPS

UZH Doc.Mobility Grant *2025*
Norges Bank PhD Fellowship Grant *2024*
Best Teaching Award, University of Zurich *2023*
Best Poster Award, PhD Retreat University of Zurich *2023*
Overseas Development Institute Grant *2023*
First-year Doctoral Grant, Swiss Finance Institute *2021*
Tutoring Award, Department of Economics, University of Bonn *2020*

TEACHING & STUDENT SUPERVISION

Master thesis supervision: 8 students, University of Zurich *2022 - Present*
Bachelor thesis supervision: 6 students, University of Zurich *2022 - Present*
Advanced Corporate Finance (TA), Master, University of Zurich *2022 - Present*
Mathematics for Economists (TA), Bachelor, University of Bonn *2019 - 2020*
Economic and Fiscal Policy (TA), Bachelor, University of Tübingen *2017*
Introduction to Microeconomics (TA), Bachelor, University of Tübingen *2016 - 2017*

CONFERENCE ORGANIZATION

Tri-City Bridge Workshop on Empirical Finance *April 2025*
University of Zurich, Keynote speaker: Itzhak Ben-David (Ohio State University)

First Rising Scholar Conference in Sustainable Finance *July 2024*
University of Zurich, Keynote speaker: Caroline Flammer (Columbia University)

Fireside Chat with Caroline Flammer on Women in Academia *July 2023*
University of Zurich

REFEREEING ACTIVITY

Management Science

IT SKILLS, LANGUAGES & CITIZENSHIP

IT skills Stata, Python, Matlab, LaTeX, LSEG Eikon, LSEG Datastream, Bloomberg
Languages German (native), English (fluent), Spanish (fluent), Latin (6 years, qualification: Latinum)
Citizenship German

ADDITIONAL INFORMATION

- PhD committee member of the E-Axes Young Scholars' Webinar on Climate Finance and Economics *2024 - 2025*
- Serving as a representative for junior researchers at the department level *2022 - Present*
  and at the faculty level *2024 - Present*
- Responsible for organizing talks and lunch talks at CareerElixier, the peer mentoring group at the University of Zurich, to empower women to pursue a career in academia. *2022 - 2024*
- Sports: rowing and cycling tours

Climate investments and monetary policy*

Solveig Erlandsen[a], Emilia Garcia-Appendini[b], and Thea Kolasa[c]

[a]Norges Bank
[b]Norges Bank, University of St Gallen and SFI
[c]Norges Bank, University of Zurich and SFI

July 30, 2025

PRELIMINARY DRAFT. DO NOT CITE OR CIRCULATE.

Abstract

We show that conventional monetary policy has stronger effects on climate investments than on non-climate ones. The impact of monetary policy is heterogeneous across different types of climate investments and varies with firm characteristics: Financially constrained firms are less likely to invest in emissions mitigation and are more responsive to interest rate changes, reflecting financial frictions tied to their life-cycle stage. High-emission firms increase climate investments when rates fall but do not cut them when rates rise, likely due to costly environmental regulations. Our results highlight the role of financial constraints in the transmission of monetary policy to climate investments.

JEL classification: G12, G38, E52

Keywords: Climate investments, monetary policy, carbon emissions, financial frictions.

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Contact: Erlandsen: solveig.erlandsen@norges-bank.no; Garcia-Appendini: emilia.garcia@norges-bank.no; Kolasa: thea.kolasa@df.uzh.ch.

1 Introduction

Central banks increasingly recognize the transition to a low-carbon economy as a source of macroeconomic risk. Yet the possibility that monetary policy actions may themselves affect climate transition dynamics has received less attention. In this paper, we ask whether conventional monetary policy can inadvertently hinder the transition by changing firms' incentives to undertake "green" investments.[1] One concern is that higher interest rates could make green investments less attractive relative to other types of investments —particularly status quo investments associated with higher carbon emissions.

A growing body of recent papers analyzes this question empirically (Altavilla, Boucinha, Pagano, and Polo, 2023, Bauer, Offner, and Rudebusch, 2025, Benchora, Leroy, and Raffestin, 2025, Döttling and Lam, 2024, Patozi, 2023). Results from these studies consistently show that a surprise tightening of the monetary policy has more adverse effects for high-carbon emission firms than for low-emission ones. Yet the authors offer differing interpretations of their findings. For example, Altavilla et al. (2023), Bauer et al. (2025), and Patozi (2023) conclude that, because they affect high-emission firms more strongly, changes in monetary policy do not affect the speed of the climate transition. By contrast, Döttling and Lam (2024) find that high-emission firms reduce emissions more rapidly than low-emission firms, and they reduce the speed of emissions mitigation disproportionately more after a monetary policy tightening. Their interpretation, therefore, suggests that changes in monetary policy do affect the speed of the climate transition. The differing interpretations stem from the fact that these large-sample studies do not observe whether high- vs low-emission firms are undertaking climate investments.

In this paper, we shed light on this debate by leveraging survey responses from a sample of Norwegian firms combined with information from their financial statements and their carbon

[1] We define green investments as those directed toward technologies or products that demonstrate reduced environmental impact through lower carbon emissions relative to conventional alternatives. In the paper, we will refer collectively to such investments interchangeably as "green investments" or "climate investments".

emissions. The Norwegian economy is particularly well-suited to analyze this issue because it is a major fossil fuel exporter with an important manufacturing sector, and at the same time, it has a long-standing commitment to climate policy, including early implementation of carbon pricing and high environmental standards. Thus, it provides an ideal setting to analyze how firm-level emissions, climate investments, and climate transition risks interact with monetary policy.

In the survey, we ask firms whether they plan to undertake climate or traditional (non-climate) investments. For the climate investments, we distinguish between investments that reduce emissions ("mitigation") and the development of green markets and products (i.e., "green products"). Importantly, we ask firms whether they would change their plans for each of their (climate and non-climate) investments if the interest rates were to move significantly upwards and downwards, respectively. Answers to this question thus shed light on the demand-side responses to upward or downward monetary policy "surprises".

Our analysis uncovers several interesting patterns. First, we find that firms with high carbon emissions, as well as firms exposed to climate transition risks, are more likely to invest in emissions mitigation and green product development than firms with low emissions or low transition risks. Collectively, emissions and climate transition risks explain about half of the variance of climate investment plans; reassuringly, these variables explain less than 10% of the variance of non-climate investments. These results resonate with the findings of Döttling and Lam (2024) that high-emission firms reduce emissions faster than low-emission ones. We further find that investments in emissions mitigation and in green product development are typically performed by different types of firms. While the former are undertaken by large firms with plenty of physical capital and cash flows (i.e., "established" firms), the latter are performed by cash-strapped growth firms (the typical characteristics of "innovative", financially constrained firms). These distinctions matter, as they suggest that firms investing in climate can be differently exposed to several channels of monetary policy transmission –

a point which we discuss in the conceptual framework and confirm in subsequent analysis below.

Second, we uncover an asymmetry in the reaction of climate investments to changes in the monetary policy rate: high-emission firms would invest more in emissions mitigation and in green products if interest rates were lower, but they would not necessarily reduce their climate investments if interest rates increased. This asymmetry likely reflects the stringent climate regulatory framework that is in place in Norway:[2] Firms plausibly continue investing in climate in spite of higher rates to comply with costly emission mitigation regulations (such as surrendering emission permits through the ETS) or to satisfy the higher demand for green products driven by climate subsidies and incentives. This finding resonates with Känzig et al. (2025), which suggests that firms may respond to monetary policy shocks by scaling back non-climate innovation while preserving investment in climate-related innovation. We also find that life-cycle characteristics (such as the size and age of the firms) and financial constraints (e.g., availability of cash flows) correlate with the sensitivity of climate and non-climate investments to changes in the interest rate.

Third, we find that both types of climate investments (emission mitigation and development of green products and markets) are more exposed to the balance-sheet and life-cycle channels of monetary policy than regular investments: Small firms, not rated firms, and firms with less cash are more likely to sacrifice their climate investments rather than their non-climate ones when interest rates change. In particular, variables measuring the firms' cash flow availability are jointly significant in explaining the differential sensitivity of climate investments relative to non-climate ones. This result can be explained by the high upfront costs of climate investments and their consequently higher reliance on external finance (Ac-

[2]Norway's environmental regulations (founded in Norway's Climate Change Act, which was enacted in 2018, set emissions reduction targets of at least 50-55% by 2030 and 90-95% by 2050, compared to 1990 levels. To reduce emissions, Norway participates in EU climate legislation for 2021-2030, including the EU Emission Trading System (EU ETS), where Norwegian companies pay one of the highest carbon tax rates globally.

cetturo et al., 2025, De Haas et al., 2025), and by the fact that their cash flows tend to be more back-loaded and thus have higher duration (Schmidt et al., 2019, Hartzmark and Shue, 2022). These results are also consistent with the theoretical predictions of Fang et al. (2024), which suggest that young firms that lack collateral forego climate investments in favor of the more profitable regular investments.

Theoretically, climate and non-climate investments could be differentially affected by the risk-taking channel of monetary policy, as the former investments face lower climate transition risks relative to the standard investments (Altavilla et al., 2023, Kacperczyk and Peydró, 2021, Bolton and Kacperczyk, 2021, Giglio et al., 2021, Pastor et al., 2021, Gormsen and Huber, 2024). However, we don't find conclusive evidence that these differences matter empirically in our sample. On the one hand, we find that emission-intensive firms appear to reduce climate investments more sharply than non-climate investments when interest rates rise. On the other side of the coin, when rates fall, we only observe higher increases in investments for mitigation-related investments (relative to non-climate investments), but not for green product development. However, these findings are not statistically significant when we use other variables related to emissions or transition risk. This ambiguity could stem from the presence of simultaneous forces influencing the observed patterns. Indeed, climate investments can also be more exposed to the risk-taking channel of monetary policy relative to non-climate investments due to their higher reliance on uncertain fiscal policy and to the technological uncertainty associated with these investments (Wang et al., 2023, Kogan et al., 2017, Aghion et al., 2024).

Overall, our results highlight that the heterogeneity in firm types undertaking different types of climate investments translates into differential exposure to monetary policy. Less established and financially constrained firms are not only less likely to invest in emissions mitigation, but also more sensitive to interest rate changes when deciding whether to pursue such investments. This suggests that mitigation efforts are more exposed to financial frictions

than non-climate investments, particularly through balance-sheet effects linked to firms' stage in the life cycle. This resonates with Cloyne et al. (2023), who show that collateral valuations significantly influence how young firms respond to monetary policy. This finding highlights the importance of coordinating monetary and fiscal policy to avoid unintended environmental consequences of monetary policy. In particular, fiscal policies that relax financial constraints for high-emission firms are could mitigate unintended consequences of monetary policy actions on the climate transition during periods of monetary tightening.

Related Literature. This paper contributes primarily to the growing literature linking monetary policy with climate outcomes, while also intersecting with theories on investment under financial frictions. A fast-growing literature shows that conventional monetary policy can interact with climate risks. Using large datasets of publicly traded firms and monetary policy surprises, these studies show that unexpected policy tightenings depress the equity values and loan supply of carbon-intensive ("brown") firms more than those of greener peers (Bauer et al., 2025, Döttling and Lam, 2024, Patozi, 2023), and increase loan spreads for brown borrowers more than for greener firms (Altavilla et al., 2023). Aghion et al. (2024) find that green patenting activity is reduced with monetary policy tightenings. Yet these studies leave open which real investment margins drive the observed effects. Our contribution is to bring in new investment-level data, complemented by rich firm-level data and information on carbon emissions, to explore the distinct transmission channels through which monetary policy affects the different types of climate investments. Our finding that financially constrained firms would rather reduce (increase) their climate than their non-climate investments with higher (lower) interest rates suggests that monetary policy can affect the speed of the green transition. This finding informs the ongoing debate on how to interpret the results from the related literature that monetary policy has a larger effect on "brown" firms, and thus helps in the design of the most relevant policies required to ensure compliance

with climate commitments.

Our paper also contributes to a second emerging strand of the literature, which highlights how financial constraints affect the green transition. Fang et al. (2024) find that small and young financially constrained firms forgo pollution-abatement investment to favor capital investments, which allow them to accumulate net worth. In a similar spirit, Lanteri and Rampini (2023) show that collateral constraints push smaller firms toward dirtier technologies. De Haas et al. (2025) and Accetturo et al. (2025) show evidence that financial constraints can hinder the investment in green technologies. Bartram et al. (2022), Kim and Xu (2022) and Levine et al. (2018) find a link between financial constraints and environmental investments. Our survey evidence extends these insights by showing that the balance-sheet and life-cycle channels of monetary policy transmission are stronger for climate projects than for conventional capital expenditures. These channels have been identified by Bernanke and Blinder (1992), Bernanke and Gertler (1995), Gertler and Gilchrist (1994), Kashyap and Stein (2000), Cloyne et al. (2023) (among others), but are new in a climate context. In unifying these two strands of the literature, we show that monetary policy, financial frictions, and binding environmental regulation jointly determine which firms accelerate—or delay—the green transition.

2 Conceptual Framework

Conventional monetary policy could have uneven effects on green and brown investments through several different and non-mutually exclusive channels. To formalize this idea, it is useful to consider investments as a perpetual stream of cash flows with initial value C_0 and growth rate g. The present value of this perpetuity is:

$$V = \frac{C_0}{r - g} - I,$$

where I is the initial investment and r is the discount rate, consisting of the interest rate plus a risk premium. Changes in the interest rate will lead to differences in the incentives

to undertake green or other investments to the extent that these investments differ in terms of the structure of their cash flows (C_0 and g), their upfront investments I, or their discount rates r.

Several characteristics of green investments imply that they do in fact differ from other types of investments in ways that matter for monetary policy transmission. First, green investments may be more exposed to the textbook *interest rate channel* of monetary policy transmission. Green investments often have smaller initial cash flows C_0 and higher growth rates g than many other types of investments, leading to payoffs over longer horizons. These characteristics imply that green investments often have more back-loaded cash flows and longer durations than other investments (Allcott and Greenstone, 2012, Fowlie, Greenstone, and Wolfram, 2018).[3] Consequently, their valuations are more sensitive to interest rate fluctuations (Schmidt, Steffen, Egli, Pahle, Tietjen, and Edenhofer, 2019, Hartzmark and Shue, 2022): the sensitivity of value to the interest rate is given by the derivative

$$\frac{\partial V}{\partial r} = -\frac{C_0}{(r-g)^2} < 0,$$

implying that valuation is convex in the discount rate. Therefore, green investments exhibit greater sensitivity to changes in the interest rate due to their higher expected growth and lower initial cash flows.

Second, green investments may be more exposed to the *balance sheet and bank-lending channels* of monetary policy transmission (see e.g., Bernanke and Blinder, 1992, Bernanke and Gertler, 1995, Kashyap and Stein, 2000). This is because green investments tend to have higher upfront costs I than many other types of investments, implying that they often rely on external financing sources (Accetturo, Barboni, Cascarano, Garcia-Appendini, and Tomasi, 2025, Lanteri and Rampini, 2023). Thus, higher interest rates and tighter credit

[3]High upfront costs are due, for example, to retrofitting expenses aimed at incorporating less polluting processes, or to the higher costs of setting up newer and more efficient (and more expensive) technologies. Payoffs have longer horizons due, for example, to lower operating costs in the long run (reduced fuel costs) or to newer and more efficient technologies.

could disproportionately raise their funding costs and affect their credit availability, while other investments and incumbent firms may rely more on retained earnings and higher collateral availability to weather the tightening (Iovino, Martin, and Sauvagnat, 2023, Fang, Hsu, and Tsou, 2024).

