Journal of Economic Behavior and Organization 231 (2025) 106915

Contents lists available at ScienceDirect

Journal of Economic Behavior and Organization

journal homepage: www.elsevier.com/locate/jebo

Research Paper

Stock market reactions to a sovereign wealth fund's broad-based public sustainability engagement: European evidence

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ARTICLE INFO

Keywords:
Corporate sustainability
Event study
Regression discontinuity in time
Shareholder engagement
Sovereign wealth fund

ABSTRACT

This study examines investor reactions to a broad-based public engagement by the world's largest sovereign wealth fund (SWF). We use the SWF's announcement to vote against firms with insufficient sustainability performance in an event study comprising 1,169 portfolio firms headquartered in Europe. The results show an average negative reaction of USD 39.99 million to the announcement. The negative effect is concentrated in portfolio firms with low sustainability performance measured by Refinitiv's environmental, social, and governance (ESG) score. Focusing on the SWF's voting share, we find that firms with low sustainability performance *and* a high voting share experience the most negative market reaction. Notably, the moderating effect of ESG score uncertainty becomes apparent, as firms with both low sustainability performance *and* low ESG score uncertainty experience more pronounced negative stock market reactions. In contrast, firms with low performance *and* high uncertainty show no statistically significant effect. Several robustness tests—including a regression discontinuity in time design—confirm our results. Overall, our findings reveal that broad-based public sustainability engagement can exert pressure on European portfolio firms, suggesting that this form of indirect engagement complements direct engagement strategies in their objective to enhance firms' sustainability performance. Our findings have valuable implications for researchers, practitioners, and policymakers interested in understanding the evolving landscape of investor-firm interactions.

1. Introduction

'The world's largest sovereign wealth fund [SWF] will become a more vocal shareholder and plans to vote against companies that fail to set a net zero emissions target, overpay their top leaders, or do not have sufficiently diverse boards' (Financial Times 2022). This article concerning the announcement of the Norway Government Pension Fund Global (henceforth the Norwegian SWF) published by the Financial Times (FT) illustrates a broad-based public engagement of an institutional investor[1] (Pawliczek et al., 2021; Fisch et al. 2019). Besides a sharp growth in socially responsible investment from USD 6.5 trillion in 2006 to USD 81.7 trillion in 2018 (Ahlström

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[1] Further prominent examples are the 'Dear CEO' letter written by the CEO of Blackrock, Larry Fink, or the announcement of the UK pension fund to vote against BP and Shell directors over climate targets (Financial Times 2023).

https://doi.org/10.1016/j.jebo.2025.106915
Received 9 October 2023; Received in revised form 22 January 2025; Accepted 23 January 2025
Available online 1 February 2025

and Monciardini 2022), there is also evidence that ethical shareholder engagement (or activism)[2] has increased over the last decade (Barko et al. 2022; Hoepner et al. 2022). Sustainability engagement of institutional investors[3] addresses and intends to improve sustainability issues—generally divided into the environmental, social, and governance (ESG) pillars—within firms that are relevant for a broad range of stakeholders (Dimson et al. 2015). Traditionally, shareholder engagement appears in various observable as well as unobservable forms, "including letter writing, phone calls, meetings, proxy actions, and selling shares" (Kim et al. 2019, p. 4918), targeting a specific firm or group of firms directly. Institutional investors recently tend to combine *direct*[4] engagement forms (e.g., via private meetings) with *indirect* ones. Such indirect engagements include broad-based public engagements—via the media—to highlight and address sustainability issues (Financial Times 2022, 2023; Pawliczek et al. 2021; BlackRock 2022). Motivated by this development, we focus on how the stock market responds to the Norwegian SWF's broad-based public sustainability engagement.

Prior studies consider primarily engagement activities of different institutional investor groups, such as large asset managers like BlackRock or Vanguard (Becht et al. 2021; Fisch et al. 2019), pension funds (Hong and Kacperczyk 2009; Sievänen et al. 2013), or socially responsible investment (SRI) funds (Kim et al. 2019; Heath et al. 2023), and address a plethora of research questions: (i) effects of sustainability engagement on corporate operating performance (Brav et al. 2008; Smith 1996), shareholder value (Becht et al. 2021; Flammer 2013; Klassen and McLaughlin 1996), or risk (Albuquerque et al. 2019; Hoepner et al. 2022); (ii) investors' influence on sustainability performance (Barko et al. 2022; Chen et al. 2020; Dyck et al. 2019), sustainability reporting (Flammer et al. 2021; Pawliczek et al. 2021) or sustainability policies (Kim et al. 2019); and (iii) sustainability engagement success and (engagement) coalition composition (Dimson et al. 2015; Slager et al. 2023) or intervention form (i.e., "voice" vs. "exit") selection (Broccardo et al. 2020; McCahery et al. 2016).

