# The Ratchet Effect of Climate Investments*

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**Abstract**

Does monetary policy accelerate or hinder the green transition? We address this question using novel investment-level data on climate and non-climate projects by Norwegian firms, overcoming the limitations of prior studies that rely on financial proxies by observing real investment choices. We find that high-emission firms and those most exposed to transition risk are the most active in emissions mitigation and green product development. These climate investments display a ratchet effect: they increase under lower interest rates but remain resilient under higher interest rates, relative to non-climate investments. In contrast, adaptation investments, undertaken by firms with substantial physical capital and exposure to physical climate risks, do not respond differently from non-climate investments. These dynamics reveal that monetary policy not only affects overall firm investment but also influences firms' investment composition and the pace of the low-carbon transition.

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# 1 Introduction

Does conventional monetary policy accelerate or hinder the transition to a low-carbon economy? This question demands attention because interest rates fundamentally shape the cost of capital, and the green transition is, above all, an investment challenge. A growing empirical literature has begun to examine this link, documenting that monetary tightening disproportionately impacts high-emission firms relative to low-emission ones (Altavilla, Boucinha, Pagano, and Polo, 2023, Bauer, Offner, and Rudebusch, 2025, Benchora, Leroy, and Raffestin, 2025, Döttling and Lam, 2024, Patozi, 2023). However, these studies rely on indirect proxies, such as equity prices and credit spreads, which reflect investor or lender expectations, not firms' actual investment decisions.

As a result, interpretations diverge. Some studies interpret the stronger impact on high-emission firms as evidence that monetary tightening accelerates or at least doesn't hinder the transition by increasing the costs of capital of high-emission firms (Altavilla et al., 2023, Bauer et al., 2025, Patozi, 2023). Others reach the opposite conclusion: if high-emission firms reduce emissions more rapidly than low-emission firms, tightening could slow the pace of decarbonization (Döttling and Lam, 2024). These conflicting views stem from a second, deeper limitation: existing work does not observe whether firms are actually investing in climate-related projects. Without direct measures of climate investment, we cannot know whether monetary policy alters the composition of capital expenditure in ways that support or hinder the climate transition.

In this paper, we move beyond these constraints by using direct, investment-level data on firms' climate investments. This granularity allows us to ask two key questions: Which firms undertake climate investments? And how do monetary policy shocks influence the allocation of capital between climate and non-climate projects within firms?

We leverage survey responses from a sample of Norwegian firms, combined with information from their financial statements and their carbon 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 public and private firms whether they plan to undertake climate or traditional (non-climate) investments. For the climate investments, we distinguish between investments that reduce emissions ("mitigation"), the development of green markets and products (i.e., "green products"), and those that increase resilience to physical climate risks (i.e., "adaptation"). Importantly, we ask firms whether and how 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 changes.

Our analysis uncovers several interesting patterns. First, we find that different types of firms tend to make distinct types of climate investments. Firms that engage in emissions mitigation tend to be large and well-established, with high levels of emissions and significant exposure to transition risks. By contrast, firms investing in green product development are typically in the growth phase of their life cycle and are facing transition risks. Finally, adaptation investments, which aim at protecting operations from extreme climate hazards, are most common among large firms with substantial physical assets and direct exposure to physical climate risks. The overarching takeaway is that firms act upon the risks they are most exposed to. In particular, the most polluting firms are more likely to invest in the cleanest technologies. These distinctions matter, as they suggest that firms investing in climate can be differently exposed to several channels of monetary policy transmission, which we discuss through a simple conceptual framework.

Second, we uncover two channels through which monetary policy transmits differently

to climate investments relative to non-climate investments within a firm. We first find that climate investments, particularly mitigation and green product development, respond asymmetrically to monetary shocks. When interest rates decrease, firms exposed to climate-related preferences or with high emissions disproportionately increase climate investment relative to non-climate investment. Under higher rates, however, these same firms do not scale back climate investment more than non-climate investments. This asymmetry suggests that climate investments are perceived less as risky and more as strategic hedges against transition risk. Hence, mitigation and product investments are less exposed to the risk-taking channel of monetary policy. In contrast, adaptation investments do not exhibit systematic reallocation in response to monetary policy shocks. A key implication of this asymmetry is the emergence of a ratchet effect: climate investment relatively increases during monetary easing but remains sticky during monetary tightening. Hence, climate investment appears less procyclical and more resilient to tightening. Consequently, conventional monetary policy can influence not just the level of investment, but also its allocation toward climate-related projects for firms that are most exposed to transition risks.

Furthermore, we find that financial frictions play a central role in shaping the investment dynamics between mitigation and non-climate investments. Financially constrained firms, especially smaller firms, cut mitigation investment disproportionately under higher interest rates and expand it under monetary easing. These symmetric responses are consistent with the balance-sheet channel of monetary policy. This implies that conventional monetary policy has distributional effects on firms: while smaller firms may contribute less to aggregate emissions, they risk being disproportionately disadvantaged as larger firms shift away from legacy technologies.

Together, these results reveal that climate investments are not only concentrated among the most exposed firms but also display distinct monetary transmission patterns. This implies that monetary policy can alter firm investment decisions and thus shape their investment

mix.

**Related Literature** This paper contributes to three strands of the literature. First, 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). Furthermore, while Aghion, Bergeaud, De Ridder, and Van Reenen (2024) find that monetary tightening reduces green patenting activity, Känzig, Konradt, Wang, and Zhang (2025) report the opposite effect. 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 findings on the differential monetary policy transmission to climate and non-climate investments suggest 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 firms with high carbon emissions, and thus helps in the design of the most relevant policies required to ensure compliance with climate commitments.

Second, our paper contributes to an emerging strand of the literature, which highlights how financial constraints affect the green transition. Fang, Hsu, and Tsou (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, Martin, Muûls, and Schweiger (2025) and Accetturo et al. (2025) show

evidence that financial constraints can hinder the investment in green technologies. Bartram, Hou, and Kim (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 mitigation 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, Ferreira, Froemel, and Surico (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 exposure to transition risks jointly determine which firms accelerate or delay the green transition.

Third, our findings provide a unique view into firms' investments in climate adaptation. There exists accumulating evidence that physical climate risks are increasingly priced in financial markets (e.g., Baldauf, Garlappi, and Yannelis, 2020, Pankratz, Bauer, and Derwall, 2023, Kruttli, Tran, and Watugala, 2025). However, less is known about how firms make real adaptation decisions. A growing body of work shows indirect evidence of adaptation through various channels such as the reallocation and diversification of production sites (e.g., Linnenluecke, Stathakis, and Griffiths, 2011, Khanna, Liang, Mobarak, and Song, 2025), automation (Custodio, Ferreira, Garcia-Appendini, and Lam, 2025) or supply-chain adjustments in response to climate shocks (Pankratz and Schiller, 2024). Furthermore, Rajan and Ramcharan (2023) emphasize the importance of access to finance for enabling firm-level adaptation investments (for a comprehensive review of firm adaptation strategies, see Grover and Kahn, 2024). We contribute to this literature by analyzing firms' actual investments in adaptation and showing that large firms with substantive physical capital and exposure to physical climate risks are more likely to invest in adaptation. We find that adaptation investments do not react differently to changes in monetary policy relative to non-climate investments.

# 2 Conceptual Framework

Conventional monetary policy could have uneven effects on climate and non-climate investments through several different and non-mutually exclusive channels. To formalize this idea, we 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 climate or non-climate investments to the extent that these investments differ in terms of the structure of their cash flows ($g$), their upfront investments $I$, or their discount rates $r$. Several characteristics of climate investments imply that they do in fact differ from other types of investments in ways that matter for monetary policy transmission.

**Interest-rate channel** Climate investments may be more exposed to the textbook *interest rate channel* of monetary policy transmission. Climate investments often have higher growth rates $g$ than many other types of investments, leading to payoffs over longer horizons. These characteristics imply that climate investments often have more back-loaded cash flows and longer durations than non-climate investments (Allcott and Greenstone, 2012, Fowlie, Greenstone, and Wolfram, 2018).[1] 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 the investment value with respect to the interest rate is given by

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

[1]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.

implying that valuation is convex in the discount rate. Therefore, for climate ($c$) and non-climate ($n$) investments:

$$\frac{\partial V^c}{\partial r} = -\frac{C_0}{(r-g_c)^2} < -\frac{C_0}{(r-g_n)^2} = \frac{\partial V^n}{\partial r} \quad \text{whenever } g_c > g_n.$$

This implies that climate investments are more sensitive to the interest rate in percentage terms as long as their growth rate is higher than that of non-climate investments.

**Balance-sheet channel** Climate 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 climate 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 could disproportionately raise their funding costs and affect their credit availability, while non-climate 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).

**Risk-taking channel** Climate 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).

We first consider emissions-reducing investments and the development of green products. These types of climate investments could be more or less exposed to this channel depending on investors' risk preferences. The presence of policy uncertainty and technological risk means that these investments often carry higher risk premia and may be seen by investors as riskier than conventional investments (Gulen and Ion, 2016, Julio and Yook, 2012, Wang,

Wurgler, and Zhang, 2023). In this context, the risk-taking channel could amplify investment in green technologies during periods of monetary easing, as investors become more willing to fund long-duration, high-risk projects. Under monetary tightening, investors could shy away. Consequently, these investments would be more exposed to the risk-taking channel than non-climate investments.

However, these climate investments may also be perceived as safer than non-climate investments over the long run, particularly because they avoid exposure to carbon regulation or stranded asset risks (Kung and Schmid, 2015, Kogan, Papanikolaou, Seru, and Stoffman, 2017). One can argue that climate investments are less exposed to the risk-taking channel, as they do not carry the transition risks of carbon-intensive 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, 2021a, 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 climate investments could be less affected by the risk-taking channel of monetary policy. This creates ambiguity in the expected exposure of mitigation and green innovation investments to the risk-taking channel, making it ultimately an empirical question.

In particular, adaptation investments, such as flood protection, heat resilience, or climate-proofing infrastructure, have a particular structure and purpose. These projects are designed to reduce losses when climate shocks occur. Their value comes from limiting damage in bad states of the world, much like insurance. This mechanism operates in two key ways: first, adaptation directly shields physical assets from damage. Second, it safeguards the firm against losses arising from production disruptions. Recent work by Giglio, Maggiori, Rao, Stroebel, and Weber (2021b) shows that assets with long-term, risk-reducing payoffs are valued using lower discount rates. This reinforces the idea that climate risk protection carries

a lower risk premium. This suggests that adaptation investments are less exposed to the risk-taking channel of monetary policy.

Finally, different types of climate investments have different cash flow characteristics and can be undertaken by firms at different moments of their life cycle. Thus, they can be exposed 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.[2]

Our core data source originates from firm responses to a special questionnaire for firms in 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. The survey's credibility is grounded in its strong institutional reputation and its consistent, high-quality methodology. Moreover, because firms are repeatedly surveyed in the same quarter each year, they face strong reputational incentives to respond truthfully rather than exaggerate their sensitivity to interest rates.