Third, green investments can be exposed to the *risk-taking channel* of monetary policy. This channel suggests that accommodative monetary policy tends to compress net interest margins and reduce uncertainty, decreasing yields and encouraging investors to take on more risk (Borio and Zhu, 2012). Green investments could be more or less exposed to this channel depending on investors' risk preferences. To the extent that green investments are perceived as riskier than other types of investments – for example, due to the policy uncertainty associated to fiscal subsidies and incentives for climate investments (Gulen and Ion, 2016, Julio and Yook, 2012, Wang, Wurgler, and Zhang, 2023), then they would be more exposed to the risk-taking channel. Similarly, some green technologies could command a higher risk premium because they are newer and more innovative than other technologies (Kung and Schmid, 2015, Kogan, Papanikolaou, Seru, and Stoffman, 2017). Conversely, one can argue that green investments are less exposed to the risk-taking channel, as they do not carry the transition risks of carbon-intense technologies stemming from climate regulations, customer and investor preferences, or litigation risks. A large literature shows evidence that climate transition risks are priced (see Bolton and Kacperczyk, 2021, Giglio, Kelly, and Stroebel, 2021, Pastor, Stambaugh, and Taylor, 2021, Gormsen and Huber, 2024, de Bandt, Kuntz, Pankratz, Pegoraro, Solheim, Sutton, Takeyama, and Xia, 2024, among many others). This literature suggests that green investments could be less affected by the risk-taking channel of monetary policy. Therefore, overall the effects of the risk-taking channel on climate investments is ambiguous.

Finally, different types of climate investments have different cash flow characteristics and can be undertaken by firms in different moments of their life cycle. Thus, they can be ex-

posed to different monetary policy transmission channels. For example, climate investments geared at reducing emissions tend to be undertaken by larger and older firms with collateral availability (Fang et al., 2024). Variations in collateral values can affect firms differentially according to their position in the life cycle (Cloyne et al., 2023, Gnewuch and Zhang, 2025). In contrast, the development of green products is typically undertaken by start-ups and firms with more limited cash flows. Thus, they could rely more heavily in external capital, making them more exposed to financial frictions through the balance sheet and bank-lending channels of transmission (Bernanke and Blinder, 1992, Gertler and Gilchrist, 1994, Bernanke and Gertler, 1995).

Overall, these transmission channels provide differing predictions on whether climate investments are more or less sensitive to changes in the interest rate. Since the relative importance of each transmission channel is uncertain, the net effect could go either way, depending on the projects' financial structures, investors' risk preferences, and the nature and type of the climate investments. In the following sections, we analyze this issue using survey data on Norwegian firms.

3 Data and Methodology

3.1 Data Sources and Variables

We construct a cross-sectional firm-level dataset combining survey responses, financial disclosures, and emissions data to examine the sensitivity of climate and non-climate investment by Norwegian firms in response to monetary policy shocks. Our analysis thus exploits the cross-sectional variation in firm characteristics, as our goal is to understand which characteristics correlate with climate investments and their sensitivity to changes in interest rates, and climate investments are largely a time-invariant firm characteristic.[4]

Our core data source originates from firm responses to a special questionnaire for firms in

[4]For example, firms like Equinor, BP and Shell are famously much more likely to undertake green investments than ExxonMobil and ConocoPhillips, and these characteristics are largely time invariant.

the Norwegian Regional Network Survey (RNS). The RNS was established in 2002 to monitor Norway's business cycle and identify key economic drivers through quarterly interviews with a panel of firms all over Norway. The survey serves as a key input into monetary policy decisions and is published shortly before each interest rate announcement, underscoring its policy relevance and institutional credibility. The sample is drawn to reflect the Norwegian economy, covering firms across all major sectors and geographic regions; the selection strategy ensures broad economic representativeness. Each survey is conducted through structured interviews with senior executives at participating firms, typically the CEO or CFO. These interviews are performed by experienced personnel from local research institutions (e.g., professors or academic staff) operating under the supervision of Norges Bank. Each round of the RNS includes a core set of recurring business cycle questions and special rotating topics. Since 2020, climate change has been featured as a special topic in the survey once a year.

We collected the survey data with the Q2:2024 RNS wave, in which 340 firms were interviewed between April 29 and May 31, 2024.[5] During this quarter, the special topic focused on the sensitivity of climate and non-climate investments to changes in interest rates.[6] Specifically, in the special topic questions we asked firms (i) whether they are affected by any of several drivers of transition risks (such as carbon taxes, other climate policies, or changes in client and employee preferences); (ii) how these risks affect their business operations today; and (iii) whether they are planning to undertake climate and other (non-climate) investments over the next years. We specifically inquired about two types of climate-related investments: those designed to reduce emissions ("emissions mitigation") and those designed to develop new green products and markets ("green products"). Finally, for each of the climate and non-climate investments, we asked the firms if they would change their investment plans

[5] A list of all firms surveyed between Q3:2023 and Q2:2024 waves can be found in the appendix of the RNS report 02/2024 (https://www.norges-bank.no/en/news-events/publications/Regional-network-reports/2024/2-2024/)

[6] The monetary policy rate was 4.5% during the interview period, following a period of monetary policy tightening due to the post-pandemic surge in inflation.

if the monetary policy rate were (iv) substantially higher or (v) substantially lower than the current rate. Questions (iv) and (v) are the main focus of this study, as they measure whether climate and non-climate investments are sensitive to changes in the interest rate. By asking firms about their investment plans in significantly higher and lower interest rate scenarios, our objective was to observe how firms would react to monetary policy "shocks" – akin to the related literature. We allow for asymmetric responses to monetary policy (Perez-Orive, Timmer, and van der Ghote, 2023). Table A1 contains an overview of the main survey questions we use in this study, and Appendix B shows a descriptive analysis of firms' responses to all the survey questions.

We combine the survey responses with firms' administrative financial records from the Norwegian Register of Business Enterprises, *Brønnøysundregistrene*. Norwegian law requires all firms to file detailed annual financial statements. From these filings, we obtain the following firm characteristics: size (log of assets), revenue, leverage ratio (total debt over assets), profitability (EBITDA over assets), cash to assets ratio, collateral availability (ratio of property, plant and equipment, PPE, to assets), sales growth, a dividend payment dummy, a dummy for R&D activities, a dummy for their rating status, a dummy for whether they are parent firms, their sector of economic activity, and their region of operation. Of the 340 surveyed firms, we are able to match 319 firms to non-missing financial statements. We use financial characteristics as of the end of fiscal year 2023. We also merge the data to a firm-level emissions database compiled by Menon Economics. The so-called *Utslippsdatabase* provides estimates of scope 1, 2, and 3 for all accounting-obligated firms in Norway. After combining all three datasets, our final sample consists of 296 firms with complete survey, financial, and emissions data. To minimize the impact of outliers, we calculate the log of variables in levels (assets, age, and emissions) and we winsorize all ratios at the 5 and 95% level. Table A2 in the Appendix contains detailed definitions of all variables contained in our analysis.

We benchmark the industry composition of firms in our final sample with firms in the Norwegian economy by comparing the fraction of firms in each industry (weighted by assets) across the national population with the sample firms. Appendix Table A3 contains this comparison, and shows that the survey has a similar industrial composition to the Norwegian economy, with a slightly larger representation of agriculture, manufacturing, and services, and a smaller representation of the financial and mining sectors. The high representation of manufacturing firms makes our sample suitable for analyzing the role of monetary policy on climate investments.

Panel A of Table 1 contains a summary of the main financial characteristics of our sample. Comparing them to the characteristics of the full population (contained in Appendix Table A4), we find that our sample firms are drawn from the top 20% of the asset distribution. They are also 15 years older on average and more likely to be parent firms and dividend payers than firms in the full population. Furthermore, our sample consists predominantly of firms within the highest 20% of CO_2 emitters. Thus, our sample is skewed towards larger, more established firms. This is the most relevant sector for our analysis given our focus on climate investments, as larger firms are typically the dominant contributors to total emissions. However, our sample could potentially contain fewer younger start-ups and innovative small firms that could be engaging in green product development.

3.2 Methodology

To investigate whether and how conventional monetary policy can inadvertently affect the transition by changing firms' incentives to undertake climate investments, we organize our empirical analysis around the following three key questions:

(i) Which types of firms are more likely to invest in climate– (and non-climate–) related projects?

(ii) Which firms are more sensitive to changes in interest rates for their climate (and non-

climate) investments?

(iii) Does monetary policy transmit differently for climate and non-climate investments?

To address these questions, we estimate a series of cross-sectional regressions of the following form:

$$y_i = \beta_1 X_i + \beta_2 z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i \tag{1}$$

where X_i corresponds to the firm characteristics described above, and z_i stands for different measures of carbon emissions or transition risks. The specification further includes sector fixed effects $\eta_{s(i)}$ and region fixed effects $\nu_{r(i)}$ to account for economic conditions and other sources of unobserved heterogeneity that vary across industries and regions.

The outcome variable y_i varies across specifications to align with the specific question being addressed. For question (i), y_i stands respectively for three different binary variables indicating whether the firm plans to undertake mitigation, green product development, or non-climate investments. That is,

$$y_i = \text{Invest}(k)_i = \begin{cases} 1 & \text{if firm } i \text{ invests in technology } k, \\ 0 & \text{otherwise} \end{cases}$$

for $k \in \{\textit{Mitigation, Products, Non-climate}\}$. Thus, this specification relates each investment activity to a set of firm fundamentals and climate exposures, enabling us to characterize the typical profile of firms that engage in each type of investment.

For question (ii), the sample is restricted to firms indicating they would invest in each of the three different technologies (mitigation, green product development, or non-climate investments), and y_i stands respectively for two dummy variables indicating whether they would change these investment plans with positive (+) or negative (−) changes in the interest rate (six dummies in total). Specifically, for $k \in \{\textit{Mitigation, Products, Non-climate}\}$,

$$y_i = \textit{Sens}(k)_i^+ \begin{cases} 1 & \text{if firm } i \text{ would decrease investment in } k \text{ if } \Delta r > 0 \\ 0 & \text{otherwise,} \end{cases}$$

and

$$y_i = Sens(k)_i^- \begin{cases} 1 & \text{if firm } i \text{ would increase investment in } k \text{ if } \Delta r < 0 \\ 0 & \text{otherwise.} \end{cases}$$

Thus, for each type of investment, these binary variables indicate whether the firms are sensitive to upward and downward interest rate movements.[7] We refer collectively to $Sens(k)^+$ and $Sens(k)^-$ as $Sens(\cdot)^*$.

Finally, for question (iii), we restrict to firms investing simultaneously in climate and non-climate investments, and y_i stands respectively for dummy variables indicating whether each of the climate investments types are more or less sensitive than non-climate investments to positive (+) or negative (−) changes in the interest rate (four dummies in total). We construct these variables by calculating the difference between the sensitivity to the climate investment relative to the non-climate investment. Specifically, for $c \in \{Mitigation,\ Products\}$,

$$\begin{aligned} Diff(c)_i^+ &= Sens(c)_i^+ - Sens(Non\text{-}climate)_i^+ \text{ and} \\ Diff(c)_i^- &= Sens(c)_i^- - Sens(Non\text{-}climate)_i^-. \end{aligned}$$

These variables, which we refer to collectively as $Diff(\cdot)^*$, can take up three different values ($-1, 0$, or 1) depending on whether the firm's climate investment is less sensitive, equally sensitive, or more sensitive than its non-climate investment to changes in the interest rate, respectively. By relating these variables to firm characteristics, we will be able to test whether climate investments are differently exposed to the different monetary policy transmission channels than other forms of capital expenditure.

Panel B of Table 1 reports descriptive statistics for variables $Invest(\cdot)$, $Sens(\cdot)^*$ and $Diff(\cdot)^*$ and other variables drawn from the survey. The table reveals that on average, 45% of firms invest in mitigation, while 39% engage in green product development. Non-climate

[7] The survey allowed firms to answer that they would increase investments with higher interest rates or decrease investments with lower interest rates. None of the firms in the sample provided these counterintuitive responses.

investments are slightly more prevalent, with 49% of firms undertaking these investments.[8]

Moving towards the sensitivity of investments to changes in interest rates, $Sens(\cdot)^*$, we find that investments in climate-related technologies (i.e., mitigation and green product investments) are sensitive to interest rates for approximately two-thirds of firms. On average, this sensitivity appears symmetric, with a similar fraction of firms changing their investments with increases and decreases in the monetary policy rate. However, for firms undertaking climate and non-climate investments, the average relative sensitivity $Diff(\cdot)^*$ is negative. This indicates that, *unconditionally*, firms with both climate and non-climate investments are more responsive to interest rate changes in their non-climate investments. When interest rates rise (fall), these firms are more likely to scale back (increase) non-climate investments than they are to reduce (increase) climate-related expenditures. In the regression analysis, we will analyze how firm characteristics that are known to affect monetary policy affect the relative sensitivity of climate and non-climate investments.

4 Results

4.1 Which firms invest in climate projects?

We start our analysis by exploring which firm characteristics correlate with the likelihood of investing in the two types of climate investments and in the non-climate investments.

Table 2, Panel A contains results for several specifications of Equation 1, where the dependent variable is $Invest(k)$; $k = Mitigation$ in columns 1–3, *Products* in columns 4–6, and *Non-climate* in columns 7–9. The specifications differ across columns due to the

[8] Table A5 contain tetrachoric correlations between the different investment types, i.e. measures of the association between the latent continuous variables underlying the observed binary climate investment outcomes. These correlations indicate that there is some degree of complementarity across the different investment types. The strongest relationship with 50% emerges between mitigation and green products, suggesting that firms pursuing mitigation efforts are also more likely to engage in green product development strategies. In addition, the positive and significant association (32%) between mitigation and non-climate innovation points to a degree of complementarity between these investments. By contrast, there is no meaningful correlation between green products and non-climate investments, indicating that firms investing in green product and market development tend to be different from those pursuing the status quo non-climate investments.

inclusion of different z variables: log of emissions in columns 1, 4, and 7; emissions-to-sales ratio in columns 2, 5, and 8; and emissions-to-assets ratio in columns 3, 6, and 9. For ease of interpretation of the economic magnitudes, in this and all subsequent tables we standardize all continuous control variables by subtracting their mean and dividing by their standard deviation (std).

In Panel B, we also report coefficients of different specifications of Equation 1, but focusing on the climate transition risk variables obtained via the survey as variable z.[9] In Panel A, we report the coefficients of all the financial variables included in X as well as the carbon emission variable z. For the benefit of space, we only report the coefficients for the z variable in Panel B; the non-reported coefficients for the variables in X are qualitatively similar to those reported in Panel A. We bootstrap the standard errors based on 1,000 iterations.