Research on SWFs—another institutional investor group—has focused primarily on the investment selection process and how SWFs' investment decisions affect firm value (Bortolotti et al. 2015; Dewenter et al. 2010; Kotter and Lel 2011). Recently, scholars have started to examine whether SWFs consider sustainability issues in their investment decisions and find that they do (Liang and Renneboog 2020). In this vein, Lehmann and Sarabi (2017) show that investment decisions of the Norwegian SWF improve target firms' financial performance and governance quality. Concerning broad-based public sustainability engagement—to the best of our knowledge—solely Liang and Vansteenkiste (2022) as well as Pawliczek et al. (2021) have examined this emerging type of engagement. The former study exploits the Norwegian SWF board diversity campaign and provides insightful results for the governance pillar. Pawliczek et al. (2021) use the "Dear CEO letter" of Larry Fink as a broad-based engagement activity. The authors show that Blackrock's portfolio firms adapt their reporting to the sustainability contents discussed in the letters. In sum, SWFs and the impact of broad-based sustainability engagement on stock markets remain underexplored in the literature.

Beyond the scarce literature on SWFs and broad-based public sustainability engagement, an emerging body of research explores whether investors can exert market discipline, thereby compelling managers to enhance their firms' sustainability performance (Gantchev et al. 2018). The condition under which market disciplining is effective—by putting enough pressure on managers—is that investors' preferences and actions must influence the market valuation of firms (Berk and van Binsbergen 2021). Consequently, the Norwegian SWF's announcement of voting against firms with insufficient sustainability performance can be interpreted as a strategy intended to trigger a negative stock market reaction, putting pressure on managers of particularly low sustainability-performing firms. At the same time, the SWF does stay in the position to "exercise their rights of control to alter corporate policy" (Berk and van Binsbergen 2021, p. 6) through broad-based public engagement. Again, there is a lack of evidence as to whether a SWF's broad-based public sustainability engagement possesses the potential to trigger stock market responses that might discipline the market.

But why should stock market participants react to the broad-based public sustainability engagement of the Norwegian SWF? Prior studies reveal that various unobservable (Barko et al. 2022; Hoepner et al. 2022) and observable (Flammer 2015) forms of direct sustainability shareholder engagement cause stock market responses. For instance, Hoepner et al. (2022) use internal data of a SRI fund and study 1443 private engagements across 485 target firms. The results show that engagement reduces risk but varies across engagement topics, i.e., environmental or social issues. In addition, Krüger (2015) shows that negative news concerning a firm's sustainability performance is perceived negatively by shareholders. This response suggests that broad-based public sustainability engagement—when perceived as negative news about a firm's sustainability performance—has the potential to affect stock prices.

To empirically examine the Norwegian SWF's broad-based public sustainability engagement, we gather stock market data for the Refinitiv Europe Universe in Datastream, covering 1806 large publicly traded firms from January 26 to December 30, 2022. Employing a fuzzy matching algorithm, we identify 1169 firms that are included in the Norwegian SWF's portfolio as of December 2022. The event window is determined using a two-step approach, which includes a news search (with Factiva; Dewenter et al. 2010) and Google search volume (GSV) analysis (e.g., Da et al. 2011; Drake et al. 2012; Bonetti et al. 2022). From the market model, we derive abnormal returns (ARs) and use cumulative abnormal returns (CARs) in an event study to examine the stock market response around the announcement date. Among other robustness tests, we apply a regression discontinuity in time (RDiT) design to address potential endogeneity concerns.

The results show a negative stock market response (-0.43 %, $p < 0.01$) for all portfolio firms around the Norwegian SWF's

[2] Throughout the paper, we use the terms engagement and activism interchangeably.