We collected the survey data with two waves of the RNS. In the Q2:2024 RNS wave, 340 firms were interviewed between April 29 and May 31, 2024. In the Q3:2025 RNS wave, 330 firms were interviewed between August 4 and August 28, 2025. The firms interviewed differ in the waves across the different quarters, but typically remain the same year on year. Thus, the

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

sample comprises a total of 670 firms interviewed in the two waves.[3] During these quarters, the special topic focused on the sensitivity of climate and non-climate investments to changes in interest rates.[4] 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 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 follow-

[3] 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/) and between Q4:2024 and Q3:2025 in the RNS report 03/2025 (https://www.norges-bank.no/en/news-events/publications/Regional-network-reports/2025/3-2025/web-report-3-2025/).

[4] The monetary policy rate was 4.5% during the Q2:2024 interview period, following a period of monetary policy tightening due to the post-pandemic surge in inflation. The interest remained at 4.5% until it was reduced to 4.25% on June 23, 2025. During the Q3:2025 interview period, the policy rate remained at 4.25%.

ing 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 total 670 surveyed firms, we are able to match 596 firms to non-missing financial statements. We use financial characteristics as of the end of fiscal year 2023 for the Q2:2024 RNS firms and as of the end of fiscal year 2024 for the Q3:2025 RNS firms. 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 596 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 manufacturing, mining, and services, and a smaller representation of the financial and utilities 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 90% of our sample firms are drawn from the top 16% 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 key questions:

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

(ii) 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:

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

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 $\eta_{s(i)}$, region fixed effects $\nu_{r(i)}$, and interview wave fixed effects $\omega_{w(i)}$ 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,

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

for $k \in \{\textit{Mitigation, Products, Adaptation, Non-Climate}\}$. 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), $y_i$ stands respectively for dummy variables indicating whether the firm decides on each of the climate investment types differently than on non-climate investments in response to positive (+) or negative (−) changes in the interest rate (six dummies in total). We construct these variables by calculating the difference in firm decisions on climate investment relative to the non-climate investment. Specifically, for $c \in$ {emissions, products, adaptation}, we define the difference under interest rate increases as

$$y_i = \textit{Difference}(c)_i^+ = \begin{cases} -1 & \text{if only non-climate investment decreases} \\ 0 & \text{if both decisions are the same} \\ 1 & \text{if only climate investment decreases} \end{cases}$$

and under interest rate decreases as[5]

$$y_i = \textit{Difference}(c)_i^- = \begin{cases} -1 & \text{if only non-climate investment increases} \\ 0 & \text{if both decisions are the same} \\ 1 & \text{if only climate investment increases} \end{cases}$$

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 $\textit{Invest}(\cdot)$, $\textit{Diff}(\cdot)^*$ and other variables drawn from the survey. The table reveals that on average, 42% of firms invest in mitigation, while 37% engage in green product development. Non-climate investments are slightly more prevalent, with 48% of firms undertaking these investments. Only 11% of the

[5]Subsequently, we refer to the variables $\textit{Difference}(k)^*$ as $\textit{Diff}(k)^*$ to shorten notation.

surveyed firms invest in adaptation.[6]

The average difference in firm decisions $Diff(\cdot)^*$ is negative. This indicates that, *unconditionally*, firms are less responsive to interest rate changes in their climate investments relative to their non-climate investments. When interest rates rise (fall), firms are less likely to reduce (increase) climate investments than they are to reduce (increase) non-climate-related expenditures. The sample is smaller than under the first question, as we drop firms that did not respond to the questions on their investment plans under different interest rate scenarios. 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 begin by characterizing who undertakes climate investments. Specifically, we estimate cross-sectional correlations between the probability of investing in each of the three climate-investment categories and in non-climate investment and the two sets of firm characteristics specified in Equation 1. The first set, vector $X$, captures the core firm features such as size, age, organizational form, growth, asset structure, and payout capacity. The second captures environmental factors $z$, such as their carbon emissions and indicators of their exposure to transition and physical climate risks.

Table 2 reports estimates for several specifications of Equation 1. Columns correspond to the four investment categories, where the dependent variable is $Invest(k)$; $k = Mitigation$ in

[6]Table A5 contains 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 suggest a degree of complementarity among the various investment types. The strongest relationship with 55% 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 (44%) between mitigation and non-climate innovation points to a degree of complementarity between these investments. By contrast, there is less correlation between green products and non-climate investments, as well as adaptation and non-climate investments, indicating that firms investing in green products and market development or adaptation tend to be different from those pursuing the status quo non-climate investments.

Column (1), *Products* in Column (2), *Adaptation* in Column (3), and *Non-Climate* in Column (4). The specifications differ across panels due to the inclusion of different $z$ variables: Panels A–C focus on different measures of Scope 1 emissions, namely the log of emissions in Panel A; the emissions-to-sales ratio in Panel B; and the emissions-to-assets ratio in Panel C. In Panels D–F, we also report coefficients of different specifications of Equation 1, but focusing on the climate transition and physical risk variables obtained via the survey as variable $z$. In particular, we report if a firm is affected by changes in preferences (Panel D), by any climate policy (Panel E), or by physical risks (Panel F).[7] 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 Panels B–F; 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. For ease of interpretation of the economic magnitudes across columns, in this and all subsequent tables, we standardize all continuous control variables by subtracting their mean and dividing by their standard deviation (std).

We first focus on the coefficients for the financial characteristics in $X$ contained in Panel A. Results in Column (1) (*Mitigation*) reveal that life cycle characteristics, such as size (log of assets), age (log of age), and whether the firm is a parent firm, are positive and statistically significant. Further, firms investing in emissions mitigation tend to have substantial physical capital (measured as the ratio of property, plant, and equipment (PPE) to assets) and higher liquidity (as shown by their higher ability to generate dividend payments). This suggests that mitigation investments are concentrated among established, mature firms. Column (2) shows a distinct pattern: the only significant correlate with (*Products*) is sales growth, with

[7]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).

no systematic relation to size, age, asset intensity, or organizational form. This suggests that green product investments are undertaken by higher-growth firms drawn from a broad cross-section, pursuing technologies and markets with uncertain payoffs. Column (3) (*Adaptation*) indicates that larger and more physically asset-intensive firms are more likely to invest in adaptation, consistent with greater exposure of tangible capital and a need for protective investment of these firms. Column (4) (*Non-Climate*) reveals few systematic patterns beyond a tendency for larger, asset-rich firms to invest more. The lack of significant of many covariates in adaptation and non-climate investments suggests that these investment decisions span a broader and more heterogeneous set of firms. By contrast, mitigation and product investments may reflect more specific needs linked to technological and demand constraints, or economic and regulatory pressures.

These patterns are economically intuitive: established firms focus on cutting emissions (mitigation) and protecting existing assets (adaptation), whereas high-growth firms pursue new green products. These characteristics point to potentially 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 high-growth firms are more likely to be financially constrained and thus affected by changing interest rates. These findings also help reconcile divergent evidence in the innovation data. Using German data, Aghion et al. (2024) find that large firms drive green innovation, consistent with stronger internal finance and bank access supporting longer-duration projects. By contrast, for the US context Känzig et al. (2025) report a bigger role in innovation for smaller firms, consistent with a financing-constrained, product-oriented margin that is more sensitive to credit conditions. Our data allows us to disentangle across different investment types: once we separate mitigation from green product development, we find that both sets of findings can hold simultaneously: large, established firms lead on mitigation, while faster-growing firms

(often coinciding with early stages of the life cycle) tend to drive product development.

We next focus on the coefficients of the climate-related variables $z$. Results in Panel A–C show that emission variables are key determinants of climate investment decisions: High-emitting firms have a significantly greater propensity to invest both in mitigation and products, even after controlling for their industry classification. These results are particularly strong for mitigation investments, where the emission variables are statistically significant regardless of whether emissions are measured in levels or per unit of sales or assets. There is also some evidence for product investments, where emission intensities seem to matter most. By contrast, adaptation investments are not fundamentally related to either levels or intensities of emissions. 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 mitigation.

Similar patterns hold for climate transition risk. In Panel D, $z$ denotes a dummy equal to one if the firm is affected by changing preferences of clients or employees, while in Panel E, it is a dummy equal to one if the firm is affected by carbon taxes or other climate policy. Firms facing greater transition risks exhibit substantially higher probabilities of investing in both mitigation and green products. The effects are economically meaningful: for instance, the coefficient in Column (5) indicates that exposure to climate policy increases the likelihood of investing in green products by 16.7 percentage points. While preferences and policies are among the strongest determinants of mitigation and product investments, transition risk plays only a secondary role for adaptation investments. By contrast, physical risk exposure (Panel F) is positively associated with both adaptation and green product investment.

Finally, results for non-climate investments in Column (4) show firms with high carbon emissions are not generally more likely to invest. However, the exposure to climate transition and physical risks seems to be correlated with non-climate investments, albeit with slightly lower economic and statistical magnitudes. This result could be due to the fact that

investment in climate and non-climate activities is not mutually exclusive. Therefore, there is scope for firms to invest in many different technologies simultaneously.

Overall, the main takeaways from this table are the following: First, emissions, transition, and physical 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, where the latter are probably more innovative firms with higher growth rates. Third, firms undertaking adaptation investment have substantial physical capital, and fourth, firms undertaking non-climate investments are heterogeneous in their observable characteristics. In the following sections, we analyze whether these different firm characteristics translate into differential monetary policy transmission for climate vs non-climate investments.

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

In this section, we shift the focus to within-firm investment choices, asking whether firms tend to favor or de-prioritize climate relative to non-climate investments in response to changes in the interest rate. To do so, we estimate Equation 1 using the variables $Diff(\cdot)^*$ as dependent variables. This analysis will inform us about whether, and which types of firms shift away (or transition towards) climate investments relative to non-climate ones when monetary policy changes.

Table 3 presents the results. Columns (1) and (2) focus on the differential firm responses to changes in the interest rate of mitigation investments relative to non-climate investments, $Diff(Mitigation)^*$, while Columns (3) and (4) focus on $Diff(Products)^*$ and Columns (5) and (6) focus on $Diff(Adaptation)^*$. Odd-numbered columns focus on the effect of interest rate increases, $Diff(\cdot)^+$, while the even columns capture the effect of interest rate decreases, $Diff(\cdot)^-$. We follow a similar structure to report our results as in Table 2, where Panel A shows the estimated coefficients for financial variables and carbon emission levels, and Panels B–F con-

tain the coefficients for other climate variables $z$. The estimation sample is smaller relative to Table 2 as our dependent variable is restricted to firms responding to how they would change their investments.

We start by analyzing the differential response between climate and non-climate investment when rates rise (odd columns). When interest rates rise, a positive coefficient indicates that firms are more likely to reduce non-climate than climate investment under monetary tightening, whereas negative coefficients indicate the opposite, that is, firms would cut climate investment relative to non-climate investments.