We first focus on the coefficients for the financial characteristics in X contained in Panel A. Results in columns 1–3 (*Mitigation*) reveal that size (log of assets), the ratio of property, plant and equipment (PPE) to assets, and the dummy for dividend payer are statistically significant. This suggests that mitigation investments are concentrated among large firms with substantial physical capital, cash flows, and liquidity (as shown by their higher ability to generate dividend payments). These characteristics are typical of established, mature firms. Columns 4–6 (*Products*) show that investments in green product development follow a fundamentally different pattern, as these investments correlate positively with sales growth and negatively with cash. This suggests that the development of green products and markets tends to be concentrated in high-growth, cash-constrained firms. These patterns are economically intuitive and suggest that emissions mitigation investments are undertaken by larger firms that rely on technologies generating carbon emissions. These larger firms are po-

[9]We include these transition risk variables in separate specifications, rather than adding them to the estimations in Panel A, because our survey responses contain fewer observations than the related studies relying on administrative data. Thus, with our relatively small sample size, we face reduced power in statistical tests of confidence if we simultaneously include potentially correlated variables (such as carbon emissions and transition risks).

tentially already established firms that have accumulated more physical capital (presumably, machines relying on emission-generating technologies) as well as enough liquidity to generate dividends. In contrast, green product investments involve developing new technologies, markets, or business models with uncertain returns. These types of investments are typically performed by high-growth firms with less cash flow availability, in line with our findings. These characteristics potentially imply heterogeneous transmission of monetary policy to the different types of climate investments, as the more established firms are arguably less reliant on external financing (and hence potentially less subject to the balance sheet channel of monetary policy transmission), while the latter firms are more likely to be financially constrained and thus affected by changing interest rates.

Columns 7–9 (*Non-climate*) show that there are few systematic patterns in firms' organizational structure correlating with non-climate investments. Except for large firms, the propensity to invest in non-climate investments is not systematically driven by specific firm characteristics. This suggests that non-climate investment decisions span a broader and more heterogeneous set of firms, whereas climate-related investments may reflect more specific needs linked to technological constraints or economic and regulatory pressures.

We next focus on the coefficients of the climate-related variables z. Results in columns 1–6 of Panel A show that emission variables are key determinants of climate investment decisions: High-emitting firms have a significantly greater propensity for both mitigation and product investments, even after controlling for their industry classification, and regardless of whether emissions are measured in levels or per unit of sales or assets.[10] Similar results emerge from Panel B, where z stands for a dummy equal to one if the firm is affected by changing preferences of clients or employees (columns 1, 4, and 7); a dummy equal to one if the firm is affected by carbon taxes or other climate policy (in columns 2, 5, and 8), and a dummy if

[10]For emissions mitigation, this relationship for both absolute emissions and total assets is statistically not significant at conventional levels in column 1, which we relate to our relatively small sample plus the empirical observation that the level of emissions and assets exhibit a substantial correlation of 45% (50%) before (after) accounting for the industry.

the firm's credit conditions are affected due to climate issues (in columns 3, 6 and 9). The coefficients show that firms facing greater transition risks show markedly higher investment probabilities for both mitigation and green products. These findings are consistent with the results of Döttling and Lam (2024), who found that firms with high carbon emissions reduce their emissions at a faster rate suggesting that these firms are more likely to invest in climate. In terms of economic significance, we find that environmental variables are individually very important in explaining the variance of the likelihood to undertake climate investments. For example, the coefficient in Panel A, column 2 suggests that a one standard deviation increase in emissions intensity (measured as the emissions to sales ratio) increases the likelihood of investing in mitigation by 6.3 percentage points. Similarly, the coefficient in column 5 in Panel B suggests that being affected by climate policies increases the likelihood of investing in green innovation by 15.3 percentage points. Reassuringly, the coefficients for z in columns 7–9 show that neither carbon emissions nor transition risk exposures determines investments in non-climate-related assets.

We next assess the relative importance of the emissions and climate transition variables relative to known determinants of firm investments, such as their life cycle characteristics, their debt capacity, their available liquidity, and economic conditions. For this purpose, we group the variables into the following six broad categories: (1) Emissions (log of emissions and emissions intensity, measured by emissions over sales)[11]; (2) Transition risks (dummy variables indicating whether the firms responded in the survey that they are affected by changing preferences, climate policies, or that their credit conditions are affected by climate factors); (3) Life cycle variables (firm size, age, and sales growth, which are common proxies for firms' investment needs and of information asymmetries between firms and outside lenders); (4) Debt capacity (leverage ratio, a dummy for whether the firm is rated or not, and property, plant and equipment divided by assets to capture collateral, which can measure

[11]We do not include Scope1/Sales and Scope1/Assets simultaneously as they have a correlation of 90%.

the degree of financing frictions facing the firm); (5) Liquidity variables (cash to assets ratio, EBITDA to assets ratio, and a dummy measuring whether the firm pays dividends or not, which measure the degree of internal funding available to the firm), and (6) Economic conditions (which we measure using region and sector fixed effects). We then perform "kitchen sink" regressions including all these variables together in a single regression, and perform two complementary analyses: a joint test of significance of the variables contained in each of these six groups of variables, and a Shapley decomposition to quantify how much of the variance is explained by these groups (Shorrocks, 2013). These analyses complement our regression results, which provide individual coefficient estimates with limited statistical power due to potential cross-correlations between the variables and our relatively small sample. Table 3, Panel A contains the values of the F-statistics and the corresponding p-values for the joint tests of significance for variables in each of these six groups of variables, and Table 3 Panel B contains the Shapley variance decomposition.

Results from these analyses show that environmental factors (emissions and climate transition risks) play a central role in driving climate-related investments, but not non-climate investments. In Table 3 Panel A, we find that the joint tests of significance for the emissions and transition risk variables are significant at least at the 90% confidence level or higher for both types of climate investments. This indicates that these variables collectively play an important role in explaining the variation in climate investment outcomes. For instance, the transition risk variables jointly exhibit a strong explanatory power for green product investments (F-stat of 5.104 and p-value of 0.002), and mitigation investments (F-stat of 2.9 and p-value of 0.035). Correspondingly, Table 3 Panel B shows that the emissions and transition variables together explain more than 30% of the variance of emission mitigation investments (12.09% for emissions and 19.74% for transition risks), and about 47% of the variance of investments in green products (14.99% for emissions and 32.7% for transition risks).

In contrast, environmental factors are not significant, nor explain much of the variance,

for non-climate investments. For these investments, economic conditions –captured by firm industry and region fixed effects– are associated with the highest F-statistic and explain the largest fraction of variance (59.7%). Economic conditions are also important for climate investments, as they explain 33% of their variance. Life-cycle variables are marginally significant to explain investments in emissions mitigation (p-value is 0.118), but do not play important roles elsewhere. Financial conditions play a secondary role in this sample of larger firms.

Overall, the main takeaways from this table are the following: First, emissions and transition risks play a crucial role in the decision of firms to undertake climate investments; second, firms undertaking emission mitigation investments differ fundamentally from firms investing in the development of green products and markets; and third, firms undertaking non-climate investments are more heterogeneous in their observable characteristics than firms investing in climate. In the following sections, we analyze whether these different firm characteristics translate into more or less sensitivity of the climate investments to changes in the interest rate, and whether they lead to differential monetary policy transmission for climate vs non-climate investments.

4.2 Which firms are sensitive to changing interest rates?

We next examine which firm characteristics correlate with a larger sensitivity of different investment types to changes in monetary policy. For this purpose, we estimate Equation 1 on the different sensitivity indicators introduced previously, $Sens(\cdot)^*$. The table contains fewer observations as before, given the sample is the restricted to firms that are planning to undertake each type of investment. Table 4 reports the results for these estimations, where the dependent variable corresponds to $Sens(Mitigation)^*$ in columns 1–2, $Sens(Products)^*$ in columns 3–4, and $Sens(Non\text{-}climate)^*$ in columns 5–6. The odd-numbered columns correspond to investment sensitivity to higher interest rates, $Sens(\cdot)^+$, and even columns to

sensitivity to lower interest rates, $Sens(\cdot)^{-}$. The panels correspond to model estimations where variable z differs: log of emission (Panel A), emissions to sales ratio (Panel B), emissions to assets ratio (Panel C), an indicator for firms being affected by changing client or employee preferences (Panel D), an indicator for firms being affected by climate policies (Panel E), and an indicator for firms' credit conditions affected by climate factors (Panel F). As before, for the benefit of space we only report coefficients for the variables in X in Panel A.

Results in columns 1–4 of Panel A show that very few firm characteristics (assets, cash, and the indicator for a non-rated firm) correlate significantly with the sensitivity of climate investments to interest rate changes. Firm size seems to play a particularly prominent role, with small firms being more responsive to both increases and decreases in the monetary policy rate regarding emissions mitigation investments (columns 1 and 2), and also for green product investments –albeit only for sensitivity to positive changes in the interest rate (column 3). Size also has a strong economic significance, as shown by the large magnitudes of the standardized coefficients across columns 1–3. Cash appears negatively correlated with the likelihood of firms to reduce investments in emissions mitigation with higher rates (column 1), while the absence of a rating is positively correlated with the likelihood of firms to increase investments in emissions mitigation (column 2). These findings suggest that financial frictions correlate with the sensitivity of climate investments to changes in the interest rate, suggesting that climate investments are affected to some extent by the standard transmission mechanisms of monetary policy, such as the balance sheet channel and the life-cycle channel (Bernanke and Blinder, 1992, Bernanke and Gertler, 1995, Cloyne et al., 2023).

Financial frictions are also particularly relevant for non-climate investments, as shown in columns 5 and 6. These columns show that cash and cash flows correlate strongly with the sensitivity of non-climate investment to changes in the interest rate: firms with more cash flows (EBITDA to assets) are less sensitive to movements in the interest rate in either

direction; firms with high levels of cash are less likely to change their investment decisions when interest rates are higher (column 5); and dividend payers as well as established (i.e. low growth) firms are less likely to reduce their with lower interest rates (column 6). These patterns are also evident in the additional joint tests of significance and shapely decomposition, which we perform on the different variable categories introduced in the previous section. These results are contained in Table 5, which shows that cash flow variables are jointly highly significant (at the 99% level) for non-climate investments, both for increases (Panel A1) and decreases (Panel A2) in the interest rate, and they explain approximately 30% of the variance of these sensitivities (last columns of Panel B). In contrast, the cash flow variables are not jointly significant in regressions of climate investments, and they explain, in general, a low to very low fraction of their variance.

We next focus on the role of emissions and climate transition risks. The bottom row in Panel A of Table 4 shows that high-emission firms respond asymmetrically to changes in the monetary policy rate for their climate investments: Coefficients for the log of emissions in columns 2 and 4 are statistically significant, suggesting that firms with high-emission levels are more likely to increase their investments in emissions mitigation and green products when interest rates fall. This relation is economically significant and similar in magnitude to the effect of firm size: a one standard deviation increase in emissions amounts to an approximately 11 percentage point (pp) larger probability of increasing mitigation investments, and a 9 pp larger probability of increasing investments in green product development, with a decrease in the interest rate. In contrast, when interest rates rise, firms do not significantly reduce their climate investments (i.e., the coefficients for emissions in columns 1 and 3 are not statistically significant). This asymmetric response of climate investment to changes in the interest rate does not appear for the other measures of emissions and climate transition risks contained in Panels B–E, with the exception of investments in product development in Panel D. However, we recall that regressions in this table contain fewer observations than the

ones in Table 2 (because they are conditional on firms investing in each given technology) and hence the statistical power for tests of significance of individual coefficients might be lower than in the previous analysis. Therefore, we focus on the joint tests of hypotheses and on the contribution of each group of variables to explain the variance in the sensitivity, as contained in Table 5. Results reveal that emission variables are jointly statistically relevant to explain the sensitivity of mitigation investments to lower interest rates (p-value of 0.08, Panel A2), but not to higher interest rates (p-value = 0.792, Panel A1). Consistently, Panel B shows that these variables account for 13% of the variation in sensitivity under lower rates, compared to only 3% under higher rates. A similar, though weaker, pattern emerges for green product development. For lower interest rates, the joint hypothesis test of emissions does not reach conventional significance levels for green product development in Panel A2; however, the p-value of these variables is the lowest one across the different groups, and the variance decomposition shows that emissions and transition risks explain approximately 26% of the R^2 of the sensitivity of these investments to lower interest rates (Panel B2). These results present some evidence that high-emission firms are asymmetrically sensitive to changes in interest rates, and would invest more in climate with lower interest rates.[12]

This asymmetric response may indicate that climate investments are perceived by firms in the sample as an optimal economic strategy. This can be attributed to Norway's regulatory framework, which on the one hand provides strong economic pressure to high-emission firms to reduce emissions (through mechanisms such as Norway's participation in the EU Emissions Trading System and by imposing high national carbon pricing), and on the other one provides strong economic incentives to develop green products (though the generous subsidies and incentives for development of low emission technologies, energy efficiency, and similar projects provided in Norway's Climate Action Plan). In essence, this implies that high-emission firms

[12]Table 4 shows a positive and significant coefficient for the indicator of whether the firm is affected by climate policies in the sensitivity of non-climate investments to changes in the interest rate (column 5, Panel E). However, transition risks are jointly not statistically significant to explain the sensitivity of non-climate investments, as shown in Table 5, and they explain a low fraction of their variance.

have strong economic incentives to invest in climate technologies to the extent that it is more economical to do so than to reduce the investments when interest rates rise substantially. These findings appear to align with those of Känzig et al. (2025), who show that the impact of monetary policy tightening on the share of green patents is positive, while the absolute number of green patents remains stable and statistically insignificant for two years following the shock. One possible interpretation is that firms may reduce non-climate innovation while maintaining green innovation. This interpretation resonates with our results, where we observe that carbon-intensive firms do not scale back their investments during periods of contraction.

Other than emissions, we also find that life-cycle considerations jointly explain a substantial portion of the variation in climate-related investment responses in both monetary regimes. This is especially true for emissions mitigation, where the p-values in the joint test of significance of the variables in group 3 are very low (especially in Panel A2, i.e. to explain the sensitivity to reductions in the interest rate), and by the large fraction of variance explained by these variables in Panel B. Finally, economic conditions (group 6) are important determinants of the sensitivity of all investments to changes in the interest rate.

Overall, results from this section indicate that financial frictions are relevant to explain the sensitivity of standard non-climate investments to changes in the interest rate, but much less so for climate investments. In contrast, emissions and transition risks, as well as life cycle variables, seem to play a more important role for the sensitivity of climate investments to changes in the interest rate. These results suggest that monetary policy transmission might be different for climate and for non-climate investments, as climate regulations and economic incentives for the former investments might interact with firms' financing needs and financial conditions, affecting the investment decisions differently. We will explore in more detail the differences in monetary policy transmission between the different investment types in the next section.

4.3 Does monetary policy transmit differently for climate vs non-climate investments?

In this section we examine which types of firms are more likely to adjust their climate investments rather than their non-climate investments in response to monetary policy shocks, by estimating Equation 1 using variables $Diff(\cdot)^*$ as dependent variable. This analysis will inform us about whether, and for which types of firms, monetary policy transmits differently for climate investments than for other types of investments.