[3] Other shareholder groups, such as non-governmental organizations (Waygood and Wehrmeyer 2003) or religious organizations (van Cranenburgh et al. 2014), engage as well but are beyond the scope of this study.

[4] These direct forms are usually more cost-intensive.

announcement to vote against firms with low sustainability performance. More precisely, within the event window from December 5, 2022 to December 8, 2022, the mean cost of the announcement is approximately USD 39.99 million.[5] Since institutional investors engage with their portfolio firms when they recognize a need for improvement in particular areas (Appel et al. 2016; Hirschman 1970; McCahery et al. 2016; Pawliczek et al. 2021; Smith 1996), the negative effect around the Norwegian SWF announcement indicates that stock market participants perceive the announcement as news of poor sustainability performance and react accordingly. From a theoretical perspective, our findings align with the view that corporate sustainability is a form of value-maximizing governance mechanism, contributing not only to societal goals but also to shareholder wealth (Ferrell et al. 2016; Krüger 2015).

Next, as investors can and do evaluate firms' sustainability performance (Hartzmark and Sussman 2019), we test whether the market reaction differs for firms with high and low sustainability performance. To do so, we split the sample based on pre-announcement sustainability performance, assigning firms with sustainability performance below the industry median to the low-performance group and those above the median to the high-performance group. Consistent with our theoretical argument that corporate sustainability is integral to long-term shareholder wealth creation, we predict and find a negative reaction for firms in the low performance sample (−0.65 %, $p < 0.01$), while there is no significant effect for firms in the high-performance sample (−0.13 %, $p > 0.10$). Next, we divide portfolio firms into high and low performers based on their emissions, workforce, and management scores. Given that the announcement addressed net zero targets, salary gaps, and board diversity, these metrics allow for a more nuanced assessment of market reactions compared to the aggregate sustainability score. For the emissions and workforce scores, the results reveal a pattern consistent with the overall sustainability performance analysis: firms with low performance experience a negative stock market reaction, while no significant effect is observed for firms with high performance. However, for the management score, which serves as a proxy for board diversity, the CARs are negative and significant for both high and low performers.

In sum, the negative stock market reactions for portfolio firms with low sustainability performance, as well as low emissions and workforce scores, combined with the lack of significant negative CARs for high-performing firms, indicates that strong sustainability performance protects shareholder value. These findings are in line with prior studies, providing evidence that news concerning firms' superior environmental or social performance causes positive stock market reactions (Deng et al. 2013; Flammer 2013; Klassen and McLaughlin 1996). In the governance pillar, the results point to the debate about whether corporate governance is a product of managerial rent extraction or value-maximizing contracts between managers and shareholders (Larcker et al. 2011). Furthermore, the management score encompasses a broader range of issues—compared to the emissions and workforce scores—covering aspects such as audit committee independence, board diversity, and executive sustainability compensation incentives. This variation may offer another explanation for the inconclusive results observed for the management score (Aguilera and Jackson 2003).

Beyond the documented heterogeneous effects driven by sustainability performance, we further analyze voting data to assess whether the Norwegian SWF's voting share amplifies the observed negative stock market reactions in the low sustainability performance sample. The voting share effect is ex-ante unclear. On the one hand, given that prior studies document improvements in sustainability performance following direct engagements (Barko et al. 2022; Chen et al. 2020), a high voting share could moderate our main effect as follows. The negative effect is less pronounced in low-sustainability firms with a high voting share, as the Norwegian SWF's engagement is expected to enhance future sustainability performance, suggesting a potential long-term effect. On the other hand, investors might perceive the announcement as a stronger signal of low sustainability performance for firms with a high voting share, given that the Norwegian SWF places greater focus on and maintains closer oversight of these firms (Iliev et al. 2021). Thus, a clearer picture of high voting share firms' low sustainability performance leads to a more pronounced negative stock market reaction, suggesting a short-term effect. Consistent with the short-term view, the CAR for low sustainability performance firms with a high voting share is twice as negative (−0.96 %, $p < 0.01$) compared to firms where the Norwegian SWF holds a low voting share (−0.43 %, $p < 0.10$). The same effect is also evident when using the emissions, workforce, or management score. Moreover, we find no significant voting effect for firms with high sustainability performance.