We first analyze the coefficients of the financial variables in $X$. For mitigation investments, the negative coefficient on size and sales growth suggests that smaller firms and those with lower sales growth are significantly more likely to cut mitigation investments relative to non-climate investments. Furthermore, firms that pay dividends are more likely to reduce non-climate than mitigation investments under monetary tightening. To put it differently, firms that do not pay dividends reduce mitigation investments relatively more than non-climate investments with higher interest rates. Jointly, this indicates that firms with greater financial constraints decrease their mitigation investments relatively more. We find no differential effect of financial characteristics for green product investments: life cycle, debt capacity, and liquidity do not correlate with firm decisions to cut products versus non-climate. This result implies no systematic shift in firm behavior for product and non-climate investments in response to interest rate increases. One interpretation of this is that product development is closer to the core business pipeline and, therefore, potentially treated similarly to other capital expenditure under tightening. For adaptation, more profitable firms are relatively less likely to cut adaptation than non-climate investment. This suggests that profitability supports maintaining adaptation investments even as other projects are deferred.

We now turn to examine the role of emissions and climate risk characteristics. Firms with higher emissions or exposure to transition and physical climate risks do not exhibit sys-

tematically different responses in terms of climate versus non-climate investment reductions when interest rates increase. This pattern holds consistently across all categories of climate investment: mitigation (Column (1)), products (Column (3)), and adaptation (Column (5)). These results suggest that climate investments are not disproportionately cut, even among firms most exposed to climate-related risks. In other words, climate investments appear relatively sticky under higher interest rates, irrespective of firms' exposure profiles.

We next examine whether firms increase climate investments more than non-climate investments with lower interest rates. Positive coefficients indicate that firms are more likely to increase climate investments relative to non-climate investments; negative coefficients indicate that firms are more likely to increase non-climate investments.

Panel A in Table 3 reveals that financial characteristics, $X$, play a limited role: the main exception is that larger firms (as measured in ln(Assets) in Column (2)) are more likely to expand non-climate investment relative to mitigation investments, which implies, equivalently, that smaller firms tilt their expansions toward mitigation relative to non-climate when financing becomes cheaper. Overall, this suggests that smaller firms, which are often more financially constrained, respond to monetary easing by disproportionately expanding mitigation investments.

By contrast, emissions and climate preferences, $z$, are essential drivers of differential firm decisions. For mitigation, firms with higher emissions are significantly more likely to increase mitigation investments relative to non-climate investments when interest rates fall (Column (2), Panel A–C). This implies that these firms actively shift toward mitigation when borrowing becomes cheaper. Similarly, firms that are affected by changes in employee or client preferences increase mitigation investments disproportionately to non-climate investments (Panel D). For green products, firms that are affected by changes in preferences shift their investment mix towards green products relative to non-climate investments. In contrast,

other climate risks and firms' emissions are not robust predictors of differential responses. In other words, monetary easing reallocates investment within firms toward green projects precisely among the most exposed firms. In our data, this exposure manifests primarily through employee and client preferences, upon which firms put more emphasis on mitigation and green products. For mitigation, the most polluting firms expand abatement disproportionately relative to non-climate investment. For adaptation, we do not find evidence of differential treatment relative to non-climate investment under easing. One reason plausibly could be because adaptation is insurance-like and may be budgeted alongside maintenance or risk-management spending; the null could also reflect limited power due to a smaller sample of adaptation-active firms.

Our results reveal that climate investments, particularly mitigation and green product investments, exhibit fundamentally different risk characteristics than conventional investments through the transmission channels discussed in Section 2.

First, we find support that mitigation and green product investments are less exposed to the *risk-taking channel*. The evidence points to an asymmetry in how firms respond to monetary policy changes. During monetary easing, firms subject to climate-related preferences increase mitigation and product investments disproportionately, even after controlling for financial characteristics, as well as industry and regional differences. However, these same firms show no corresponding reduction in climate investments during monetary tightening. This asymmetric pattern is particularly pronounced among high-emission firms, which reallocate disproportionately toward mitigation projects when interest rates fall but do not scale back these investments when rates rise.

This asymmetry reveals that climate investments function as strategic hedges rather than risky projects. If climate investments were perceived as inherently risky, firms would scale them back relative to other non-climate investments during monetary tightening. Yet they

do not. Instead, firms preserve these investments during adverse conditions, indicating they view climate investments as protection against transition and reputational risks rather than sources of additional risk exposure.

This finding aligns closely with asset pricing evidence showing that transition risk is priced in brown, not green, activities. Prior work finds that firms with high carbon intensity face higher required returns due to exposure to regulatory and preference-driven climate risks (see Bolton and Kacperczyk, 2021, Giglio, Kelly, and Stroebel, 2021a, Pastor, Stambaugh, and Taylor, 2021, Gormsen and Huber, 2024, de Bandt, Kuntz, Pankratz, Pegoraro, Solheim, Sutton, Takeyama, and Xia, 2024, among many others). This implies that the risk premium associated with the climate transition is embedded in brown cash flows.

Our results are consistent with this view. High-emission firms do not disproportionately cut climate investments when rates rise. Consequently, green investments are not perceived as riskier or more exposed to financial tightening. When rates fall and the cost of capital declines, these same firms reallocate toward mitigation, which indicates that they treat green investments as a hedge against transition risk. This evidence collectively indicates that climate investments, particularly mitigation and green products, are less exposed to the risk-taking channel than conventional investments. Rather than amplifying risk sensitivity, green investments appear to serve as strategic hedges or as means of repositioning.

This behavior complements the findings reported in Table 2. Firms with the highest emissions and greater exposure to transition risks are significantly more likely to invest in climate mitigation and green product development. Together, these findings show that transition-exposed firms use climate investments to buffer against future risk, rather than pulling back when financial constraints tighten.

Second, the evidence supports a *balance-sheet channel* that is particularly relevant for mitigation investments. Smaller firms, which are more likely to face external financing constraints, reallocate more resources toward mitigation when interest rates fall. Under higher

interest rates, these firms are more likely to cut mitigation investments rather than non-climate investments. This is consistent with the idea that mitigation projects are more sensitive to financing conditions due to their investment profiles, such as low initial cash flows and high duration.

This finding aligns with a growing literature emphasizing the role of financial frictions in shaping climate investment behavior. First, the stronger response among smaller firms and those more reliant on external finance supports the view that climate investment is exposed to the balance-sheet and bank-lending channels of monetary policy transmission (Bernanke and Blinder, 1992, Bernanke and Gertler, 1995). These firms lack the internal funds to finance high-cost, long-horizon projects, making them more sensitive to credit conditions. Second, Cloyne et al. (2023) show that young firms' investment responses depend critically on collateral valuations, while Fang et al. (2024) provide theoretical support for the idea that collateral availability is central to firms' decisions to abate emissions. Finally, these patterns reinforce empirical evidence that climate investments are particularly susceptible to financial frictions due to their high upfront costs, back-loaded payoffs, and greater reliance on external financing (Schmidt et al., 2019, Hartzmark and Shue, 2022, Accetturo et al., 2025, De Haas et al., 2025, Lanteri and Rampini, 2023). As a result, firms with stronger balance sheets and greater debt capacity are better positioned to maintain climate investment plans even when monetary conditions tighten. Together with our findings from Table 2, where we found that the more established firms are more likely to invest in mitigation to begin with, this shows that firm financial strength is a key determinant of climate investment capacity. In particular, firms with stronger balance sheets are not only more likely to engage in mitigation but are also better equipped to sustain these investments in the face of tightening financial conditions.

These findings have several implications for understanding monetary policy effectiveness. First, the asymmetric response through the risk-taking channel suggests that expansionary

monetary policy may be more effective at stimulating climate investments than contractionary policy is at reducing them. This asymmetry could lead to a ratchet effect, where climate investment levels gradually increase over multiple monetary cycles without corresponding decreases during tightening phases. Second, the differential responses across firm types point to heterogeneous transmission effects. Large, well-capitalized firms use climate investments strategically and are less sensitive to monetary conditions, while smaller, credit-dependent firms exhibit greater sensitivity to policy changes. This heterogeneity implies that monetary policy's climate-related effects are likely to be concentrated among financially constrained firms, potentially influencing the pace and distribution of green transition across the economy. Although smaller firms' emissions may not be quantitatively dominant for overall net zero targets, they can become disproportionately disadvantaged as larger players transition away from legacy technologies, leaving smaller firms at a comparative disadvantage in both financing access and technological adoption.

From a macroeconomic perspective, these transmission patterns suggest that climate investments may exhibit different cyclical properties than conventional investments. The combination of being less exposed to the risk-taking channel and more exposed to the balance-sheet channel creates a transmission mechanism that could amplify green investment during expansions while providing some downside protection during contractions, at least among larger firms. These findings contribute to the emerging understanding of how climate considerations interact with traditional monetary policy channels. This reveals that the green transition introduces new dimensions to policy transmission that warrant consideration in both academic research and policy design.

# 5 Conclusions

We study how conventional monetary policy affects the allocation of capital between climate and non-climate investments. To overcome data limitations from prior literature, we rely on novel, investment-level data from Norwegian firms matched with firm financials and emissions. Our results highlight that the transmission of monetary policy to climate investment is heterogeneous across investment types and firm characteristics.

We first document substantial heterogeneity in the types of firms undertaking different kinds of climate investment. Large, well-established firms with high emissions intensity and significant exposure to transition risk are more likely to invest in emissions mitigation. Green product development is more common among firms in the growth phase of their life cycle, also facing transition pressures. In contrast, adaptation investments are concentrated in large firms with substantial physical capital and direct exposure to physical climate risks. The overarching takeaway is that firms respond to the risks they are most exposed to, and, notably, the dirtiest firms tend to make the cleanest investments.

Second, we find that monetary policy shapes the composition of investment within firms. Mitigation and green product investments respond asymmetrically to interest rate changes: they increase under lower rates but are not disproportionately reduced under higher rates relative to non-climate investments. This asymmetry generates a ratchet effect: a persistent upward shift in the climate investment share over the cycle. This suggests that these types of investments are viewed less as risky and more as strategic responses to transition pressures. We conclude that mitigation and product investment are less exposed to the risk-taking channel of monetary policy. In contrast, adaptation investments do not respond differently to monetary policy than non-climate investments, suggesting that exposure to physical risks alone does not trigger differentiated behavior under changing financial conditions.

Third, we uncover a distinct role for financial frictions. Smaller, and thus financially constrained, firms adjust their mitigation investments more sharply to monetary shocks in

both directions, consistent with the balance-sheet channel of monetary policy. This points to a distributional consequence: while these firms are not the largest emitters, they may face greater barriers to participating in the green transition when financial conditions tighten.