Table 6 presents the results. Columns 1 and 2 focus on the differential sensitivity to changes in the interest rate of mitigation investments relative to non-climate investments, $Diff(Mitigation)^*$, while columns 3 and 4 focus on $Diff(Products)^*$. As before, odd-numbered columns focus on the effect of interest rate increases, $Diff(\cdot)^+$, while the even columns capture the effect of interest rate decreases, $Diff(\cdot)^-$. Panel A shows the estimated coefficients for financial variables and carbon emissions, and Panels B–F contain the coefficients for other climate variables. The sample is further reduced as relative to Tables 2 and 4 as we are analyzing firms that are simultaneously undertaking climate and non-climate investments.

We first analyze the coefficients of the variables in X. Columns 1–2 show that mitigation investments are more sensitive to changes in the interest rate for young and small firms, as well as those with lower sales growth (significant coefficients for log of assets, log of age, and sales growth). These results suggest that monetary policy transmits differently for mitigation investments depending on the firms' position in the life cycle –a common indicator of financial constraints. Column 1 shows that large firms are less likely to reduce their emission mitigation efforts (than their non-climate investments) with increases in the interest rate, and column 2 shows that small and young firms are more likely to increase their mitigation efforts (rather than their non-climate investments) when the interest rates are lowered. Consistent with the results of the previous section, these results suggest that mitigation investments are economically beneficial for the Norwegian firms in the sample

–possibly due to the high costs of climate regulation. Thus, financially unconstrained (older) firms would rather reduce their non-climate investments than their reductions in emissions under higher interest rate scenarios, while financially constrained (younger and smaller) firms would prioritize these investments over others under lower interest rate scenarios, possibly to reduce the regulatory costs of producing carbon emissions.

The findings from columns 1 and 2 align very well with earlier findings from Table 2 which showed that mitigation investments are more likely to be undertaken by "established" firms. The less established (and thus financially constrained) firms are not only less likely to invest in mitigation of emissions, but they are also more sensitive to movements in the interest rate when deciding to undertake these investments. These results suggest that mitigation investments are more likely to be affected by financial frictions linked to the firms' position in the life cycle, through the transition channel documented by Cloyne et al. (2023). These authors argue that collateral valuations of young firms play a role in this transmission mechanism. Further supporting our interpretation, Fang et al. (2024) show theoretically that collateral availability is an important factor in firms' decision to abate emissions.

Financial constraints might also be correlated with a differential sensitivity of investments in the development of green products and markets vs. non-climate investments, albeit possibly through a different transmission channel. In columns 3 and 4, cash (column 3) and the indicator for not-rated firms (column 4) are the only variables appearing with individual statistical significance in the regressions. The positive coefficient for cash in column 3 suggests that the less constrained (high-cash) firms are more likely to reduce their non-climate investments rather than the development of green products when interest rates go up. The positive coefficient for the not-rated dummy in column 4 indicates that financially constrained (not-rated) firms are more likely to increase their investments in the development of green products and markets, rather than their non-climate investments, with lower interest rates. Again, these results suggest that financially constrained firms might not be investing their

optimal amounts in the development of green products and markets, so they would invest more when interest rates move favorably – possibly due to the economic incentives provided in Norway for the development of such products.

The findings from columns 3 and 4 also align very well with findings from Table 2. In that table, we found that the development of green products and markets are associated with firms with little cash and cash flow availability. Consistently with this finding, cash-poor (financially constrained) firms are more likely to change their decisions to invest in the development of green products and markets with changes in the interest rate. This finding suggests that investments in the development of green products and markets are likely to be affected by the balance sheet and bank-lending channels of monetary policy transmission, as these firms are more likely to depend on external financing for their investments rather than on internal funds (Bernanke and Blinder, 1992, Bernanke and Gertler, 1995).

Joint tests of significance and variance decomposition results in Table 7 confirm the intuition that financial constraints are important in explaining the differential sensitivities of climate vs non-climate investments. Results in Panel A show that cash flow variables are jointly statistically significant for both types of climate investment when interest rates increase (Panel A1, group 5), and for emissions mitigation investments when interest rates decrease (Panel A2). Debt capacity variables are also jointly statistically significant for green product investments in Panel A (and marginally significant with a p-value of 0.118 for emissions mitigation), and significant with a p-value of 0.058 for emissions mitigation in Panel A2. Life cycle variables and cash flow variables explain a significant part of the variance of the differential sensitivity of climate and non-climate investments, as shown in Panel B.

Overall, these results suggest that financial constraints –as measured through size, age, cash flow variables, and debt capacity variables– are important determinants of the differential sensitivity of climate vs non-climate investments. We conclude that financial frictions

affect the transmission of monetary policy for climate investments more than for non-climate investments. Results also point towards different channels of monetary policy transmission affecting climate investments heterogeneously: investments in emissions mitigation investments seem to be particularly exposed to the life-cycle channel of monetary policy transmission, where collateral availability (and hence debt capacity) plays an important role (Cloyne et al., 2023). In contrast, investments in the development of green products and markets are likely more affected by the bank-lending channel of monetary policy (Bernanke and Blinder, 1992, Bernanke and Gertler, 1995, Gertler and Gilchrist, 1994), which suggests that firms' balance sheet conditions matter for monetary policy transmission. These results are consistent with empirical evidence emphasizing the role of financial frictions on climate investments, which are the result of their high upfront costs and back-loaded cash flows (Schmidt et al., 2019, Hartzmark and Shue, 2022), and their increased dependence on external financing (Accetturo et al., 2025, De Haas et al., 2025, Lanteri and Rampini, 2023). As a result, firms with stronger balance sheets and larger debt capacity are less likely to delay or scale back climate investments when borrowing costs rise.

Next, we analyze the role of carbon emissions and transition risks (variable z) on the differential sensitivity of climate investments to changes in the interest rate. We find that carbon emission variables are significant in Panels B and C, when we use emissions intensity as variable z. Results in columns 1 and 3 show that when interest rates rise, firms with higher emissions intensity reduce their climate investments more readily than their non-climate investments. The differential impact of changes in the monetary policy rate on climate investments is also apparent for reductions in the interest rate, albeit only for emission mitigation investments (column 2). We do not find that other emissions or transition risk variables are individually significant in explaining the differential sensitivity of climate investments relative to non-climate investments, as shown by the non-significant coefficients of the climate variables in Panels A and D–F.

As before, we explore whether the lack of statistical significance of the emission and transition risk variables is due to the relatively small sample size and consequent low power of the individual tests, by looking at the joint tests of significance of these variables. Results from this analysis are mixed. On the one hand, the joint tests of significance in Panel A of Table 7 show that the set of transition risk variables jointly contributes to explaining differences in investment sensitivity of emission mitigation investments (p-values of 0.053 for higher interest rates and 0.079 for lower interest rates). However, these variables are not statistically significant for investments in the development of green products and markets, and they explain low portions of the variation in the differential sensitivity (as shown by the low Shapley values in Panel B).

Overall, from the coefficients of the variables z in Table 6 and the analysis in Table 7, we cannot unambiguously conclude whether climate investments are more or less subject to the risk-taking channel of monetary policy. On the one hand, the joint significance of the transition risk variables in the emissions mitigation regressions would suggest that these investments are more exposed to the risk-taking channel of monetary policy. Specifically, emission-intensive firms expand their exposure to climate transition risks relatively more when interest rates decline and contract it when rates rise. While this finding would align with the literature suggesting that green technologies may command a higher risk premium due to their novelty and innovation (Kung and Schmid, 2015, Kogan, Papanikolaou, Seru, and Stoffman, 2017), the result is not robust to the Shapley decomposition analysis and does not hold for investments in the development of green products and markets.

5 Conclusions

We provide novel empirical evidence on how conventional monetary policy affects firms' climate investment decisions. Thereby, we contribute to the growing debate about the environmental consequences of central bank actions. By using unique survey data from Norwegian

firms combined with their financial statements and carbon emissions data, we shed light on the mechanisms through which monetary policy influences the climate transition–a question that previous large-sample studies could not adequately address due to their inability to observe investment types directly.

Our analysis yields several important findings that advance our understanding of the monetary policy-climate nexus. First, we demonstrate that high-emission firms and those exposed to climate transition risks are more likely to invest in both emissions mitigation and green product development, with emissions and transition risks explaining up to 48% of the variation in climate investment plans. Crucially, we find that these types of climate investments are undertaken by fundamentally different types of firms: emissions mitigation by established firms with strong balance sheets, and green product development by cash-constrained growth firms.

Second, our results reveal an important asymmetry in how climate investments respond to monetary policy changes. High-emission firms indicate they would increase climate investments if interest rates were lower, but would not necessarily reduce them if rates increased. We argue that this reflects the stringency of Norwegian climate regulation. Furthermore, life-cycle characteristics and financial constraints are strongly correlated with the sensitivity of both climate and non-climate investments to changes in the interest rate.

Third, and perhaps most importantly for policy, we find that climate investments are differentially exposed to monetary policy transmission channels compared to standard, non-climate investments. In particular, we find that climate investments are more exposed to the balance-sheet and life-cycle channels of monetary policy transmission than non-climate investments. Financially constrained firms are less likely to invest in emissions mitigation and more responsive to interest rate changes. High-emission firms increase climate investments when rates fall but do not cut them when rates rise, likely due to stringent climate regulations. However, these firms still reallocate toward non-climate activities under monetary tightening.

These findings have significant implications for both monetary and environmental policy. Our results demonstrate that conventional policy can indeed affect the speed and composition of the green transition, contrary to some interpretations in the literature that suggest monetary policy is neutral with respect to climate outcomes. The differential effects we document suggest that monetary tightening could inadvertently slow the green transition by disproportionately affecting the climate investments of financially constrained firms.

From a policy coordination perspective, our findings highlight the importance of considering the environmental consequences of monetary policy decisions. Central banks and environmental regulators should be aware that monetary policy can interact with climate policies in complex ways, potentially requiring coordinated responses to ensure that macroeconomic stabilization does not undermine environmental objectives. The asymmetric responses we document suggest that accommodative monetary policy may be more effective at accelerating the climate transition than restrictive policy is at hindering it, at least in regulatory environments similar to Norway's.

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Tables

Table 1: Summary Statistics Regression Sample

Panel A: Administrative data

	N	Mean	SD	p10	p25	p50	p75	p90
Firm characteristics								
Assets (in 1000 NOK)	296	2.22e+06	1.39e+07	21079.000	57394.000	1.71e+05	8.07e+05	2.62e+06
ln(Assets)	296	12.257	1.933	9.956	10.957	12.050	13.601	14.779
Age (in years)	296	29.135	20.155	8.000	17.000	25.500	37.000	50.000
ln(Age)	296	3.156	0.694	2.079	2.833	3.238	3.611	3.912
Leverage (win)	296	0.641	0.203	0.339	0.505	0.667	0.799	0.875
EBITDA / Assets (win)	296	0.130	0.134	-0.013	0.043	0.118	0.196	0.303
PPE / Assets (win)	296	0.150	0.177	0.004	0.019	0.076	0.226	0.416
Cash (win)	296	0.160	0.192	0.001	0.013	0.063	0.260	0.479
Dividend Payer	296	0.331	0.471	0.000	0.000	0.000	1.000	1.000
Sales Growth (win)	296	0.142	0.306	-0.156	-0.004	0.096	0.242	0.399
Has R&D or Patents	296	0.409	0.492	0.000	0.000	0.000	1.000	1.000
Not rated	296	0.135	0.342	0.000	0.000	0.000	0.000	1.000
Parent firm	296	0.155	0.363	0.000	0.000	0.000	0.000	1.000
Scope1 emissions	296	5138.284	45506.560	5.495	30.354	173.638	974.910	4026.284
ln(Scope1)	296	5.080	2.760	1.704	3.413	5.157	6.881	8.301
Scope1 / Sales (win)	296	0.002	0.005	0.000	0.000	0.001	0.002	0.005
Scope1 / Assets (win)	296	0.004	0.010	0.000	0.000	0.001	0.003	0.010

Panel B: Survey data

	N	Mean	SD	p10	p25	p50	p75	p90
Firm investment types								
Emissions Mitigation	296	0.453	0.499	0.000	0.000	0.000	1.000	1.000
Green Products	296	0.385	0.487	0.000	0.000	0.000	1.000	1.000
Non-Climate	296	0.486	0.501	0.000	0.000	0.000	1.000	1.000
Firm monetary policy rate sensitivity								
Sens(Mitigation)–	175	0.320	0.468	0.000	0.000	0.000	1.000	1.000
Sens(Mitigation)+	175	0.343	0.476	0.000	0.000	0.000	1.000	1.000
Sens(Products)–	160	0.331	0.472	0.000	0.000	0.000	1.000	1.000
Sens(Products)+	160	0.319	0.467	0.000	0.000	0.000	1.000	1.000
Sens(Non-Climate)–	202	0.351	0.479	0.000	0.000	0.000	1.000	1.000
Sens(Non-Climate)+	202	0.386	0.488	0.000	0.000	0.000	1.000	1.000
Diff(Mitigation)–	142	-0.085	0.552	-1.000	0.000	0.000	0.000	1.000
Diff(Mitigation)+	142	-0.077	0.462	-1.000	0.000	0.000	0.000	0.000
Diff(Products)–	129	-0.062	0.527	-1.000	0.000	0.000	0.000	1.000
Diff(Products)+	129	-0.109	0.472	-1.000	0.000	0.000	0.000	0.000
Firm transition risk								
Client preferences	296	0.338	0.474	0.000	0.000	0.000	1.000	1.000
Employees preferences	296	0.101	0.302	0.000	0.000	0.000	0.000	1.000
Carbon pricing	296	0.098	0.298	0.000	0.000	0.000	0.000	0.000
Other climate policies	296	0.307	0.462	0.000	0.000	0.000	1.000	1.000

Notes: This table presents summary statistics for all variables in the analysis on firm characteristics from administrative data (Panel A) and firm investment types, monetary policy sensitivity, and transition risks from the Regional Network Survey (Panel B). All ratios have been winsorized at the 5 and 95% levels to minimize the impact of outliers, as indicated by "(win)". Variable definitions are available in Table A2.