Together, these results suggest that conventional monetary policy affects not only the level of investment, but also its allocation across green and non-green uses. The ratchet effect implies that monetary easing can disproportionately support climate investment without equivalent reversal under tightening, thereby making green capital formation less procyclical. However, the presence of financial frictions indicates that some firms remain vulnerable to being left behind. As climate policy and monetary policy increasingly intersect, understanding these micro-level dynamics is essential for designing frameworks that ensure an inclusive and effective transition.

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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, win) | 596 | 1.65e+06 | 7.39e+06 | 20567.000 | 60555.000 | 1.71e+05 | 7.55e+05 | 2.68e+06 |
| ln(Assets) | 596 | 12.240 | 1.910 | 9.931 | 11.011 | 12.049 | 13.535 | 14.803 |
| ln(Age) | 596 | 3.155 | 0.707 | 2.197 | 2.833 | 3.258 | 3.611 | 3.892 |
| Parent Firm | 596 | 0.144 | 0.352 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| Not Rated | 596 | 0.133 | 0.339 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| Leverage (win) | 596 | 0.640 | 0.210 | 0.326 | 0.488 | 0.684 | 0.800 | 0.879 |
| EBITDA / Assets (win) | 596 | 0.113 | 0.125 | -0.031 | 0.032 | 0.101 | 0.181 | 0.276 |
| PPE / Assets (win) | 596 | 0.156 | 0.185 | 0.004 | 0.017 | 0.071 | 0.240 | 0.458 |
| Cash (win) | 596 | 0.141 | 0.172 | 0.001 | 0.011 | 0.055 | 0.226 | 0.412 |
| Dividend Payer | 596 | 0.304 | 0.460 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Sales Growth (win) | 596 | 0.107 | 0.293 | -0.177 | -0.042 | 0.069 | 0.190 | 0.389 |
| Scope 1 Emissions (win) | 596 | 1874.684 | 5800.360 | 5.607 | 31.982 | 193.867 | 936.608 | 3771.034 |
| ln(Scope1) | 593 | 5.124 | 2.665 | 1.813 | 3.495 | 5.309 | 6.849 | 8.235 |
| Scope1 / Sales (win) | 593 | 0.003 | 0.005 | 0.000 | 0.000 | 0.001 | 0.003 | 0.005 |
| Scope1 / Assets (win) | 596 | 0.004 | 0.008 | 0.000 | 0.000 | 0.001 | 0.004 | 0.010 |

**Panel B: Survey data**

| | N | Mean | SD | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|---|---|
| *Firm investment types* | | | | | | | | |
| Mitigation | 596 | 0.423 | 0.494 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Products | 596 | 0.367 | 0.483 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Adaptation | 596 | 0.111 | 0.314 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| Non-climate | 596 | 0.477 | 0.500 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| *Firm monetary policy rate sensitivity* | | | | | | | | |
| Inc(Mitigation)- | 341 | 0.320 | 0.467 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Dec(Mitigation)+ | 341 | 0.346 | 0.476 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Inc(Products)- | 305 | 0.357 | 0.480 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Dec(Products)+ | 305 | 0.344 | 0.476 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Inc(Adaptation)- | 171 | 0.187 | 0.391 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| Dec(Adaptation)+ | 171 | 0.257 | 0.438 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Inc(Non-Climate)- | 387 | 0.380 | 0.486 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Dec(Non-Climate)+ | 387 | 0.421 | 0.494 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Diff(Mitigation)- | 279 | -0.093 | 0.535 | -1.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| Diff(Mitigation)+ | 279 | -0.115 | 0.450 | -1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Diff(Products)- | 252 | -0.048 | 0.533 | -1.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| Diff(Products)+ | 252 | -0.115 | 0.454 | -1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Diff(Adaptation)- | 155 | -0.168 | 0.481 | -1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Diff(Adaptation)+ | 155 | -0.200 | 0.447 | -1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| *Firm transition risk* | | | | | | | | |
| Affected by changing preferences | 596 | 0.792 | 0.406 | 0.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Affected by any climate policy | 596 | 0.723 | 0.448 | 0.000 | 0.000 | 1.000 | 1.000 | 1.000 |
| Credit conditions | 596 | 0.366 | 0.482 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Physical risk | 596 | 0.532 | 0.499 | 0.000 | 0.000 | 1.000 | 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) Products | (3) Adaptation | (4) Non-Climate |
|---|---|---|---|---|
| **Panel A: Ln(Emissions)** | | | | |
| ln(Assets) (std) | 0.062** | 0.027 | 0.042* | 0.079*** |
| | (0.027) | (0.029) | (0.022) | (0.027) |
| Parent Firm | 0.162*** | 0.086 | 0.017 | -0.076 |
| | (0.058) | (0.062) | (0.042) | (0.064) |
| ln(Age) (std) | 0.051** | -0.002 | -0.011 | -0.008 |
| | (0.023) | (0.024) | (0.014) | (0.023) |
| Sales Growth (std) | 0.025 | 0.037* | 0.017 | 0.015 |
| | (0.019) | (0.021) | (0.014) | (0.020) |
| Not Rated | 0.040 | 0.064 | 0.046 | 0.065 |
| | (0.061) | (0.063) | (0.041) | (0.060) |
| Leverage (std) | -0.020 | -0.014 | -0.007 | -0.026 |
| | (0.021) | (0.021) | (0.013) | (0.022) |
| PPE / Assets (std) | 0.078*** | 0.018 | 0.054*** | 0.059*** |
| | (0.021) | (0.023) | (0.018) | (0.022) |
| Cash / Assets (std) | -0.010 | -0.021 | -0.010 | -0.015 |
| | (0.021) | (0.021) | (0.012) | (0.021) |
| EBITDA / Assets (std) | -0.017 | -0.007 | -0.016 | 0.031 |
| | (0.019) | (0.021) | (0.014) | (0.021) |
| Dividend Payer | 0.076* | 0.034 | 0.015 | -0.022 |
| | (0.045) | (0.045) | (0.029) | (0.045) |
| Ln(Emissions) | 0.054** | 0.041 | -0.002 | 0.003 |
| | (0.026) | (0.028) | (0.016) | (0.027) |
| Observations | 593 | 593 | 593 | 593 |
| $R^2$ | 0.184 | 0.094 | 0.075 | 0.152 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes |
| **Panel B: Emissions/Sales** | | | | |
| Emissions/Sales | 0.056*** | 0.049** | -0.012 | 0.016 |
| | (0.021) | (0.022) | (0.014) | (0.020) |
| Observations | 593 | 593 | 593 | 593 |
| $R^2$ | 0.193 | 0.101 | 0.082 | 0.156 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes |
| **Panel C: Emissions/Assets** | | | | |
| Emissions/Assets | 0.062*** | 0.042* | -0.007 | 0.017 |
| | (0.020) | (0.022) | (0.014) | (0.020) |
| Observations | 596 | 596 | 596 | 596 |
| $R^2$ | 0.195 | 0.098 | 0.080 | 0.156 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes |
| **Panel D: Preferences** | | | | |
| Affected by changing preferences | 0.122*** | 0.185*** | -0.004 | 0.106** |
| | (0.044) | (0.043) | (0.031) | (0.047) |
| Observations | 596 | 596 | 596 | 596 |
| $R^2$ | 0.190 | 0.113 | 0.080 | 0.161 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes |
| **Panel E: Climate Policies** | | | | |
| Affected by any climate policy | 0.104** | 0.167*** | 0.052* | 0.099** |
| | (0.044) | (0.045) | (0.028) | (0.046) |
| Observations | 596 | 596 | 596 | 596 |
| $R^2$ | 0.188 | 0.111 | 0.084 | 0.161 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes |
| **Panel F: Physical Risks** | | | | |
| Physical risk | 0.046 | 0.165*** | 0.134*** | 0.084** |
| | (0.039) | (0.039) | (0.026) | (0.041) |
| Observations | 596 | 596 | 596 | 596 |
| $R^2$ | 0.182 | 0.116 | 0.119 | 0.161 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes |

*Notes:* The table reports OLS results for the regression, $Invest(k)_i = \beta_1 X_i + \beta_2 z_i + \eta_{s(i)} + \nu_{r(i)} + \omega_{w(i)} + \varepsilon_i$, where Invest$(k)_i$ is an indicator equal to one if firm $i$ reports plans to invest in technology $k$, for $k \in \{$*Mitigation* (Column (1)), *Products* (Column (2)), *Adaptation* (Column (3)), *Non-climate* (Column (4))$\}$. Variable $z_i$ varies across the different panels and represents different measures of carbon emissions (Panel A–C) or climate risk factors (Panel D–F). 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, $\nu_{r(i)}$, and wave fix effects $\omega_{w(i)}$ (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:** Relative Interest Rate Sensitivity of Investments

| | (1) Diff(Mitigation)+ | (2) Diff(Mitigation)- | (3) Diff(Products)+ | (4) Diff(Products)- | (5) Diff(Adaptation)+ | (6) Diff(Adaptation)- |
|---|---|---|---|---|---|---|
| **Panel A: Ln(Emissions)** | | | | | | |
| ln(Assets) (std) | -0.063* | -0.104** | 0.004 | -0.012 | -0.063 | -0.030 |
| | (0.038) | (0.042) | (0.038) | (0.054) | (0.056) | (0.071) |
| Parent Firm | 0.034 | 0.029 | 0.040 | -0.027 | -0.074 | -0.108 |
| | (0.064) | (0.112) | (0.091) | (0.111) | (0.109) | (0.132) |
| ln(Age) (std) | 0.020 | -0.017 | 0.015 | -0.038 | -0.040 | -0.054 |
| | (0.030) | (0.039) | (0.034) | (0.037) | (0.043) | (0.059) |
| Sales Growth (std) | -0.063** | -0.054 | -0.011 | -0.026 | -0.010 | -0.021 |
| | (0.030) | (0.036) | (0.032) | (0.038) | (0.043) | (0.063) |
| Not Rated | 0.062 | -0.024 | 0.046 | -0.056 | 0.012 | -0.089 |
| | (0.085) | (0.094) | (0.092) | (0.111) | (0.108) | (0.131) |
| Leverage (std) | -0.002 | -0.030 | 0.016 | -0.043 | 0.027 | -0.014 |
| | (0.026) | (0.036) | (0.032) | (0.041) | (0.046) | (0.050) |
| PPE / Assets (std) | 0.013 | 0.007 | -0.017 | 0.013 | 0.023 | -0.023 |
| | (0.029) | (0.031) | (0.032) | (0.037) | (0.037) | (0.047) |
| Cash / Assets (std) | -0.011 | 0.016 | 0.031 | 0.011 | 0.055 | 0.045 |
| | (0.035) | (0.039) | (0.039) | (0.045) | (0.044) | (0.045) |
| EBITDA / Assets (std) | -0.031 | -0.025 | -0.012 | -0.018 | -0.094* | -0.051 |
| | (0.037) | (0.041) | (0.045) | (0.044) | (0.049) | (0.052) |
| Dividend Payer | 0.114* | 0.097 | 0.004 | 0.073 | -0.052 | 0.061 |
| | (0.069) | (0.076) | (0.078) | (0.086) | (0.089) | (0.106) |
| Ln(Emissions) | -0.005 | 0.088** | -0.021 | 0.024 | -0.009 | 0.006 |
| | (0.034) | (0.042) | (0.036) | (0.048) | (0.057) | (0.072) |
| Observations | 276 | 276 | 249 | 249 | 152 | 152 |
| $R^2$ | 0.100 | 0.084 | 0.065 | 0.060 | 0.205 | 0.092 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel B: Emissions/Sales** | | | | | | |
| Emissions/Sales | 0.002 | 0.044* | 0.002 | 0.030 | 0.001 | 0.029 |
| | (0.020) | (0.027) | (0.023) | (0.028) | (0.042) | (0.045) |
| Observations | 278 | 278 | 252 | 252 | 155 | 155 |
| $R^2$ | 0.100 | 0.079 | 0.064 | 0.062 | 0.205 | 0.098 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel C: Emissions/Assets** | | | | | | |
| Emissions/Assets | 0.006 | 0.051** | 0.008 | 0.033 | 0.014 | 0.059 |
| | (0.020) | (0.024) | (0.022) | (0.026) | (0.036) | (0.042) |
| Observations | 279 | 279 | 252 | 252 | 155 | 155 |
| $R^2$ | 0.100 | 0.082 | 0.065 | 0.063 | 0.206 | 0.112 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel D: Preferences** | | | | | | |
| Affected by changing preferences | 0.062 | 0.161* | 0.136 | 0.262*** | 0.118 | 0.143 |
| | (0.069) | (0.086) | (0.090) | (0.088) | (0.110) | (0.115) |
| Observations | 279 | 279 | 252 | 252 | 155 | 155 |
| $R^2$ | 0.102 | 0.082 | 0.073 | 0.082 | 0.213 | 0.105 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel E: Climate Policies** | | | | | | |
| Affected by any climate policy | 0.059 | 0.001 | -0.064 | -0.040 | 0.011 | 0.030 |
| | (0.082) | (0.119) | (0.092) | (0.102) | (0.107) | (0.130) |
| Observations | 279 | 279 | 252 | 252 | 155 | 155 |
| $R^2$ | 0.101 | 0.071 | 0.066 | 0.059 | 0.205 | 0.094 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel G: Physical Risks** | | | | | | |
| Physical risk | -0.013 | -0.025 | 0.013 | 0.110 | 0.127 | -0.016 |
| | (0.056) | (0.074) | (0.067) | (0.076) | (0.091) | (0.101) |
| Observations | 279 | 279 | 252 | 252 | 155 | 155 |
| $R^2$ | 0.100 | 0.072 | 0.064 | 0.066 | 0.216 | 0.094 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes:* Columns 1 and 3 in this table report OLS results for the regressions $Difference(k)_i^+ = \delta_1^+ X_i + \delta_2^+ z_i + \eta_{s(i)} + \nu_{r(i)} + \omega_{w(i)} + \varepsilon_i$ and columns 2 and 4 report the results for the regression $Difference(k)_i^- = \delta_1^- X_i + \delta_2^- z_i + \eta_{s(i)} + \nu_{r(i)} + \omega_{w(i)} + \varepsilon_i$, 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, $\eta_{s(i)}$, industry fixed effects, $\nu_{r(i)}$, and interview wave fixed effects $\omega_{w(i)}$ (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 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)<br>–Changes in client preferences<br>–Changes in employee preferences<br>–Carbon prices<br>–Other climate policies<br>–Changes in credit conditions at banks<br><br>*Original question in Norwegian: Hva betyr følgende klimarelaterte forhold for deres bedrift i dag? Velg aktuelt svaralternativ fra nedtrekksliste.*<br>*–Endrede preferanser hos kunder*<br>*–Endrede preferanser hos arbeidstagere*<br>*–Endrede kredittbetingelser hos bankene*<br>*–Karbonpriser*<br>*–Andre politikktiltak* |
| (ii) | What impact do climate-related issues have on your business? Select '1' for the relevant answer options. (Answers: multiple answers possible)<br>–Need to invest in new technology<br>–Need for new skills<br>–Higher costs<br>–Need to develop new products or markets<br>–More competitiveness<br>–Travel reduction<br>–More difficult access to workers<br>–Lower costs<br>–Lower competitiveness<br>–Easier access to labor<br><br>*Original question in Norwegian: Hva fører klimarelaterte forhold til for din bedrift? Sett '1' for aktuelle svaralternativer.*<br>*–Behov for ny kompetanse*<br>*–Mer satsning på ny teknologi*<br>*–Produktutvikling/ Vridning mot nye markeder*<br>*–Redusert reiseaktivitet*<br>*–Økt konkurransekraft* |

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**Table A1 – continued from previous page**

| No. | Survey Question |
|---|---|
| | *–Redusert konkurransekraft*<br>*–Økte kostnader*<br>*–Reduserte kostnader*<br>*–Vanskeligere tilgang på arbeidskraft*<br>*–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)<br>–Reduction of carbon emissions<br>–Development of "green" products and markets<br>–Other (non-climate) investments<br><br>*Original question in Norwegian: Hvilke type investeringer planlegger dere å gjennomføre i løpet av de neste par årene? Sett '1' for aktuelle svaralternativer.*<br>*–Investeringer for å redusere egne klimagassutslipp*<br>*–Investeringer knyttet til "grønne" markeder og produkter*<br>*–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)<br>–Reduction of carbon emissions<br>–Development of "green" products and markets<br>–Other (non-climate) investments<br><br>*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.*<br>*–Investeringer for å redusere egne klimagassutslipp*<br>*–Investeringer knyttet til "grønne" markeder og produkter*<br>*–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)<br>–Reduction of carbon emissions<br>–Development of "green" products and markets<br>–Other (non-climate) investments<br><br>*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.*<br>*–Investeringer for å redusere egne klimagassutslipp*<br>*–Investeringer knyttet til "grønne" markeder og produkter*<br>*–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 |
| $Dec(k)^+$ | 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 |
| $Inc(k)^-$ | 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 |
| $Diff(c)^+$ | $Dec(c)^+ - Dec(Non\text{-}climate)^+$. 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. $$Diff(c)^+ = \begin{cases} -1 & \text{if } Dec(c)^+ = 0 \wedge Dec(NC)^+ = 1 \\ 0 & \text{if } Dec(c)^+ = Dec(NC)^+ \\ 1 & \text{if } Dec(c)^+ = 1 \wedge Dec(NC)^+ = 0 \end{cases}$$ | RNS Q2:2024 |

Continued on next page

**Table A2 – continued from previous page**

| Variable Name | Definition | Data Source |
|---|---|---|
| *Diff*$(c)^-$ | *Inc*$(c)^-$ − *Inc*(*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. $$\textit{Diff}(c)^- = \begin{cases} -1 & \text{if } \textit{Inc}(c)^- = 0 \wedge \textit{Inc}(NC)^- = 1 \\ 0 & \text{if } \textit{Inc}(c)^- = \textit{Inc}(NC)^- \\ 1 & \text{if } \textit{Inc}(c)^- = 1 \wedge \textit{Inc}(NC)^- = 0 \end{cases}$$ | 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 / Assets* | 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 |

Continued on next page

**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

| Industry | Population Mean | Regression Sample Mean |
|---|---|---|
| Agriculture | 0.013 | 0.013 |
| Mining | 0.004 | 0.020 |
| Manufacturing | 0.038 | 0.277 |
| Utilities | 0.008 | 0.003 |
| Construction | 0.135 | 0.145 |
| Commerce | 0.127 | 0.142 |
| Transportation | 0.029 | 0.042 |
| Services | 0.083 | 0.106 |
| Finance | 0.053 | 0.015 |
| Other | 0.511 | 0.236 |

*Notes:* This table compares the industrial composition between the universe of firms in Norway and the 596 firms surveyed for the Regional Network Survey in Q2:2024 and Q3:2025, 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, win) | 354011 | 25609.503 | 94358.564 | 68.000 | 2550.000 | 39615.000 |
| ln(Assets) | 347311 | 7.760 | 2.421 | 4.575 | 7.897 | 10.612 |
| Sales (win) | 354011 | 8732.183 | 31547.735 | 0.000 | 153.000 | 15628.000 |
| Age | 332816 | 14.098 | 14.728 | 2.000 | 10.000 | 31.000 |
| ln(Age) | 332816 | 2.193 | 1.006 | 0.693 | 2.303 | 3.434 |
| Scope 1 Emissions (win) | 354008 | 17.218 | 78.794 | 0.000 | 0.289 | 19.758 |
| ln(Scope1) | 255951 | -0.019 | 2.974 | -3.593 | 0.059 | 3.532 |
| Leverage (win) | 347791 | 0.997 | 2.581 | 0.008 | 0.583 | 1.271 |
| EBITDA / Assets (win) | 347791 | -0.027 | 0.636 | -0.250 | 0.017 | 0.352 |
| PPE / Assets (win) | 347791 | 0.220 | 0.334 | 0.000 | 0.009 | 0.879 |
| Cash (win) | 347791 | 0.303 | 0.332 | 0.001 | 0.156 | 0.901 |
| (d.PPE + Depr) / Assets (win) | 338572 | 0.025 | 0.116 | 0.000 | 0.000 | 0.084 |
| R&D + Patents / Assets (win) | 347791 | 0.005 | 0.039 | 0.000 | 0.000 | 0.000 |
| Z-Score (win) | 347791 | 0.969 | 5.057 | -0.757 | 0.988 | 4.553 |
| Sales Growth (win) | 200135 | 0.404 | 2.165 | -0.790 | 0.034 | 0.998 |
| Has R&D or Patents | 354012 | 0.042 | 0.200 | 0.000 | 0.000 | 0.000 |
| Dividend Payer | 354011 | 0.134 | 0.341 | 0.000 | 0.000 | 1.000 |
| Parent firm | 354011 | 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* for 2023.

**Table A5:** Investment Technologies

| *Descriptive statistics* | | | | |
|---|---|---|---|---|
| | N | Mean | Median | SD |
| Mitigation | 596 | 0.423 | 0.000 | 0.494 |
| Products | 596 | 0.367 | 0.000 | 0.483 |
| Adaptation | 596 | 0.111 | 0.000 | 0.314 |
| Non-Climate | 596 | 0.477 | 0.000 | 0.500 |

| *Tetrachoric correlations* | | | | |
|---|---|---|---|---|
| | Mitigation | Products | Adaptation | Non-Climate |
| Mitigation | 1.000 | | | |
| Products | 0.546* | 1.000 | | |
| Adaptation | 0.354* | 0.306* | 1.000 | |
| Non-Climate | 0.436* | 0.261* | 0.257* | 1.000 |

*Notes:* The table presents the basic characteristics of four investment technologies—mitigation, green products, adaptation, and other—and the tetrachoric correlations among them. Asterisks indicate significance at the 5% level.