Table 2: Determinants of Investments

	(1) Mitigation	(2) Mitigation	(3) Mitigation	(4) Products	(5) Products	(6) Products	(7) Non-climate	(8) Non-climate	(9) Non-climate
Panel A: Emissions Variables									
ln(Assets) (std)	0.057	0.086***	0.090***	-0.010	0.040	0.044	0.064*	0.070**	0.072**
	(0.038)	(0.033)	(0.033)	(0.037)	(0.032)	(0.033)	(0.038)	(0.033)	(0.034)
ln(Age) (std)	0.024	0.023	0.023	0.003	0.003	0.003	0.004	0.004	0.003
	(0.035)	(0.035)	(0.035)	(0.035)	(0.034)	(0.035)	(0.036)	(0.036)	(0.036)
Parent firm	0.125	0.095	0.106	0.054	0.005	0.018	-0.112	-0.119	-0.116
	(0.079)	(0.077)	(0.078)	(0.076)	(0.075)	(0.075)	(0.090)	(0.088)	(0.088)
Not rated	-0.033	-0.040	-0.046	-0.037	-0.050	-0.056	0.069	0.067	0.065
	(0.087)	(0.087)	(0.087)	(0.086)	(0.084)	(0.084)	(0.092)	(0.093)	(0.093)
Leverage (std)	-0.004	0.005	0.003	-0.019	-0.002	-0.005	-0.048	-0.046	-0.047
	(0.031)	(0.029)	(0.029)	(0.030)	(0.028)	(0.028)	(0.032)	(0.032)	(0.032)
EBITDA / Assets (std)	-0.014	-0.009	-0.009	-0.016	-0.005	-0.005	0.047	0.048	0.047
	(0.033)	(0.032)	(0.032)	(0.030)	(0.029)	(0.029)	(0.031)	(0.031)	(0.031)
PPE / Assets (std)	0.080**	0.073**	0.075**	0.003	-0.004	0.001	0.026	0.025	0.024
	(0.031)	(0.031)	(0.031)	(0.032)	(0.033)	(0.032)	(0.031)	(0.031)	(0.030)
Cash (std)	-0.035	-0.034	-0.035	-0.062**	-0.061**	-0.062**	0.027	0.027	0.027
	(0.033)	(0.033)	(0.033)	(0.031)	(0.031)	(0.031)	(0.032)	(0.032)	(0.032)
Dividend Payer	0.112*	0.103*	0.106*	0.062	0.048	0.051	-0.053	-0.055	-0.055
	(0.059)	(0.059)	(0.059)	(0.061)	(0.061)	(0.062)	(0.064)	(0.064)	(0.064)
Sales Growth (std)	-0.009	-0.013	-0.013	0.073**	0.065**	0.064**	-0.026	-0.027	-0.027
	(0.026)	(0.025)	(0.025)	(0.029)	(0.030)	(0.030)	(0.029)	(0.029)	(0.029)
Ln(Emissions) (std)	0.055			0.099**			0.012		
	(0.037)			(0.039)			(0.042)		
Emissions/Sales (std)		0.063**			0.081***			0.014	
		(0.028)			(0.030)			(0.031)	
Emissions/Assets (std)			0.065**			0.069**			0.020
			(0.029)			(0.030)			(0.031)
Observations	296	296	296	296	296	296	296	296	296
R^2	0.223	0.231	0.233	0.167	0.170	0.165	0.155	0.156	0.157
Panel B: Transition Risk Variables									
Affected by changing preferences	0.149**			0.175**			0.100		
	(0.069)			(0.070)			(0.081)		
Affected by any climate policy		0.134**			0.153**			0.052	
		(0.062)			(0.068)			(0.069)	
Credit conditions			0.154**			0.233***			0.072
			(0.069)			(0.063)			(0.063)
Observations	296	296	296	296	296	296	296	296	296
R^2	0.227	0.228	0.234	0.161	0.161	0.189	0.160	0.157	0.159

Notes: The table reports OLS results for the regression, $Invest(k)_i = \beta_1 X_i + \beta_2 z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$, where Invest$(k)_i$ is an indicator equal to one if firm i reports plans to invest in technology k, for $k \in \{$*Mitigation* (columns 1–3), *Products* (columns 4–6), *Non-climate* (columns 7–9)$\}$. Variable z_i varies across the different columns and panels and represents different measures of carbon emissions (Panel A) or transition risk factors (Panel B). All panels include a set of firm financial characteristics, X_i; coefficients for these variables are only reported in Panel A. For ease of interpretation of the economic magnitudes, all continuous variables have been standardized by subtracting the mean and dividing by the standard deviation (std). All specifications include region fixed effects, $\eta_{s(i)}$, and industry fixed effects, $\nu_{r(i)}$ (coefficients not reported). Variable definitions are available in Table A2. Standard errors, based on 1,000 bootstrap iterations, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Importance and Influence of Variable Groups for Investment Types

Group	Description	Emissions Mitigation		Green Products		Non-Climate	
Panel A: Joint Determination							
		F-stat	p-value	F-stat	p-value	F-stat	p-value
1	Emissions	2.378	0.095	3.156	0.044	0.097	0.908
2	Transition Risks	2.900	0.035	5.104	0.002	0.756	0.520
3	Life Cycle	1.866	0.117	1.379	0.241	1.003	0.406
4	Debt Capacity	1.535	0.206	0.353	0.787	0.730	0.535
5	Cash Flow	0.920	0.432	1.406	0.241	1.376	0.251
6	Economic Conditions	2.147	0.021	2.255	0.015	3.497	0.000
Panel B: Shapley Decomposition							
		Shapley Value	%	Shapley Value	%	Shapley Value	%
1	Emissions	0.031	12.09	0.033	14.99	0.005	2.79
2	Transition Risks	0.050	19.74	0.072	32.70	0.011	7.03
3	Life Cycle	0.043	16.83	0.025	11.53	0.023	13.95
4	Debt Capacity	0.026	10.28	0.002	0.83	0.016	9.61
5	Cash Flow	0.020	7.84	0.014	6.49	0.011	6.95
6	Economic Conditions	0.085	33.22	0.074	33.46	0.097	59.67
	Total	0.255	100.00	0.220	100.00	0.163	100.00

Notes: This table presents joint tests of hypotheses (Panel A) and variance decompositions (Panel B). The underlying regressions follow $Invest(k)_i = \beta_1 X_i + \beta_2 z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$, where Invest$(k)_i$ is an indicator equal to one if firm i reports plans to invest in technology k, for $k \in \{$*Mitigation* (columns 1–2), *Products* (columns 3–4), *Non-climate* (columns 5–6)$\}$. The specification includes all emissions and transition risk variables z. The groups of variables are defined as follows: Group 1 (Emissions) includes Ln(Emissions) and Emissions / Sales. Group 2 (Transition Risks) includes Preferences, Climate policies, and Credit conditions. Group 3 (Life Cycle) includes ln(Assets), Parent firm, ln(Age), and Sales Growth. Group 4 (Debt capacity) includes Not rated, Leverage, and PPE / Assets. Group 5 (Cash Flow) includes Cash, EBITDA / Assets, and Dividend Payer. Group 6 (Economic Conditions) includes Industry Dummies and Region Dummies. Variable definitions are available in Table A2.

Table 4: Interest Rate Sensitivity of Investments

	(1) Sens(Mitigation)+	(2) Sens(Mitigation)-	(3) Sens(Products)+	(4) Sens(Products)-	(5) Sens(non-climate)+	(6) Sens(non-climate)-
Panel A: Ln(Emissions)						
ln(Assets) (std)	-0.119**	-0.123**	-0.092*	-0.054	-0.068	-0.060
	(0.051)	(0.050)	(0.055)	(0.061)	(0.048)	(0.045)
ln(Age) (std)	0.057	-0.006	0.030	0.013	0.056	0.065
	(0.044)	(0.045)	(0.043)	(0.043)	(0.044)	(0.044)
Parent firm	0.047	0.147	0.055	0.007	-0.018	-0.035
	(0.110)	(0.113)	(0.114)	(0.109)	(0.102)	(0.094)
Not rated	0.104	0.217*	-0.063	0.081	-0.166	-0.114
	(0.114)	(0.122)	(0.106)	(0.123)	(0.108)	(0.119)
Leverage (std)	0.060	0.004	0.058	-0.035	0.031	-0.012
	(0.040)	(0.044)	(0.047)	(0.047)	(0.038)	(0.040)
EBITDA / Assets (std)	-0.022	0.007	-0.033	-0.014	-0.079**	-0.089**
	(0.044)	(0.045)	(0.054)	(0.052)	(0.039)	(0.037)
PPE / Assets (std)	0.041	-0.003	0.023	0.021	0.014	0.021
	(0.040)	(0.038)	(0.043)	(0.042)	(0.042)	(0.039)
Cash (std)	-0.080*	-0.051	-0.014	0.015	-0.072*	-0.037
	(0.044)	(0.043)	(0.056)	(0.057)	(0.040)	(0.036)
Dividend Payer	0.129	0.068	0.072	0.034	-0.112	-0.183**
	(0.092)	(0.088)	(0.090)	(0.091)	(0.084)	(0.074)
Sales Growth (std)	-0.028	0.009	-0.010	0.007	0.055	0.060*
	(0.048)	(0.046)	(0.037)	(0.046)	(0.038)	(0.033)
Ln(Emissions) (std)	0.032	0.108**	0.046	0.091*	0.034	0.071
	(0.050)	(0.053)	(0.049)	(0.054)	(0.051)	(0.048)
Observations	176	176	161	161	202	202
R^2	0.146	0.155	0.149	0.146	0.161	0.176
Panel B: Emissions/Sales						
Emissions/Sales (std)	0.015	0.048	0.026	0.035	0.013	0.021
	(0.034)	(0.035)	(0.030)	(0.038)	(0.038)	(0.039)
Observations	175	175	160	160	202	202
R^2	0.140	0.140	0.142	0.136	0.159	0.168
Panel C: Emissions/Assets						
Emissions/Assets (std)	0.016	0.045	0.027	0.029	0.017	0.018
	(0.034)	(0.036)	(0.031)	(0.039)	(0.039)	(0.040)
Observations	176	176	161	161	202	202
R^2	0.145	0.142	0.148	0.132	0.160	0.167
Panel D: Preferences						
Affected by changing preferences	0.047	0.122	0.125	0.236*	0.074	0.040
	(0.140)	(0.130)	(0.103)	(0.135)	(0.104)	(0.098)
Observations	176	176	161	161	202	202
R^2	0.145	0.136	0.149	0.144	0.161	0.167
Panel E: Climate Policies						
Affected by any climate policy	-0.012	-0.011	0.150	0.152	0.180**	0.079
	(0.112)	(0.114)	(0.108)	(0.118)	(0.087)	(0.086)
Observations	176	176	161	161	202	202
R^2	0.144	0.131	0.154	0.137	0.177	0.170
Panel F: Credit Conditions						
Credit conditions	0.015	0.101	0.059	0.108	0.073	0.054
	(0.087)	(0.081)	(0.088)	(0.085)	(0.081)	(0.077)
Observations	176	176	161	161	202	202
R^2	0.144	0.141	0.147	0.137	0.163	0.168

Notes: Columns 1, 3 and 5 in this table report OLS results for the regressions $Sens(k)_i^+ = \gamma_1^+ X_i + \gamma_2^+ z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$, and columns 2, 4 and 6 for $Sens(k)_i^- = \gamma_1^- X_i + \gamma_2^- z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$. $Sens(k)_i^+$ equals one if a firm reports to increase investments in technology k if interest rates were lower than today, 0 otherwise. $Sens(k)_i^-$ equals one if a firm reports to decrease investments in technology k if interest rates were lower (higher) than today, 0 otherwise. k corresponds to investments in emissions mitigation (*Mitigation*) in columns 1 and 2, green product or market development (*Products*) in columns 3 and 4, and non-climate investments (*Non-climate*) in columns 5 and 6. Variable z_i differs across panels: log of emissions (Panel A), emissions to sales (Panel B), emissions to assets (Panel C), changes in client or employee preferences (Panel D) affected by climate policies (Panel E), credit conditions affected by climate factors (Panel F). All panels include a set of firm financial characteristics, X_i; coefficients for these variables are only reported in Panel A. All specifications include region fixed effects, $\eta_{s(i)}$, and industry fixed effects, $\nu_{r(i)}$ (coefficients not reported). Variable definitions are available in Table A2. Standard errors, based on 1,000 bootstrap iterations, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Importance and Influence of Variable Groups for Interest Rate Sensitivity

Group	Description	Emissions Mitigation		Green Products		Non-Climate	
Panel A: Joint Determination							
		F-stat	p-value	F-stat	p-value	F-stat	p-value
Panel A1: Sensitivity to higher interest rates							
1	Emissions	0.234	0.792	0.490	0.614	0.072	0.930
2	Transition Risks	0.073	0.974	0.796	0.498	1.452	0.229
3	Life Cycle	1.610	0.175	1.012	0.404	0.914	0.457
4	Debt Capacity	1.463	0.227	0.601	0.616	1.380	0.250
5	Cash Flow	1.602	0.191	0.299	0.826	5.314	0.002
6	Economic Conditions	0.917	0.519	1.548	0.129	1.835	0.058
Panel A2: Sensitivity to lower interest rates							
1	Emissions	2.472	0.088	1.998	0.140	1.358	0.260
2	Transition Risks	0.882	0.452	1.179	0.320	0.267	0.849
3	Life Cycle	1.916	0.111	0.767	0.549	1.446	0.221
4	Debt Capacity	1.323	0.269	0.641	0.590	0.517	0.671
5	Cash Flow	0.536	0.658	0.054	0.984	6.333	0.000
6	Economic Conditions	1.333	0.218	1.435	0.171	2.541	0.007
Panel B: Shapley Decomposition							
		Shapley Value	%	Shapley Value	%	Shapley Value	%
Panel B1: Sensitivity to higher interest rates							
1	Emissions	0.004	3.01	0.005	3.15	0.002	1.21
2	Transition Risks	0.003	2.15	0.018	11.24	0.023	12.92
3	Life Cycle	0.034	23.94	0.021	13.23	0.018	9.88
4	Debt Capacity	0.023	16.38	0.021	13.01	0.018	10.09
5	Cash Flow	0.027	18.84	0.004	2.68	0.052	28.86
6	Economic Conditions	0.051	35.69	0.090	56.70	0.066	37.05
	Total	0.143	100.00	0.158	100.00	0.179	100.00
Panel B2: Sensitivity to lower interest rates							
1	Emissions	0.023	13.49	0.015	8.10	0.006	3.36
2	Transition Risks	0.020	11.80	0.033	18.26	0.006	3.50
3	Life Cycle	0.032	18.60	0.020	11.16	0.021	11.48
4	Debt Capacity	0.015	8.74	0.011	6.28	0.008	4.47
5	Cash Flow	0.008	4.53	0.001	0.75	0.057	31.29
6	Economic Conditions	0.073	42.83	0.101	55.45	0.083	45.90
	Total	0.171	100.00	0.182	100.00	0.181	100.00

Notes: This table presents joint tests of hypotheses (Panel A) and variance decompositions (Panel B). The underlying regressions follow $Sens(k)_i^+ = \gamma_1^+ X_i + \gamma_2^+ z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$, and columns 2, 4 and 6 for $Sens(k)_i^- = \gamma_1^- X_i + \gamma_2^- z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$. $Sens(k)_i^+$ equals one if a firm reports to increase investments in technology k if interest rates were lower than today, 0 otherwise. $Sens(k)_i^-$ equals one if a firm reports to decrease investments in technology k if interest rates were lower (higher) than today, 0 otherwise. k corresponds to investments in emissions mitigation (*Mitigation*) in columns 1 and 2, green product or market development (*Products*) in columns 3 and 4, and non-climate investments (*Non-climate*) in columns 5 and 6. The specification includes all emissions and transition risk variables z. The groups of variables are defined as follows: Group 1 (Emissions) includes Ln(Emissions) and Emissions / Sales. Group 2 (Transition Risks) includes Preferences, Climate policies, and Credit conditions. Group 3 (Life Cycle) includes ln(Assets), Parent firm, ln(Age), and Sales Growth. Group 4 (Debt capacity) includes Not rated, Leverage, and PPE / Assets. Group 5 (Cash Flow) includes Cash, EBITDA / Assets, and Dividend Payer. Group 6 (Economic Conditions) includes Industry Dummies and Region Dummies. Variable definitions are available in Table A2.