**Table A6:** Determinants of Investments

| | (1) Mitigation | (2) Products | (3) Adaptation | (4) Non-climate |
|---|---|---|---|---|
| **Panel A: ln(Emissions)** | | | | |
| ln(Assets) (std) | 0.062** | 0.027 | 0.042* | 0.079*** |
| | (0.027) | (0.029) | (0.022) | (0.027) |
| Parent Firm | 0.162*** | 0.086 | 0.017 | -0.076 |
| | (0.058) | (0.062) | (0.042) | (0.064) |
| ln(Age) (std) | 0.051** | -0.002 | -0.011 | -0.008 |
| | (0.023) | (0.024) | (0.014) | (0.023) |
| Sales Growth (std) | 0.025 | 0.037* | 0.017 | 0.015 |
| | (0.019) | (0.021) | (0.014) | (0.020) |
| Not Rated | 0.040 | 0.064 | 0.046 | 0.065 |
| | (0.061) | (0.063) | (0.041) | (0.060) |
| Leverage (std) | -0.020 | -0.014 | -0.007 | -0.026 |
| | (0.021) | (0.021) | (0.013) | (0.022) |
| PPE / Assets (std) | 0.078*** | 0.018 | 0.054*** | 0.059*** |
| | (0.021) | (0.023) | (0.018) | (0.022) |
| Cash / Assets (std) | -0.010 | -0.021 | -0.010 | -0.015 |
| | (0.021) | (0.021) | (0.012) | (0.021) |
| EBITDA / Assets (std) | -0.017 | -0.007 | -0.016 | 0.031 |
| | (0.019) | (0.021) | (0.014) | (0.021) |
| Dividend Payer | 0.076* | 0.034 | 0.015 | -0.022 |
| | (0.045) | (0.045) | (0.029) | (0.045) |
| Building and construction | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Manufacturing | -0.058 | -0.022 | -0.009 | 0.310*** |
| | (0.067) | (0.070) | (0.044) | (0.067) |
| Oil supply | -0.095 | 0.156 | -0.115** | 0.222** |
| | (0.099) | (0.098) | (0.050) | (0.101) |
| Services | -0.177*** | -0.119* | 0.001 | 0.176*** |
| | (0.069) | (0.070) | (0.041) | (0.067) |
| Retail | -0.199*** | -0.142* | 0.042 | 0.170** |
| | (0.075) | (0.073) | (0.050) | (0.078) |
| Innland | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Midt | 0.061 | -0.095 | -0.047 | 0.187** |
| | (0.092) | (0.098) | (0.060) | (0.089) |
| Nord | -0.051 | -0.130 | -0.007 | -0.103 |
| | (0.079) | (0.085) | (0.057) | (0.087) |
| Nordvest | -0.097 | -0.064 | -0.073 | -0.010 |
| | (0.081) | (0.088) | (0.051) | (0.090) |

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| | (1) Mitigation | (2) Products | (3) Adaptation | (4) Non-climate |
|---|---|---|---|---|
| Sør | -0.184** | -0.201** | 0.009 | -0.157* |
| | (0.083) | (0.087) | (0.060) | (0.091) |
| Sørvest | -0.040 | -0.088 | 0.025 | -0.112 |
| | (0.080) | (0.085) | (0.059) | (0.085) |
| Øst | -0.027 | 0.028 | -0.018 | -0.003 |
| | (0.076) | (0.085) | (0.054) | (0.085) |
| Wave 1 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Wave 2 | -0.056 | -0.038 | 0.030 | -0.005 |
| | (0.039) | (0.040) | (0.026) | (0.038) |
| Ln(Emissions) | 0.054** | 0.041 | -0.002 | 0.003 |
| | (0.026) | (0.028) | (0.016) | (0.027) |
| Observations | 593 | 593 | 593 | 593 |
| $R^2$ | 0.184 | 0.094 | 0.075 | 0.152 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes |
| **Panel D: Preferences** | | | | |
| ln(Assets) (std) | 0.085*** | 0.040 | 0.049** | 0.076*** |
| | (0.025) | (0.025) | (0.020) | (0.025) |
| Parent Firm | 0.151** | 0.078 | 0.028 | -0.067 |
| | (0.059) | (0.058) | (0.042) | (0.061) |
| ln(Age) (std) | 0.048** | -0.004 | -0.020 | -0.008 |
| | (0.023) | (0.023) | (0.016) | (0.022) |
| Sales Growth (std) | 0.018 | 0.034* | 0.014 | 0.013 |
| | (0.019) | (0.020) | (0.015) | (0.021) |
| Not Rated | 0.032 | 0.052 | 0.054 | 0.053 |
| | (0.062) | (0.061) | (0.042) | (0.061) |
| Leverage (std) | -0.014 | -0.006 | -0.014 | -0.026 |
| | (0.021) | (0.021) | (0.013) | (0.022) |
| PPE / Assets (std) | 0.079*** | 0.016 | 0.050*** | 0.055*** |
| | (0.021) | (0.021) | (0.017) | (0.021) |
| Cash / Assets (std) | -0.008 | -0.016 | -0.010 | -0.015 |
| | (0.021) | (0.020) | (0.012) | (0.020) |
| EBITDA / Assets (std) | -0.008 | 0.002 | -0.017 | 0.031 |
| | (0.020) | (0.020) | (0.014) | (0.021) |
| Dividend Payer | 0.066 | 0.013 | 0.019 | -0.026 |
| | (0.042) | (0.044) | (0.030) | (0.045) |
| Building and construction | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Manufacturing | -0.053 | 0.004 | -0.000 | 0.329*** |

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| | (1) Mitigation | (2) Products | (3) Adaptation | (4) Non-climate |
|---|---|---|---|---|
| | (0.068) | (0.071) | (0.044) | (0.065) |
| Oil supply | -0.114 | 0.149 | -0.121** | 0.230** |
| | (0.098) | (0.098) | (0.049) | (0.097) |
| Services | -0.207*** | -0.129** | 0.004 | 0.197*** |
| | (0.062) | (0.064) | (0.038) | (0.060) |
| Retail | -0.200*** | -0.120 | 0.042 | 0.192** |
| | (0.078) | (0.075) | (0.049) | (0.075) |
| Innland | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Midt | 0.095 | -0.047 | -0.022 | 0.203** |
| | (0.091) | (0.092) | (0.058) | (0.089) |
| Nord | -0.029 | -0.103 | -0.008 | -0.089 |
| | (0.080) | (0.081) | (0.056) | (0.083) |
| Nordvest | -0.080 | -0.041 | -0.075 | 0.003 |
| | (0.087) | (0.083) | (0.049) | (0.085) |
| Sør | -0.151* | -0.159* | 0.006 | -0.136 |
| | (0.085) | (0.084) | (0.060) | (0.090) |
| Sørvest | -0.030 | -0.075 | 0.023 | -0.105 |
| | (0.083) | (0.084) | (0.056) | (0.086) |
| Øst | -0.005 | 0.046 | -0.018 | 0.006 |
| | (0.079) | (0.077) | (0.053) | (0.084) |
| Wave 1 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Wave 2 | -0.042 | -0.021 | 0.038 | 0.005 |
| | (0.038) | (0.038) | (0.026) | (0.038) |
| Affected by changing preferences | 0.122*** | 0.185*** | -0.004 | 0.106** |
| | (0.044) | (0.043) | (0.031) | (0.047) |

*Notes:* The table reports OLS results for the regression, $Invest(k)_i = \beta_1 X_i + \beta_2 z_i + \eta_{s(i)} + \nu_{r(i)} + \omega_{w(i)} + \varepsilon_i$, where $\text{Invest}(k)_i$ is an indicator equal to one if firm $i$ reports plans to invest in technology $k$, for $k \in \{$*Mitigation* (Column (1)), *Products* (Column (2)), *Adaptation* (Column (3)), *Non-climate* (Column (4))$\}$. The table shows all variables for the baseline result of Panel A and Panel D from Table 2. 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

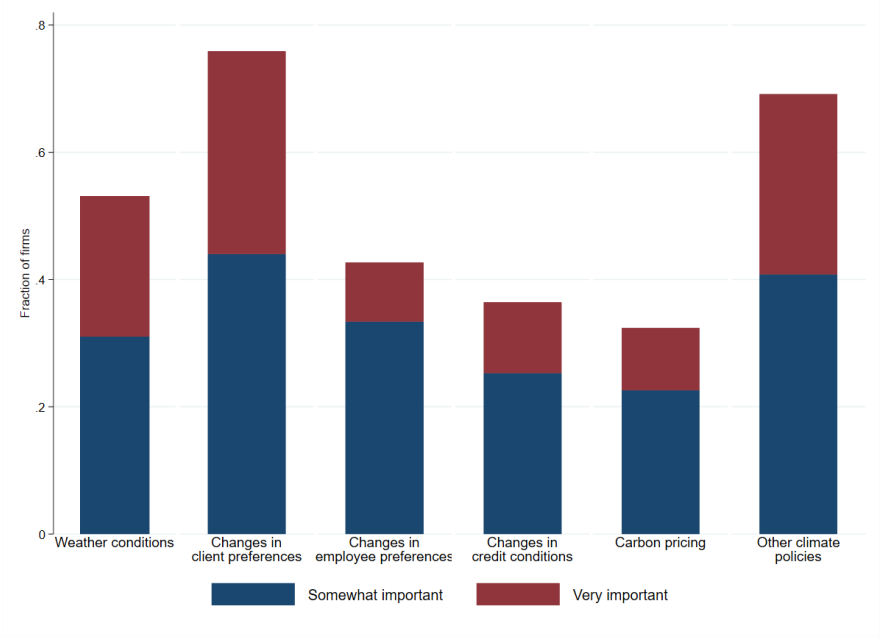
To assess firms' exposure to climate risks, we examine the perceived importance of different transition risk channels for current business operations. Understanding these perceptions sheds light on whether and how firms view climate transition risks as material today.

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 75% of firms, while employee preferences are cited by around 40%. About 70% also point to non-price regulatory changes. In contrast, only 30% of firms view carbon pricing as important. Every second firm deems weather conditions to be an important issue for their business. 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 were not important (numerically corresponding to 0), somewhat important (numerically corresponding to 1), and very important (numerically corresponding to 2).