Table 6: Relative Interest Rate Sensitivity of Investments

	(1) Diff(Mitigation)+	(2) Diff(Mitigation)-	(3) Diff(Products)+	(4) Diff(Products)-
Panel A: Ln(Emissions)				
ln(Assets) (std)	-0.116**	-0.131**	-0.025	-0.048
	(0.055)	(0.066)	(0.062)	(0.073)
ln(Age) (std)	0.005	-0.105*	-0.030	-0.057
	(0.041)	(0.054)	(0.048)	(0.050)
Parent firm	0.095	0.217	0.085	0.110
	(0.097)	(0.147)	(0.134)	(0.128)
Not rated	0.167	0.185	0.144	0.216*
	(0.136)	(0.136)	(0.151)	(0.127)
Leverage (std)	-0.022	-0.040	-0.019	-0.064
	(0.043)	(0.051)	(0.053)	(0.057)
EBITDA / Assets (std)	0.031	0.078	0.025	0.067
	(0.051)	(0.051)	(0.060)	(0.064)
PPE / Assets (std)	0.025	-0.012	-0.012	-0.004
	(0.048)	(0.054)	(0.049)	(0.061)
Cash (std)	0.043	0.009	0.115*	0.026
	(0.049)	(0.054)	(0.059)	(0.061)
Dividend Payer	0.139	0.146	0.059	0.105
	(0.107)	(0.120)	(0.120)	(0.124)
Sales Growth (std)	-0.097*	-0.025	-0.028	0.019
	(0.054)	(0.057)	(0.058)	(0.061)
Ln(Emissions)	0.072	0.057	0.046	-0.000
	(0.055)	(0.065)	(0.057)	(0.063)
Observations	142	142	129	129
R^2	0.191	0.224	0.164	0.148
Industry + Region FE	Yes	Yes	Yes	Yes
Panel B: Emissions/Sales				
Emissions/Sales	0.040*	0.050	0.043*	0.013
	(0.024)	(0.031)	(0.026)	(0.029)
Observations	142	142	129	129
R^2	0.190	0.230	0.170	0.149
Panel C: Emissions/Assets				
Emissions/Assets	0.050**	0.062**	0.052**	0.026
	(0.025)	(0.031)	(0.024)	(0.030)
Observations	142	142	129	129
Panel D: Preferences				
Affected by changing preferences	-0.025	-0.034	0.108	0.065
	(0.115)	(0.126)	(0.158)	(0.158)
Observations	142	142	129	129
R^2	0.181	0.221	0.164	0.149
Panel E: Climate Policies				
Affected by any climate policy	0.151	0.027	0.151	0.054
	(0.139)	(0.160)	(0.144)	(0.149)
Observations	142	142	129	129
Panel F: Credit Conditions				
Credit conditions	0.026	0.071	0.091	0.123
	(0.083)	(0.098)	(0.088)	(0.099)
Observations	142	142	129	129
R^2	0.182	0.224	0.168	0.159

Notes: Columns 1 and 3 in this table report OLS results for the regressions $Difference(k)_i^+ = \delta_1^+ X_i + \delta_2^+ z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$ and columns 2 and 4 report the results for the regression $Difference(k)_i^- = \delta_1^- X_i + \delta_2^- z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$, where $Difference(k)_i^+ = Sensitive(k)_i^+ - Sensitive(non\text{-}climate)_i^+$ and $Difference(k)_i^- = Sensitive(k)_i^- - Sensitive(non\text{-}climate)_i^-$, respectively. k corresponds to investments in emissions mitigation (*Mitigation*) in columns 1 and 2 and green product or market development (*Products*) in columns 3 and 4. Variable z_i differs across panels: log of emissions (Panel A), emissions to sales (Panel B), emissions to assets (Panel C), changes in client or employee preferences (Panel D) affected by climate policies (Panel E), credit conditions affected by climate factors (Panel F). All panels include a set of firm financial characteristics, X_i; coefficients for these variables are only reported in Panel A. All specifications include region fixed effects, $\eta_{s(i)}$, and industry fixed effects, $\nu_{r(i)}$ (coefficients not reported). Variable definitions are available in Table A2. Standard errors, based on 1,000 bootstrap iterations, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Importance and Influence of Variable Groups for Differential Sensitivity

Group	Description	Emissions Mitigation		Green Products	
Panel A: Joint Determination					
		F-stat	p-value	F-stat	p-value
Panel A1: Sensitivity to higher interest rates					
1	Emissions	1.598	0.207	1.320	0.272
2	Transition Risks	2.418	0.053	0.439	0.781
3	Life Cycle	0.524	0.667	0.418	0.740
4	Debt Capacity	2.001	0.118	2.980	0.035
5	Cash Flow	1.966	0.043	1.722	0.085
6	Economic Conditions	0.475	0.701	0.679	0.567
Panel A2: Sensitivity to lower interest rates					
1	Emissions	1.498	0.228	0.142	0.868
2	Transition Risks	2.154	0.079	0.660	0.621
3	Life Cycle	1.174	0.323	1.907	0.133
4	Debt Capacity	2.570	0.058	1.104	0.351
5	Cash Flow	3.071	0.002	1.452	0.169
6	Economic Conditions	0.233	0.873	0.539	0.656
Panel B: Shapley Decomposition					
		Shapley Value	%	Shapley Value	%
Panel B1: Sensitivity to higher interest rates					
1	Emissions	0.013	6.22	0.008	4.27
2	Transition Risks	0.007	3.66	0.022	11.86
3	Life Cycle	0.045	22.15	0.008	4.05
4	Debt Capacity	0.005	2.61	0.009	4.63
5	Cash Flow	0.030	14.58	0.030	16.26
6	Economic Conditions	0.103	50.79	0.110	58.91
Total		0.203	100.00	0.186	100.00
Panel B2: Sensitivity to lower interest rates					
1	Emissions	0.017	7.32	0.005	3.26
2	Transition Risks	0.006	2.49	0.015	9.21
3	Life Cycle	0.056	23.94	0.020	12.59
4	Debt Capacity	0.008	3.53	0.018	11.07
5	Cash Flow	0.033	14.02	0.015	9.46
6	Economic Conditions	0.114	48.72	0.088	54.41
Total		0.233	100.00	0.162	100.00

Notes: This table presents joint tests of hypotheses (Panel A) and variance decompositions (Panel B). The underlying regressions follow $\textit{Difference}(k)_i^+ = \delta_1^+ X_i + \delta_2^+ z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$ and columns 2 and 4 report the results for the regression $\textit{Difference}(k)_i^- = \delta_1^- X_i + \delta_2^- z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$, where $\textit{Difference}(k)_i^+ = \textit{Sensitive}(k)_i^+ - \textit{Sensitive}(\textit{Non-climate})_i^+$ and $\textit{Difference}(k)_i^- = \textit{Sensitive}(k)_i^- - \textit{Sensitive}(\textit{Non-climate})_i^-$, respectively. k corresponds to investments in emissions mitigation (*Mitigation*) in columns 1 and 2, and green product or market development (*Products*) in columns 3 and 4. The specification includes all emissions and transition risk variable z. The groups of variables are defined as follows: Group 1 (Emissions) includes Ln(Emissions) and Emissions / Sales. Group 2 (Transition Risks) includes Preferences, Climate policies, and Credit conditions. Group 3 (Life Cycle) includes ln(Assets), Parent firm, ln(Age), and Sales Growth. Group 4 (Debt capacity) includes Not rated, Leverage, and PPE / Assets. Group 5 (Cash Flow) includes Cash, EBITDA / Assets, and Dividend Payer. Group 6 (Economic Conditions) includes Industry Dummies and Region Dummies. Variable definitions are available in Table A2.

Appendix A

A Supplementary Tables

Table A1: Survey Questions

No.	Survey Question
(i)	What do the following climate-related issues mean for your company today? Select the appropriate answer from the drop-down list. (Answers: Very affected / Somewhat affected / Not affected) –Changes in client preferences –Changes in employee preferences –Carbon prices –Other climate policies –Changes in credit conditions at banks *Original question in Norwegian: Hva betyr følgende klimarelaterte forhold for deres bedrift i dag? Velg aktuelt svaralternativ fra nedtrekksliste.* *–Endrede preferanser hos kunder* *–Endrede preferanser hos arbeidstagere* *–Endrede kredittbetingelser hos bankene* *–Karbonpriser* *–Andre politikktiltak*
(ii)	What impact do climate-related issues have on your business? Select '1' for the relevant answer options. (Answers: multiple answers possible) –Need to invest in new technology –Need for new skills –Higher costs –Need to develop new products or markets –More competitiveness –Travel reduction –More difficult access to workers –Lower costs –Lower competitiveness –Easier access to labor *Original question in Norwegian: Hva fører klimarelaterte forhold til for din bedrift? Sett '1' for aktuelle svaralternativer.* *–Behov for ny kompetanse* *–Mer satsning på ny teknologi* *–Produktutvikling/ Vridning mot nye markeder* *–Redusert reiseaktivitet* *–Økt konkurransekraft*

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Table A1 – continued from previous page

No.	Survey Question
	–Redusert konkurransekraft *–Økte kostnader* *–Reduserte kostnader* *–Vanskeligere tilgang på arbeidskraft* *–Lettere tilgang på arbeidskraft*
(iii)	What type of investments are you planning over the next couple of years? Mark '1' for the relevant answer options. (Answers: multiple answers possible) –Reduction of carbon emissions –Development of "green" products and markets –Other (non-climate) investments *Original question in Norwegian: Hvilke type investeringer planlegger dere å gjennomføre i løpet av de neste par årene? Sett '1' for aktuelle svaralternativer.* *–Investeringer for å redusere egne klimagassutslipp* *–Investeringer knyttet til "grønne" markeder og produkter* *–Andre investeringer*
(iv)	How will [the above] investments develop if the interest rate is significantly lower than the company currently assumes? Select the appropriate answer from the drop-down list. (Answers: Increase / Equal / Decrease) –Reduction of carbon emissions –Development of "green" products and markets –Other (non-climate) investments *Original question in Norwegian: Hvordan vil ulike investeringer utvikle seg dersom renten blir betydelig lavere enn bedriften nå legger til grunn? Velg aktuelt svaralternativ fra nedtrekksliste.* *–Investeringer for å redusere egne klimagassutslipp* *–Investeringer knyttet til "grønne" markeder og produkter* *–Andre investeringer*
(v)	How will [the above] investments develop if the interest rate is significantly higher than the company currently assumes? Select the appropriate answer from the drop-down list. (Answers: Increase / Equal / Decrease) –Reduction of carbon emissions –Development of "green" products and markets –Other (non-climate) investments *Original question in Norwegian: Hvordan vil ulike investeringer utvikle seg dersom renten blir betydelig høyere enn bedriften nå legger til grunn? Velg aktuelt svaralternativ fra nedtrekksliste.* *–Investeringer for å redusere egne klimagassutslipp* *–Investeringer knyttet til "grønne" markeder og produkter* *–Andre investeringer*

Table A2: Variables Definition

Variable Name	Definition	Data Source
Dependent Variables		
Mitigation	Indicator variable containing a one if the firm is investing or plans to invest in emissions mitigation, and a zero otherwise. Deduced from answers to question (iii), see Table A1.	Regional Network Survey (RNS) Q2:2024
Green Products	Indicator variable containing a one if the firm is investing or plans to invest in the development of green products or markets, and a zero otherwise. Deduced from answers to question (iii), see Table A1.	RNS Q2:2024
Non-climate	Indicator variable containing a one if the firm is investing or plans to invest in non-climate investments, and a zero otherwise. Deduced from answers to question (iii), see Table A1.	RNS Q2:2024
$Sens(k)^+$	Indicator variable equal to one if the firm reports to decrease investments in technology k, for $k \in \{Mitigation, Green\ Products, Non\text{-}climate\}$, if interest rates were higher than today. Deduced from answers to question (iv), see Table A1.	RNS Q2:2024
$Sens(k)^-$	Indicator variable equal to one if the firm reports to increase investments in technology k, for $k \in \{Mitigation, Green\ Products, Non\text{-}climate\}$, if interest rates were lower than today. Deduced from answers to question (v), see Table A1.	RNS Q2:2024
$Diff(c)^+$	$Sens(c)^+ - Sens(Non\text{-}climate)^+$. It describes the relative sensitivity of technology c to non-climate investments under a higher interest rate regime. This variable can take on the three values $\{-1, 0, 1\}$, where a negative value implies that climate investments in technology c are less sensitive than non-climate investments, and a positive value implies that climate investments are more sensitive, respectively. $$Diff(c)^+ = \begin{cases} -1 & \text{if } Sens(c)^+ = 0 \wedge Sens(NC)^+ = 1 \\ 0 & \text{if } Sens(c)^+ = Sens(NC)^+ \\ 1 & \text{if } Sens(c)^+ = 1 \wedge Sens(NC)^+ = 0 \end{cases}$$	RNS Q2:2024

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Table A2 – continued from previous page

Variable Name	Definition	Data Source
Diff$(c)^-$	*Sens*$(c)^-$ − *Sens*(*Non-climate*)$^-$. It describes the relative sensitivity of technology c to non-climate investments under a lower interest rate regime. This variable can take on the three values $\{-1, 0, 1\}$, where a negative value implies that climate investments in technology c are less sensitive than non-climate investments, and a positive value implies that climate investments are more sensitive, respectively. $$\textit{Diff}(c)^- = \begin{cases} -1 & \text{if } \textit{Sens}(c)^- = 0 \wedge \textit{Sens}(NC)^- = 1 \\ 0 & \text{if } \textit{Sens}(c)^- = \textit{Sens}(NC)^- \\ 1 & \text{if } \textit{Sens}(c)^- = 1 \wedge \textit{Sens}(NC)^- = 0 \end{cases}$$	RNS Q2:2024
Firm financial characteristics		
ln(Assets)	Total assets of the firm on a logarithmic scale.	*Brønnøysund-registrene*
ln(Age)	Age since establishment of the firm on a logarithmic scale.	*Brønnøysund-registrene*
Leverage	*Total Debt / Total Assets*	*Brønnøysund-registrene*
EBITDA / Assets	Measures profitability as earnings before interest, taxes, depreciation, and amortization to total assets.	*Brønnøysund-registrene*
PPE / Assets	Property, plants, and equipment relative to total assets.	*Brønnøysund-registrene*
Cash	Cash holding by firm relative to its total assets.	*Brønnøysund-registrene*
Dividend Payer	Indicator variable equal to one if the firm pays dividends.	*Brønnøysund-registrene*
Sales Growth	Determining the percentage change of sales from 2022 to 2023.	*Brønnøysund-registrene*
Not Rated	Indicator variable equal to one if the firm is not rated by a credit agency.	*Brønnøysund-registrene*
Parent Firm	Indicator variable equal to one if the firm is the ultimate parent and is not a subsidiary of another firm.	*Brønnøysund-registrene*
Firm transition risk		
ln(Scope1)	Direct emissions from the firm's owned or controlled sources.	*Utslippsdatabase* Menon Economics

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Table A2 – continued from previous page

Variable Name	Definition	Data Source
Scope1 / Sales	Scope1 emissions intensity measured in terms of sales.	*Utslippsdatabase* Menon Economics and *Brønnøysund-registrene*
Scope1 / Assets	Scope1 emissions intensity measured in terms of total assets.	*Utslippsdatabase* Menon Economics and *Brønnøysund-registrene*
Client Preferences	Indicator variable equal to one if the firm answers that it is somewhat or very affected by changes in client preferences. Deduced from answers to question (i), see Table A1.	RNS Q2:2024
Employee Preferences	Indicator variable equal to one if the firm answers that it is somewhat or very affected by changes in employee preferences. Deduced from answers to question (i), see Table A1.	RNS Q2:2024
Preferences	Indicator variable equal to one if the firm is either affected by *Employee Preferences* or *Client Preferences*. Deduced from answers to question (i), see Table A1.	RNS Q2:2024
Carbon Pricing	Indicator variable equal to one if the firm answers that it is somewhat or very affected by carbon pricing. Deduced from answers to question (i), see Table A1.	RNS Q2:2024
Other Climate Policies	Indicator variable equal to one if the firm answers that it is somewhat or very affected by other (non-carbon pricing) climate policies. Deduced from answers to question (i), see Table A1.	RNS Q2:2024
Climate Policies	Indicator variable equal to one if the firm is either affected by *Carbon Pricing* or *Other Climate Policies*. Deduced from answers to question (i), see Table A1.	RNS Q2:2024
Credit Conditions	Indicator variable equal to one if the firm answers that it is somewhat or very affected by changes in credit conditions. Deduced from answers to question (i), see Table A1.	RNS Q2:2024

Table A3: Industrial Composition

Sector	**All Firms**	**Sample Firms**
Agriculture	0.013	0.099
Mining	0.086	0.031
Manufacturing	0.040	0.086
Construction	0.030	0.032
Commerce	0.033	0.040
Transportation	0.028	0.044
Services	0.033	0.228
Finance	0.562	0.323
Other	0.138	0.116

Notes: This table compares the industrial composition between the universe of firms in Norway and the 296 firms surveyed for the Regional Network Survey in Q2:2024, which are included in our final sample. The statistics shown are the weighted total assets of firms in the sample.