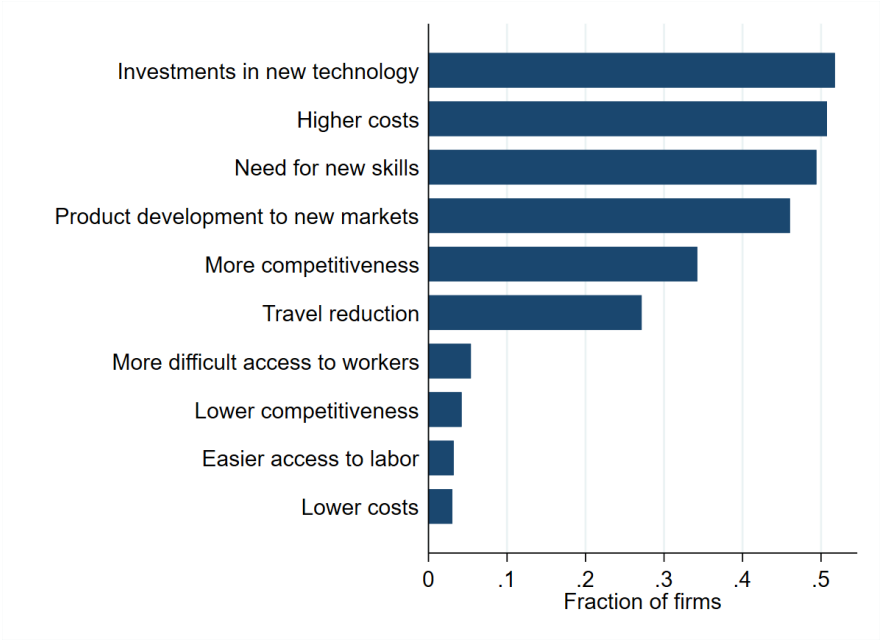
## B.2 Transition risks in business operations

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 that they require both capital upgrades and workforce adaptation: 50% 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.

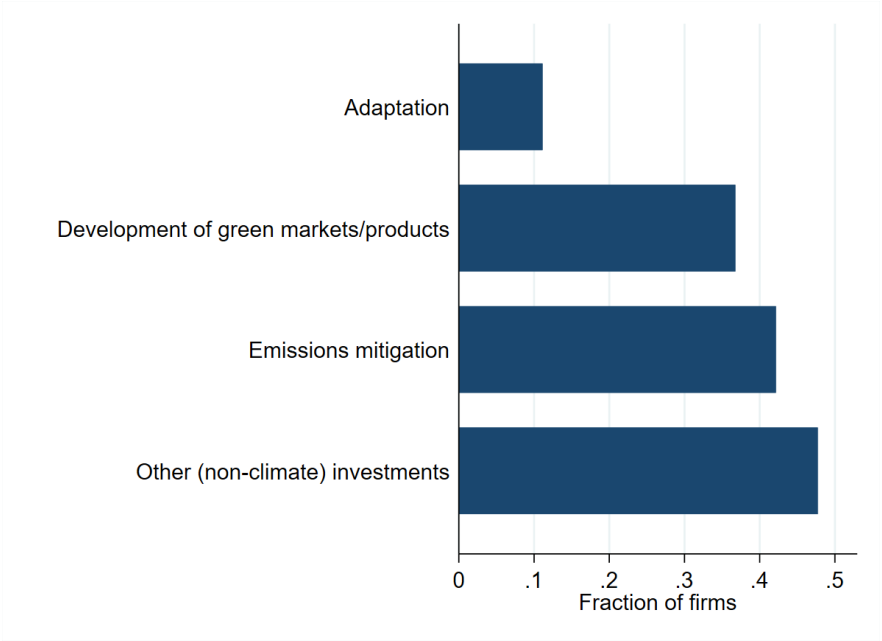
## B.3 Investment plans for climate and non-climate investments

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 investments in the development of green products and markets, as well as emissions mitigation, are now as common as conventional capital expenditures. Close to 47% of the firms report plans for non-climate-related investments, and 42% indicate forthcoming investments aimed at mitigating carbon emissions. In addition, 37% plan to develop green products or enter green markets, suggesting that a substantial portion of firms see business opportunities in the climate transition. Investments in adaptation appear to be rare, with only one in nine surveyed firms answering that they invest in adaptation.

**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

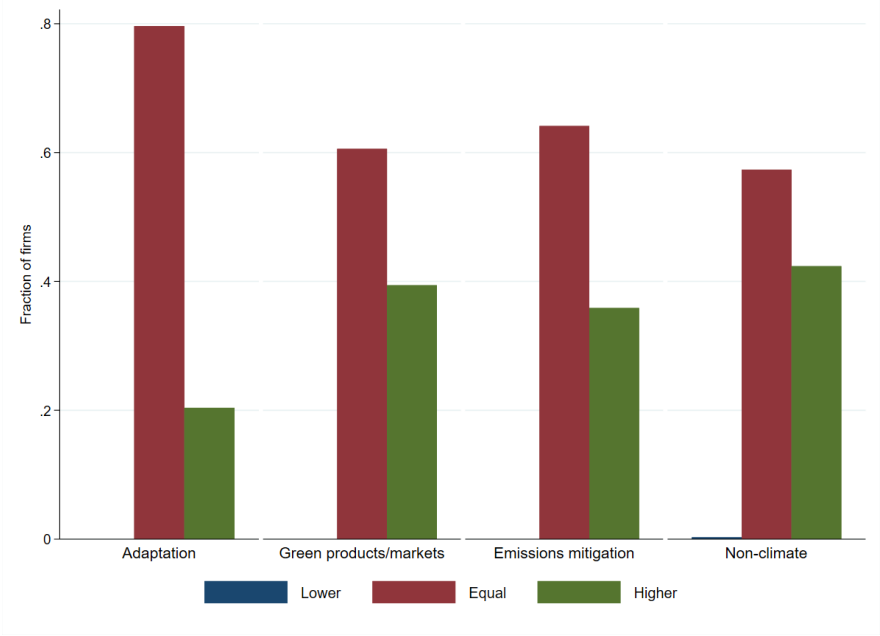
Figure B4 examines how firms expect their investment plans to respond to changes in interest rates, distinguishing between general (non-climate), green, and emissions-reducing investments. Panels (a) and (b) report the distribution of responses to scenarios in which interest rates are significantly lower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

In the case of lower interest rates (Panel a), around 40% of firms indicate that they would increase investment, with the remaining majority maintaining current plans. This response pattern is broadly consistent across all investment types except for adaptation. Notably, a slightly higher share of firms reports increasing non-climate investments compared to climate-related ones. For adaptation, only 20% of firms state that they would increase their investments.

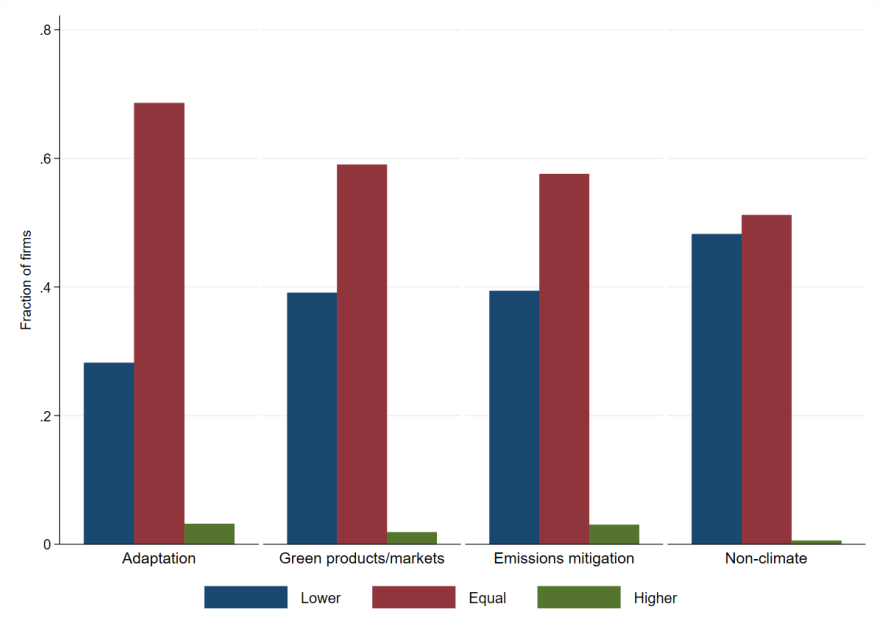
In response to higher interest rates (Panel b), the pattern reverses. Around 55% of firms report no change in investment plans for green products and emissions mitigation, while roughly 40% expect to reduce investment. The corresponding share of firms reporting reductions is slightly higher for non-climate investment. For adaptation, nearly 70% of firms indicate leaving investments at their current level, which for the majority means not having any investments. A small fraction of firms indicate an increase in investments under higher rates.

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.

# Appendix C

## C Cross-sectional results

In this section, we examine how firms adjust their investment behavior when interest rates change and whether climate investments are special in this respect in the cross-section of firms. For this purpose, we estimate Equation 1 on the different indicators introduced previously, $Dec(\cdot)^+$ and $Inc(\cdot)^-$.

Table C1 reports the results for these estimations, where the dependent variable corresponds to changes in *Mitigation* in Columns (1)–(2), *Products* in Columns (3)–(4), and *Adaptation* in Columns (5)–(6). The odd-numbered columns correspond to investment changes to higher interest rates, $Dec(\cdot)^+$, and even columns to changes in response to lower interest rates, $Inc(\cdot)^-$. 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' physical risk exposure (Panel F). As before, for the benefit of space, we only report coefficients for the variables in $X$ in Panel A.

We first focus on which firms would change their investments under higher interest rates. The dependent variable in odd-numbered columns is an indicator for whether a firm reduces investment when interest rates rise, $Dec(\cdot)^+$. This specification is designed so that positive coefficients on firm characteristics indicate a higher propensity to cut investment under monetary tightening, whereas negative coefficients indicate greater resilience.