Table A4: Summary Statistics Entire Norwegian Sample

	N	Mean	SD	p10	p50	p90
Assets (in 1000 NOK)	354005	25570.763	94139.505	67.000	2550.000	39595.000
ln(Assets)	347305	7.759	2.420	4.575	7.897	10.612
Sales	354005	8722.248	31497.968	0.000	153.000	15625.000
Age	332810	14.096	14.727	2.000	10.000	31.000
ln(Age)	332810	2.193	1.006	0.693	2.303	3.434
Scope 1 Emissions	354002	17.202	78.699	0.000	0.289	19.751
Leverage	347785	0.997	2.581	0.008	0.583	1.271
EBITDA / Assets	347785	-0.027	0.636	-0.250	0.017	0.352
PPE / Assets	347785	0.220	0.334	0.000	0.009	0.879
Cash	347785	0.303	0.332	0.001	0.156	0.901
(d.PPE + Depr) / Assets	338564	0.025	0.116	0.000	0.000	0.084
R&D + Patents / Assets	347785	0.005	0.039	0.000	0.000	0.000
Z-Score	347785	0.969	5.057	-0.757	0.988	4.553
Sales Growth	200125	0.404	2.166	-0.790	0.034	0.998
Has R&D or Patents	354006	0.042	0.200	0.000	0.000	0.000
Dividend Payer	354005	0.134	0.341	0.000	0.000	1.000
Parent firm	354005	0.012	0.110	0.000	0.000	0.000

Notes: This table presents summary statistics for firm characteristics of the entire Norwegian sample extracted from the *Brønnøysundregistrene*.

Table A5: Investment Technologies

Descriptive statistics			
	N	Mean	SD
Emissions Mitigation	296	0.453	0.499
Green Products	296	0.385	0.487
Non-Climate	296	0.486	0.501

Tetrachoric correlations			
	Mitigation	Green Innovation	Non-climate
Emissions Mitigation	1.000		
Green Products	0.496*	1.000	
Non-Climate	0.352*	0.144	1.000

Notes: The table presents the basic characteristics of the three investment technologies—mitigation, green innovation, and non-climate—and the tetrachoric correlations among them.

Table A6: Determinants of Investments

	(1) Mitigation	(2) Mitigation	(3) Mitigation	(4) Products	(5) Products	(6) Products	(7) Non-climate	(8) Non-climate	(9) Non-climate
Panel A: Emissions Variables									
ln(Assets) (std)	0.057	0.086***	0.090***	-0.010	0.040	0.044	0.064*	0.070**	0.072**
	(0.038)	(0.033)	(0.033)	(0.037)	(0.032)	(0.033)	(0.038)	(0.033)	(0.034)
ln(Age) (std)	0.024	0.023	0.023	0.003	0.003	0.003	0.004	0.004	0.003
	(0.035)	(0.035)	(0.035)	(0.035)	(0.034)	(0.035)	(0.036)	(0.036)	(0.036)
Parent firm	0.125	0.095	0.106	0.054	0.005	0.018	-0.112	-0.119	-0.116
	(0.079)	(0.077)	(0.078)	(0.076)	(0.075)	(0.075)	(0.090)	(0.088)	(0.088)
Not rated	-0.033	-0.040	-0.046	-0.037	-0.050	-0.056	0.069	0.067	0.065
	(0.087)	(0.087)	(0.087)	(0.086)	(0.084)	(0.084)	(0.092)	(0.093)	(0.093)
Leverage (std)	-0.004	0.005	0.003	-0.019	-0.002	-0.005	-0.048	-0.046	-0.047
	(0.031)	(0.029)	(0.029)	(0.030)	(0.028)	(0.028)	(0.032)	(0.032)	(0.032)
EBITDA / Assets (std)	-0.014	-0.009	-0.009	-0.016	-0.005	-0.005	0.047	0.048	0.047
	(0.033)	(0.032)	(0.032)	(0.030)	(0.029)	(0.029)	(0.031)	(0.031)	(0.031)
PPE / Assets (std)	0.080**	0.073**	0.075**	0.003	-0.004	0.001	0.026	0.025	0.024
	(0.031)	(0.031)	(0.031)	(0.032)	(0.033)	(0.032)	(0.031)	(0.031)	(0.030)
Cash (std)	-0.035	-0.034	-0.035	-0.062**	-0.061**	-0.062**	0.027	0.027	0.027
	(0.033)	(0.033)	(0.033)	(0.031)	(0.031)	(0.031)	(0.032)	(0.032)	(0.032)
Dividend Payer	0.112*	0.103*	0.106*	0.062	0.048	0.051	-0.053	-0.055	-0.055
	(0.059)	(0.059)	(0.059)	(0.061)	(0.061)	(0.062)	(0.064)	(0.064)	(0.064)
Sales Growth (std)	-0.009	-0.013	-0.013	0.073**	0.065**	0.064**	-0.026	-0.027	-0.027
	(0.026)	(0.025)	(0.025)	(0.029)	(0.030)	(0.030)	(0.029)	(0.029)	(0.029)
Building and construction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Manufacturing	-0.039	-0.065	-0.064	-0.021	-0.065	-0.063	0.338***	0.333***	0.333***
	(0.103)	(0.102)	(0.102)	(0.107)	(0.106)	(0.106)	(0.091)	(0.091)	(0.091)
Oil supply	0.014	-0.019	-0.008	0.273**	0.225*	0.242*	0.321**	0.313*	0.315*
	(0.148)	(0.150)	(0.152)	(0.139)	(0.137)	(0.137)	(0.162)	(0.163)	(0.165)
Services	-0.210**	-0.252***	-0.249***	-0.070	-0.154	-0.155	0.175*	0.166*	0.168*
	(0.104)	(0.095)	(0.095)	(0.103)	(0.096)	(0.097)	(0.101)	(0.094)	(0.094)
Retail	-0.233**	-0.234**	-0.233**	-0.133	-0.151	-0.157	0.205**	0.205**	0.207**
	(0.112)	(0.110)	(0.109)	(0.110)	(0.110)	(0.110)	(0.100)	(0.099)	(0.099)
Innland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Midt	0.060	0.062	0.048	-0.164	-0.155	-0.169	0.018	0.018	0.013
	(0.125)	(0.122)	(0.123)	(0.130)	(0.128)	(0.129)	(0.117)	(0.118)	(0.118)
Nord	-0.046	-0.046	-0.053	-0.202*	-0.203*	-0.211*	-0.301***	-0.301***	-0.303***
	(0.108)	(0.107)	(0.107)	(0.114)	(0.114)	(0.114)	(0.111)	(0.112)	(0.111)
Nordvest	-0.234**	-0.234**	-0.239**	-0.194*	-0.191*	-0.193*	-0.316**	-0.316**	-0.318**
	(0.106)	(0.104)	(0.105)	(0.116)	(0.112)	(0.113)	(0.124)	(0.125)	(0.124)
Sør	-0.241**	-0.246**	-0.257**	-0.377***	-0.379***	-0.388***	-0.237*	-0.238*	-0.242*
	(0.116)	(0.117)	(0.117)	(0.117)	(0.117)	(0.118)	(0.134)	(0.136)	(0.136)
Sørvest	-0.019	-0.014	-0.032	-0.133	-0.126	-0.146	-0.251**	-0.250**	-0.255**
	(0.109)	(0.107)	(0.108)	(0.122)	(0.123)	(0.123)	(0.117)	(0.117)	(0.117)
Øst	0.009	0.020	0.009	-0.030	-0.013	-0.025	-0.170	-0.168	-0.171
	(0.108)	(0.107)	(0.108)	(0.114)	(0.110)	(0.111)	(0.113)	(0.114)	(0.113)
Ln(Emissions)	0.055			0.099**			0.012		
	(0.037)			(0.039)			(0.042)		
Emissions/Sales		0.063**			0.081***			0.014	
		(0.028)			(0.030)			(0.031)	
Emissions/Assets			0.065**			0.069**			0.020
			(0.029)			(0.030)			(0.031)
Observations	296	296	296	296	296	296	296	296	296
R^2	0.223	0.231	0.233	0.167	0.170	0.165	0.155	0.156	0.157
Panel B: Transition Risk Variables									
ln(Assets) (std)	0.075**	0.075**	0.074**	0.028	0.028	0.023	0.064*	0.067**	0.066*
	(0.034)	(0.034)	(0.035)	(0.033)	(0.033)	(0.032)	(0.034)	(0.034)	(0.034)

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	(1) Mitigation	(2) Mitigation	(3) Mitigation	(4) Products	(5) Products	(6) Products	(7) Non-climate	(8) Non-climate	(9) Non-climate
ln(Age) (std)	0.023	0.017	0.026	0.002	-0.004	0.007	0.002	0.001	0.005
	(0.034)	(0.035)	(0.035)	(0.035)	(0.035)	(0.034)	(0.036)	(0.036)	(0.036)
Parent firm	0.117	0.126	0.081	0.031	0.042	-0.019	-0.108	-0.108	-0.127
	(0.079)	(0.078)	(0.076)	(0.075)	(0.075)	(0.072)	(0.088)	(0.088)	(0.087)
Not rated	-0.057	-0.062	-0.032	-0.069	-0.074	-0.037	0.055	0.058	0.071
	(0.088)	(0.086)	(0.086)	(0.086)	(0.084)	(0.083)	(0.093)	(0.093)	(0.092)
Leverage (std)	0.008	0.011	0.002	0.001	0.004	-0.006	-0.044	-0.044	-0.047
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.032)	(0.032)	(0.032)
EBITDA / Assets (std)	-0.006	-0.002	-0.007	-0.002	0.002	-0.004	0.048	0.050	0.048
	(0.032)	(0.032)	(0.032)	(0.029)	(0.029)	(0.029)	(0.031)	(0.031)	(0.031)
PPE / Assets (std)	0.083***	0.073**	0.073**	0.010	-0.002	-0.005	0.027	0.023	0.022
	(0.031)	(0.031)	(0.030)	(0.032)	(0.033)	(0.032)	(0.031)	(0.031)	(0.030)
Cash (std)	-0.033	-0.033	-0.028	-0.060**	-0.060**	-0.052*	0.028	0.028	0.030
	(0.032)	(0.033)	(0.033)	(0.031)	(0.030)	(0.030)	(0.032)	(0.032)	(0.032)
Dividend Payer	0.100*	0.107*	0.100*	0.044	0.052	0.042	-0.059	-0.054	-0.058
	(0.058)	(0.058)	(0.059)	(0.062)	(0.062)	(0.061)	(0.063)	(0.064)	(0.064)
Sales Growth (std)	-0.012	-0.020	-0.016	0.065**	0.056*	0.061**	-0.026	-0.030	-0.028
	(0.026)	(0.025)	(0.025)	(0.029)	(0.029)	(0.030)	(0.028)	(0.029)	(0.029)
Building and construction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Manufacturing	-0.034	-0.047	-0.010	-0.028	-0.044	0.017	0.352***	0.339***	0.357***
	(0.103)	(0.102)	(0.105)	(0.108)	(0.105)	(0.105)	(0.093)	(0.090)	(0.094)
Oil supply	0.009	0.014	-0.015	0.260*	0.266*	0.226	0.322**	0.322**	0.310*
	(0.149)	(0.153)	(0.150)	(0.146)	(0.148)	(0.145)	(0.163)	(0.161)	(0.165)
Services	-0.250***	-0.237**	-0.217**	-0.153	-0.139	-0.097	0.175*	0.174*	0.186**
	(0.096)	(0.098)	(0.100)	(0.098)	(0.098)	(0.095)	(0.095)	(0.094)	(0.095)
Retail	-0.234**	-0.245**	-0.219**	-0.154	-0.168	-0.121	0.218**	0.205**	0.219**
	(0.111)	(0.109)	(0.111)	(0.110)	(0.108)	(0.107)	(0.100)	(0.098)	(0.100)
Innland	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Midt	0.077	0.057	0.110	-0.138	-0.161	-0.085	0.025	0.015	0.039
	(0.124)	(0.125)	(0.121)	(0.131)	(0.133)	(0.134)	(0.118)	(0.117)	(0.119)
Nord	-0.036	-0.009	-0.016	-0.192*	-0.162	-0.157	-0.293***	-0.286**	-0.286**
	(0.112)	(0.112)	(0.110)	(0.115)	(0.117)	(0.111)	(0.112)	(0.113)	(0.112)
Nordvest	-0.191*	-0.226**	-0.210*	-0.139	-0.180	-0.154	-0.291**	-0.315**	-0.307**
	(0.109)	(0.108)	(0.108)	(0.118)	(0.116)	(0.113)	(0.126)	(0.124)	(0.125)
Sør	-0.192	-0.216*	-0.206*	-0.314***	-0.343***	-0.321***	-0.208	-0.229*	-0.222*
	(0.120)	(0.119)	(0.116)	(0.120)	(0.119)	(0.116)	(0.136)	(0.134)	(0.134)
Sørvest	-0.019	-0.019	-0.005	-0.132	-0.133	-0.111	-0.250**	-0.251**	-0.244**
	(0.110)	(0.112)	(0.108)	(0.123)	(0.123)	(0.118)	(0.117)	(0.117)	(0.116)
Øst	0.023	0.022	0.051	-0.010	-0.012	0.035	-0.164	-0.166	-0.152
	(0.110)	(0.111)	(0.110)	(0.111)	(0.111)	(0.107)	(0.113)	(0.113)	(0.115)
Affected by changing preferences	0.149**			0.175**			0.100		
	(0.069)			(0.070)			(0.081)		
Affected by any climate policy		0.134**			0.153**			0.052	
		(0.062)			(0.068)			(0.069)	
Credit conditions			0.154**			0.233***			0.072
			(0.069)			(0.063)			(0.063)
Observations	296	296	296	296	296	296	296	296	296
R^2	0.227	0.228	0.234	0.161	0.161	0.189	0.160	0.157	0.159