Leverage emerges as the dominant predictor of investment cuts. A one-standard-deviation increase in leverage is associated with an 8 percentage point higher probability of reducing investment when rates rise (Column (1)). This pattern is robust across climate and non-climate categories, although the magnitude is somewhat smaller for non-climate investment

## **Table C1:** Interest Rate Sensitivity of Investments

| | (1) Dec(Mitigation)+ | (2) Inc(Mitigation)- | (3) Dec(Products)+ | (4) Inc(Products)- | (5) Dec(Adaptation)+ | (6) Inc(Adaptation)- | (7) Dec(Non-Climate)+ | (8) Inc(Non-Climate)- |
|---|---|---|---|---|---|---|---|---|
| **Panel A: Ln(Emissions)** | | | | | | | | |
| ln(Assets) (std) | -0.068* | -0.109*** | -0.067 | -0.044 | -0.071 | -0.077 | -0.047 | -0.062* |
| | (0.036) | (0.035) | (0.042) | (0.045) | (0.049) | (0.052) | (0.036) | (0.036) |
| Parent Firm | 0.106 | 0.100 | 0.105 | 0.014 | 0.110 | 0.066 | 0.131* | 0.110 |
| | (0.075) | (0.074) | (0.082) | (0.088) | (0.103) | (0.086) | (0.074) | (0.078) |
| ln(Age) (std) | 0.058** | 0.033 | 0.056* | 0.003 | 0.002 | -0.024 | 0.030 | 0.027 |
| | (0.029) | (0.029) | (0.030) | (0.030) | (0.043) | (0.036) | (0.030) | (0.029) |
| Sales Growth (std) | -0.022 | -0.028 | 0.011 | -0.011 | 0.022 | 0.007 | 0.057** | 0.048* |
| | (0.027) | (0.028) | (0.028) | (0.031) | (0.038) | (0.041) | (0.027) | (0.026) |
| Not Rated | 0.035 | 0.018 | -0.027 | -0.052 | -0.034 | -0.031 | -0.063 | -0.012 |
| | (0.076) | (0.079) | (0.077) | (0.083) | (0.103) | (0.090) | (0.076) | (0.076) |
| Leverage (std) | 0.080*** | 0.027 | 0.090*** | -0.012 | 0.083** | 0.053 | 0.059** | 0.029 |
| | (0.027) | (0.026) | (0.031) | (0.031) | (0.040) | (0.038) | (0.027) | (0.028) |
| PPE / Assets (std) | 0.035 | 0.020 | 0.019 | 0.024 | 0.020 | 0.025 | 0.015 | 0.015 |
| | (0.027) | (0.028) | (0.031) | (0.032) | (0.038) | (0.033) | (0.026) | (0.027) |
| Cash / Assets (std) | -0.063** | -0.045 | -0.030 | -0.018 | -0.051 | -0.029 | -0.066** | -0.059** |
| | (0.032) | (0.030) | (0.034) | (0.035) | (0.044) | (0.038) | (0.029) | (0.026) |
| EBITDA / Assets (std) | -0.021 | -0.023 | -0.007 | -0.022 | -0.066 | -0.036 | -0.032 | -0.036 |
| | (0.034) | (0.034) | (0.038) | (0.038) | (0.046) | (0.037) | (0.027) | (0.029) |
| Dividend Payer | 0.077 | 0.016 | -0.010 | -0.018 | -0.043 | -0.075 | -0.065 | -0.113* |
| | (0.061) | (0.059) | (0.065) | (0.070) | (0.081) | (0.070) | (0.058) | (0.059) |
| Ln(Emissions) | 0.012 | 0.099*** | 0.010 | 0.078** | -0.001 | 0.053 | 0.041 | 0.051 |
| | (0.035) | (0.034) | (0.038) | (0.038) | (0.053) | (0.049) | (0.035) | (0.035) |
| Observations | 338 | 338 | 302 | 302 | 168 | 168 | 384 | 384 |
| $R^2$ | 0.109 | 0.090 | 0.104 | 0.070 | 0.176 | 0.130 | 0.125 | 0.096 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel B: Emissions/Sales** | | | | | | | | |
| Emissions/Sales | 0.013 | 0.062*** | 0.011 | 0.056** | 0.017 | 0.038 | 0.026 | 0.030 |
| | (0.023) | (0.024) | (0.025) | (0.028) | (0.034) | (0.031) | (0.024) | (0.025) |
| Observations | 339 | 339 | 304 | 304 | 171 | 171 | 386 | 386 |
| $R^2$ | 0.102 | 0.082 | 0.098 | 0.071 | 0.175 | 0.134 | 0.122 | 0.093 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel C: Emissions/Assets** | | | | | | | | |
| Emissions/Assets | 0.013 | 0.051** | 0.011 | 0.042 | 0.025 | 0.059* | 0.038 | 0.029 |
| | (0.023) | (0.025) | (0.025) | (0.028) | (0.031) | (0.031) | (0.026) | (0.026) |
| Observations | 341 | 341 | 305 | 305 | 171 | 171 | 387 | 387 |
| $R^2$ | 0.107 | 0.080 | 0.100 | 0.063 | 0.177 | 0.152 | 0.127 | 0.094 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel D: Preferences** | | | | | | | | |
| Affected by changing preferences | -0.094 | -0.033 | 0.022 | 0.119 | -0.042 | -0.014 | -0.047 | -0.147** |
| | (0.076) | (0.077) | (0.083) | (0.091) | (0.100) | (0.098) | (0.065) | (0.065) |
| Observations | 341 | 341 | 305 | 305 | 171 | 171 | 387 | 387 |
| $R^2$ | 0.110 | 0.066 | 0.100 | 0.060 | 0.174 | 0.123 | 0.122 | 0.103 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel E: Climate Policies** | | | | | | | | |
| Affected by any climate policy | 0.029 | -0.090 | 0.015 | -0.020 | 0.080 | 0.034 | 0.181*** | 0.026 |
| | (0.072) | (0.074) | (0.088) | (0.089) | (0.107) | (0.103) | (0.062) | (0.064) |
| Observations | 341 | 341 | 305 | 305 | 171 | 171 | 387 | 387 |
| $R^2$ | 0.106 | 0.070 | 0.100 | 0.055 | 0.176 | 0.124 | 0.139 | 0.091 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Panel E: Physical Risks** | | | | | | | | |
| Physical risk | 0.120** | 0.033 | 0.128** | 0.145** | 0.252*** | 0.166*** | 0.082 | 0.037 |
| | (0.059) | (0.060) | (0.062) | (0.060) | (0.074) | (0.063) | (0.053) | (0.054) |
| Observations | 341 | 341 | 305 | 305 | 171 | 171 | 387 | 387 |
| $R^2$ | 0.119 | 0.067 | 0.114 | 0.072 | 0.221 | 0.149 | 0.126 | 0.092 |
| Industry + Region + Wave FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes:* Columns 1, 3 and 5 in this table report OLS results for the regressions $Dec(k)_i^+ = \beta_1^+ X_i + \beta_2^+ z_i + \eta_{s(i)} + \nu_{r(i)} + \omega_{w(i)} + \varepsilon_i$, and columns 2, 4 and 6 for $Inc(k)_i^+ = \beta_1^- X_i + \beta_2^- z_i + \eta_{s(i)} + \nu_{r(i)} + \omega_{w(i)} + \varepsilon_i$. $Dec(k)_i^+$ equals one if a firm reports to increase investments in technology $k$ if interest rates were lower than today, 0 otherwise. $Inc(k)_i^-$ 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, $\eta_{s(i)}$, industry fixed effects, $\nu_{r(i)}$, and interview wave fixed effects, $\omega_{w(i)}$ (coefficients not reported). Variable definitions are available in Table A2. Standard errors, based on 1,000 bootstrap iterations, are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

(5.9 percentage points). The results are consistent with balance-sheet sensitivity to the cost of external finance: more leveraged firms face tighter financing constraints when policy rates increase and thus disproportionately retrench.

Firm size also matters, particularly for mitigation investments. Smaller firms are significantly more likely to curtail mitigation spending in response to higher interest rates. For other investment categories, the point estimates are of similar magnitude but are not statistically significant. This asymmetry suggests that, conditionally on investing in mitigation, the relatively smaller firms may perceive mitigation expenditures as more deferrable or less central to short-run operations when financing costs rise, or that they face greater frictions in accessing external funding for mitigation projects.

Cash constraints amplify the investment response to monetary tightening. Firms that are cash-constrained show a greater propensity to cut both non-climate and mitigation investments. For other investment types, the estimated effects are similar in magnitude but not statistically distinguishable from zero. Together with the leverage results, this pattern underscores the role of internal liquidity and balance-sheet strength in shaping the transmission of higher rates to real investment.

Older firms are more likely to reduce mitigation and product investments when rates increase. One interpretation consistent with the broader picture is that older firms may have fewer high-growth opportunities and a stronger focus on preserving balance-sheet strength during tightening cycles; they may also face higher adjustment costs or be more inclined to postpone projects perceived as discretionary. Alternatively, vintage capital and organizational inertia could make it costlier for older firms to pivot toward newer (mitigation or green product) investments under tighter financial conditions, leading to a greater likelihood of deferral.

We find that neither carbon emissions nor transition risk exposure predicts whether firms cut investment when interest rates rise (Panels A–E). Exposure to physical climate risks is

positively associated with reductions in climate investment during monetary tightening. Although this might appear counterintuitive, one might expect risk exposure to spur protective or adaptive investment, there are plausible mechanisms. First, firms facing physical risks often also face higher baseline operating risk and insurance premia, which can become more binding when financing costs rise, crowding out climate investment even when its long-run value is high. Second, lenders may tighten credit disproportionately for risk-exposed firms, raising the cost of capital precisely for the projects intended to mitigate those risks.

In sum, under higher interest rates, financially constrained firms, such as those with higher leverage or limited internal liquidity, are more likely to cut investment. This pattern holds for both climate and non-climate categories.

We now turn to analyzing which firms expand their investments when interest rates fall. In the even-numbered columns, the dependent variable is an indicator for whether a firm increases investment when interest rates fall, $Inc(\cdot)^{-}$. Coefficients are interpreted as sensitivities to monetary easing: positive coefficients indicate a greater propensity to expand investment as financing costs decline, while negative coefficients indicate relative insensitivity, i.e., firms do not scale up even when funding becomes cheaper.

A striking and consistent pattern is that emissions are the strongest predictor of expansion in climate investments, particularly mitigation and green product development. Firms with higher emissions ramp up mitigation and product-related spending when rates fall. Quantitatively, a one-standard-deviation increase in emissions is associated with a 10-percentage-point higher probability of expanding mitigation investment. This association holds even within industry and region. The same directional pattern appears for green product development, though magnitudes are somewhat smaller. By contrast, we do not find a comparable emissions gradient for adaptation or for non-climate investment, underscoring that the emissions channel operates most strongly where decarbonization and product innovation are directly at stake.

Transition risk exposure does not predict greater climate investment under lower rates. However, we estimate a negative association of changes in client or employee preferences with non-climate investment. Physical risk exposure, in particular for adaptation investments, is positively associated with increases in investments during monetary easing. Firms more exposed to physical hazards expand adaptation projects when funding becomes cheaper, which can make them more attractive as insurance-like investments.

In sum, under lower interest rates, high-emission firms disproportionately increase climate investment, especially mitigation and green product development, while transition risks do not systematically affect these investments and are negatively associated with non-climate increases. Physical risk exposure, however, does predict greater adaptation and product investment.

Taken together, our results show that monetary policy transmits to climate investments through familiar balance-sheet channels, with two key nuances. Under higher rates, financial constraints are the common determinant across climate and non-climate investment types. This indicates that tightening primarily operates through general financing frictions rather than a climate-specific margin. Under lower rates, by contrast, high-emission and emission-intensive firms are the primary drivers of expansion in climate investment, especially mitigation and green product development. The main takeaway is that monetary policy affects climate investment much like regular investment, financial strength governs overall sensitivity. But when financing conditions ease, high-emission firms disproportionately step up climate spending. Consequently, lower interest rates have the strongest effect in unlocking climate investments among the most emission-intensive firms, thereby amplifying the green transition when credit conditions relax.

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## 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** *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

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**Professor Zacharias Sautner**
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## 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*

**The Ratchet Effect of Climate Investments**
*with Solveig Erlandsen and Emilia Garcia-Appendini*

## WORK IN PORGRESS

**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, Sustainable Development Colloquium Columbia University

**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