Notes: The table reports OLS results for the regression, $Invest(k)_i = \beta_1 X_i + \beta_2 z_i + \eta_{s(i)} + \nu_{r(i)} + \varepsilon_i$, where Invest$(k)_i$ is an indicator equal to one if firm i reports plans to invest in technology k, for $k \in \{$*Mitigation* (columns 1–3), *Products* (columns

4–6), *Non-climate* (columns 7–9)}. Variable z_i varies across the different columns and panels and represents different measures of carbon emissions (Panel A) or transition risk factors (Panel B). All panels include a set of firm financial characteristics, X_i; coefficients for these variables are only reported in Panel A. All specifications include region fixed effects, $\eta_{s(i)}$, and industry fixed effects, $\nu_{r(i)}$ (coefficients not reported). Variable definitions are available in Table A2. Standard errors, based on 1,000 bootstrap iterations, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix B

B Transition risks in firms' investment decisions

B.1 Importance of transition risks

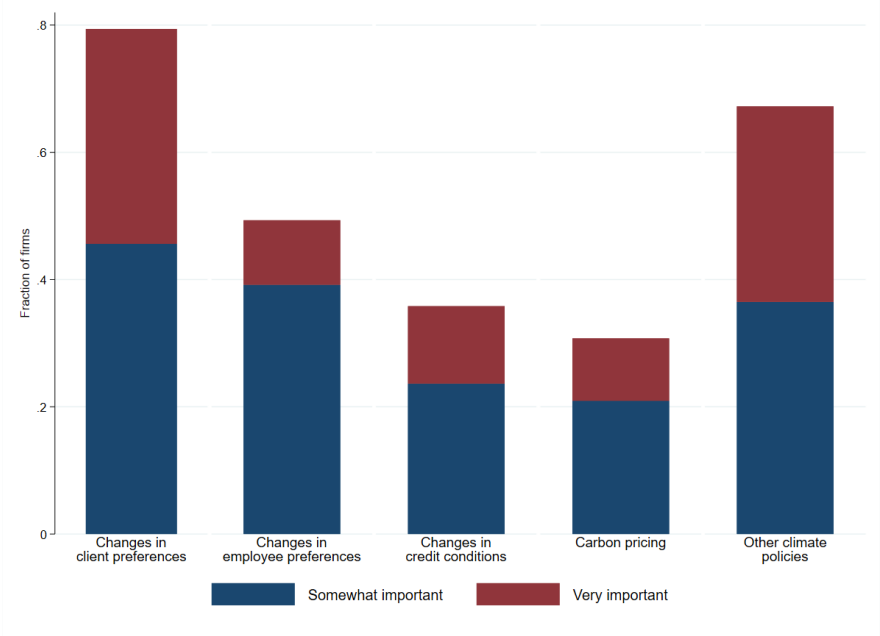
To assess firms' exposure to climate risks, we examine the perceived importance of different transition risk channels for current business operations. Understanding these perceptions sheds light on whether and how firms view climate transition risks as material today.

Figure B1 reports the share of firms rating various transition risks as somewhat or very important. We classify these into three channels: (i) market-driven factors (e.g., client or employee preferences), (ii) regulatory risks (e.g., carbon pricing, other climate policies), and (iii) financial risks (e.g., credit conditions). The most salient concern is a shift in client preferences, cited by 80% of firms, while employee preferences are cited by around 50%. About 70% also point to non-price regulatory changes. In contrast, only 30% of firms view carbon pricing as important. A third of firms report climate-related changes in access to credit.

These findings indicate that transition risks, particularly market-based and regulatory, are currently more salient than financial risks. The limited importance of carbon pricing is notable, especially given Norway's long-standing carbon tax and participation in the EU ETS. This may reflect firm-level adaptation over time, sectoral differences in exposure, or perceived policy stability that reduces uncertainty. Despite ranking lower, the fact that credit access is already affected by climate factors for a meaningful share of firms suggests the early emergence of financial transmission channels.

Overall, Norwegian firms widely recognize transition risks, with client preferences and non-price policies perceived as the most immediate and material.

Figure B1: Importance of transition risks



Notes: This graph displays the answers to the question "How important are the following climate-related issues for your business today?". Potential answers where not important (numerically corresponding to 0), somewhat important (numerically corresponding to 1), and very important (numerically corresponding to 2).

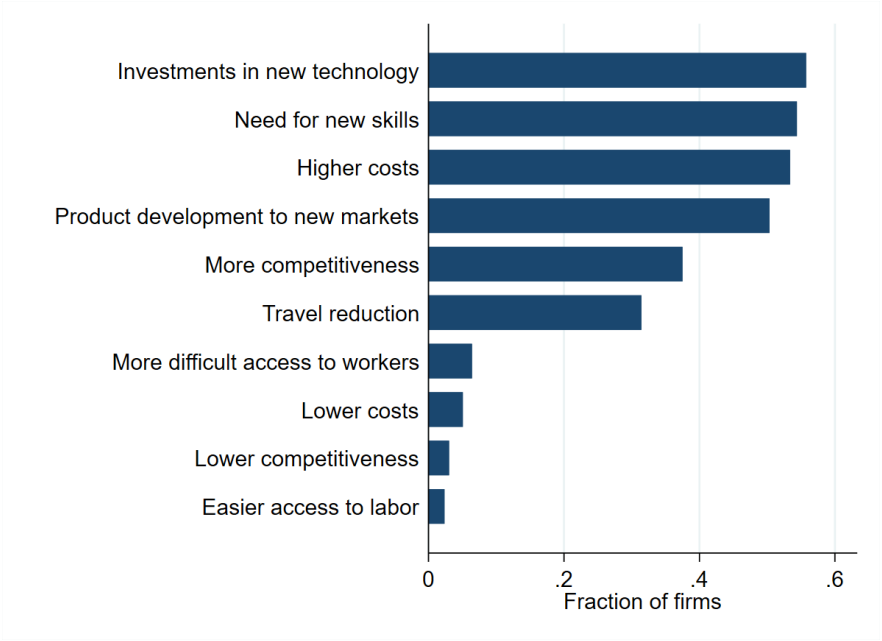
B.2 Transition risks in business operations

While firms broadly view climate concerns as important, we next examine how these translate into concrete business challenges and strategic responses.

To assess this, we asked firms which climate-related issues they currently face, such as rising costs, skill gaps, technological needs, and shifting market demands. Figure B2 shows the responses. On the input margin firms state to require both capital upgrades and workforce adaptation. 55–60% of firms report the need to invest in new technology, acquire new skills, and manage higher costs.

Furthermore, product development emerges as a key response, suggesting that climate change is reshaping demand or creating new market opportunities. Less frequently cited, but still notable, are increased competitive pressure and reduced travel, pointing to shifts in market positioning and operational practices.

Figure B2: Transition risks in business operations



Notes: This graph displays the answers to the question "Which of the following climate-related issues apply to your business?" Multiple selections were possible.

The results suggest that firms are adapting through reallocation of inputs, upskilling, and innovation. The transition appears capital- and knowledge-intensive, which can have implications for heterogeneity in firms' adjustment capacity.

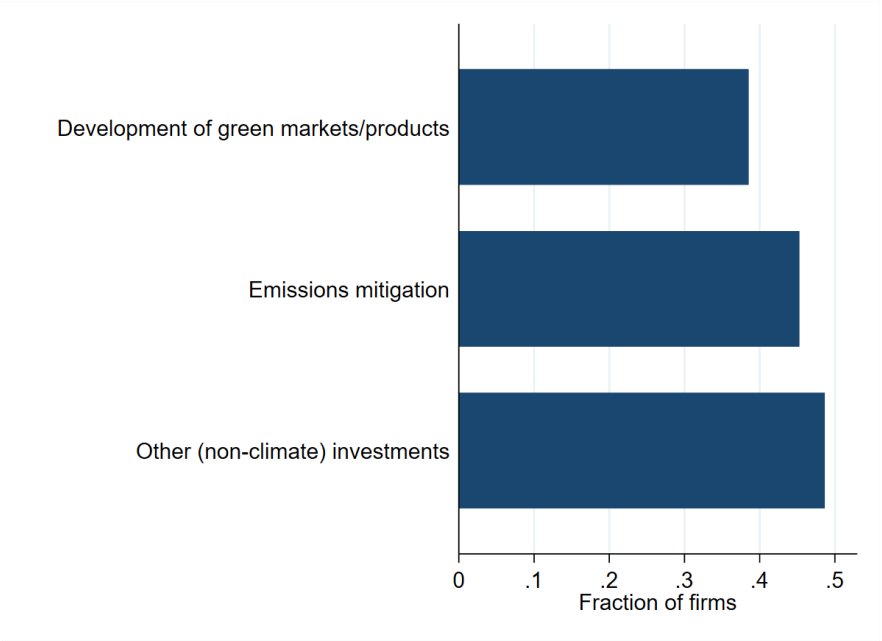
B.3 Investment plans for climate and non-climate investments

While earlier sections focused on current exposures and operational responses, investment plans offer a more direct measure of how firms internalize climate risks in capital allocation. Therefore, we asked firms whether they plan to invest in areas directly related to climate mitigation and green product development. This question is economically relevant as investment behavior reflects expectations about future costs, returns, and regulation. If firms anticipate persistent policy pressure or changing demand conditions, we would expect them to reallocate capital towards climate investments.

Figure B3 shows the share of firms planning investments across different categories. The

results suggest that climate-related investments are now as common as conventional capital expenditures. Close to 50% of the firms report plans for non-climate-related investments, and 46% indicate forthcoming investments aimed at mitigating carbon emissions. In addition, 38% plan to develop green products or enter green markets, suggesting that a substantial portion of firms see business opportunities in the climate transition.

Figure B3: Planned investments



Notes: This graph displays the answers to the question "Which types of investments are you planning over the next couple of years?". Multiple selections were possible.

B.4 Monetary policy and climate investments

Figure B4 examines how firms expect their investment plans to respond to changes in interest rates, distinguishing between general (non-climate), green, and emissions-reducing investments. Panels (a) and (b) report the distribution of responses to scenarios in which interest rates are significantly lower or higher than currently assumed, respectively.

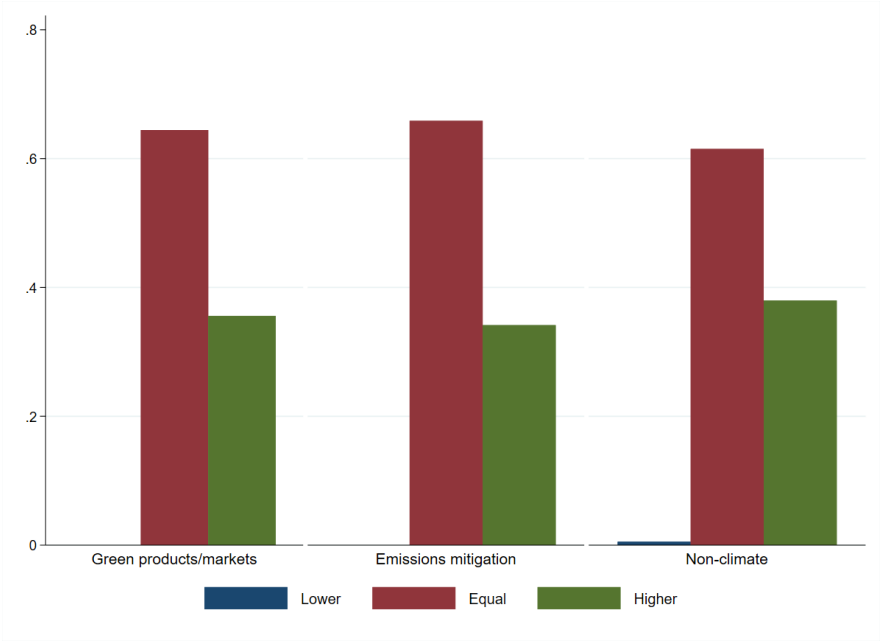
In the case of lower interest rates (Panel a), approximately one-third of firms indicate that they would increase investment, with the remaining majority maintaining current plans.

This response pattern is broadly consistent across investment types. Notably, a slightly higher share of firms report increasing non-climate investments compared to climate-related ones.

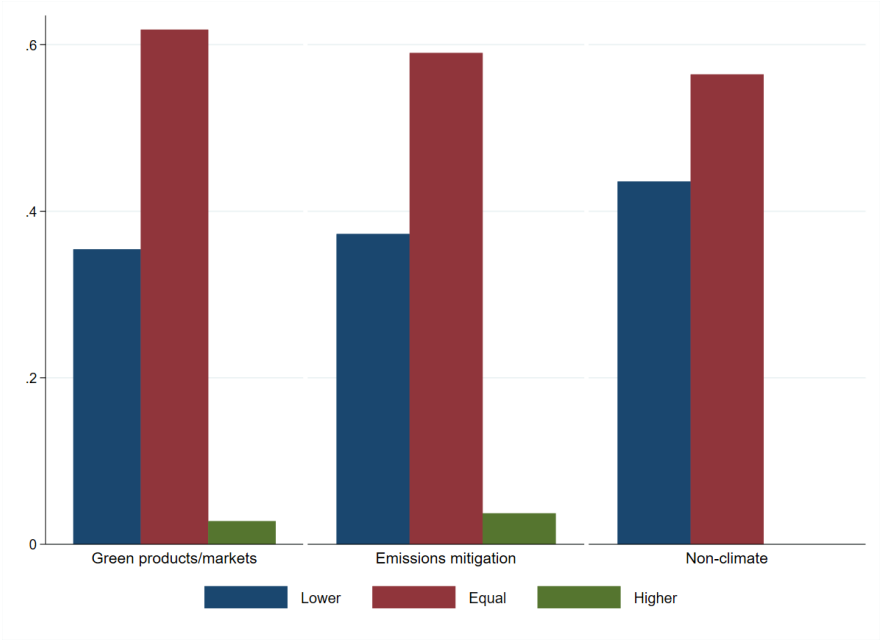
In response to higher interest rates (Panel b), the pattern reverses. Around 60% of firms report no change in investment plans for green products and emissions mitigation, while roughly 45% expect to reduce investment. The corresponding share of firms reporting reductions is slightly higher for non-climate investment.

This reveals two key observations. First, on average, firms exhibit asymmetric sensitivity to monetary policy: a notable share would increase investment under lower interest rates, while fewer would cut back under higher rates. Second, climate-related investments respond similarly to non-climate investments, though they appear slightly less sensitive on average.

Figure B4: Change in investment plans to lower and higher interest rates



(a) Lower interest rates



(b) Higher interest rates

Notes: This graph displays the fraction of firms answered lower, equal, or higher to the question "How will investments develop if the interest rate is significantly lower than the company currently assumes" in panel a) and "How will investments develop if the interest rate is significantly lower than the company currently assumes" in panel b). The question has been asked individually for investments in adaptation, general green investments, investments targeted at emission reduction, and other (non-climate-related) investments.