As recent studies highlight the divergence in ESG scores (e.g., Berg et al. 2022) and their impact on investor decision-making (Avramov et al. 2022), we account for ESG score uncertainty in our analysis. We find that the negative stock market reaction is particularly pronounced among portfolio firms with low sustainability performance when ESG score uncertainty[6] is low (−0.94 %, $p < 0.01$). This implies that low uncertainty enables investors to better evaluate the underlying sustainability performance of a firm. In contrast, firms with low sustainability performance but high ESG score uncertainty do not exhibit significant negative CARs (−0.08 %, $p > 0.10$), and may therefore "benefit" from the divergence in ESG scores. Since high ESG score uncertainty can help firms to disguise their low sustainability performance, potentially resulting in capital misallocation (i.e., towards less sustainable firms), our results further support policymakers' efforts to regulate ESG scores (European Commission 2024; Reuters 2024).

Overall, our study provides three distinct contributions. First, we contribute to the literature by studying the stock market reactions to news concerning sustainability issues (Deng et al. 2013; Krüger 2015; Flammer 2013). While prior studies show a stock market reaction to news concerning firms' sustainability performance, we reveal that such an effect also exists for a (SWF's) broad-based public sustainability engagement. The results further imply that good sustainability performance can mitigate negative stock market responses (Shiu and Yang 2017). With regard to investors' evaluation of sustainability performance (Avramov et al. 2022), our

[5] We calculate the announcement cost as the product of the mean sample market capitalization (= USD 9.3 billion) and the mean 4-day CAR (= −0.43%).

[6] Throughout the manuscript, we refer to sustainability performance by using Refinitiv's ESG score. We use this score for our analyses, given its extensive coverage of European firms and wide use among (institutional) investors. Moreover, ESG score uncertainty refers to the disagreement between ESG scores from different data providers. For the ESG score uncertainty analysis, we further use ESG scores from MSCI and Sustainalytics.

study provides further indications that ESG score uncertainty hinders investors' ability to make informed investment decisions.

Second, the study contributes to the literature strand on how shareholder engagement affects firm value (Becht et al. 2021; Flammer 2015; Hoepner et al. 2022) by revealing a negative stock market response following the Norwegian SWF's broad-based public engagement. In this context, we expand upon prior SWF studies. In particular, we complement Liang and Vansteenkiste (2022), as our results indicate that the number of sustainability issues addressed in a broad-based public sustainability campaign might influence stock market responses. The authors report a positive stock market reaction after the Norwegian SWF board diversity campaign in 2021. Investor demand for high board diversity and the prospect that firms with low board diversity will improve their performance after the campaign leads to increased investments. In our setting, we argue that the negative stock market reaction following the Norwegian SWF announcement aligns with the view that corporate sustainability serves as a form of value-maximizing governance mechanism (Ferrell et al. 2016).

Third, our results broaden the recent debate on how (socially responsible) investors can exert market discipline (Berk and van Binsbergen 2021; Gantchev et al. 2018). To the best of our knowledge, this study is the first to show that a SWF's broad-based public sustainability engagement exerts market discipline by triggering a negative stock market response in portfolio firms—an effect that is stronger for low sustainability-performing firms. Investors might use broad-based public sustainability engagement as it does not come at the expense of giving up control in target firms, i.e., selling stocks (Gantchev et al. 2018; Berk and van Binsbergen 2021), and is less cost-intensive compared to direct engagement. Investors should be aware that the engagement effect is more pronounced in firms where they hold a high voting share. In sum, the observed negative reaction puts pressure on European portfolio firms and enables institutional investors to adopt a multifaceted approach that combines direct and indirect engagement forms, leading to a more comprehensive and effective engagement strategy.

2. Institutional background—sovereign wealth funds

SWFs are state-owned investment funds that manage and invest in a country's foreign currency reserves and surplus revenues from natural resource exports. SWFs invest across a range of asset classes, including equities, fixed income, real estate, and alternative investments—such as private equity, hedge funds, and infrastructure. The investment strategy of SWFs varies, depending on their objectives, risk appetite, and asset allocation. Some SWFs are more active investors—taking large stakes in companies and seeking to influence their governance—while others are passive investors—focusing on the achievement of market returns. As of 2021, there are over 150 SWFs globally, with assets under management (AUM) totaling over USD 8 trillion (SWFI 2022).

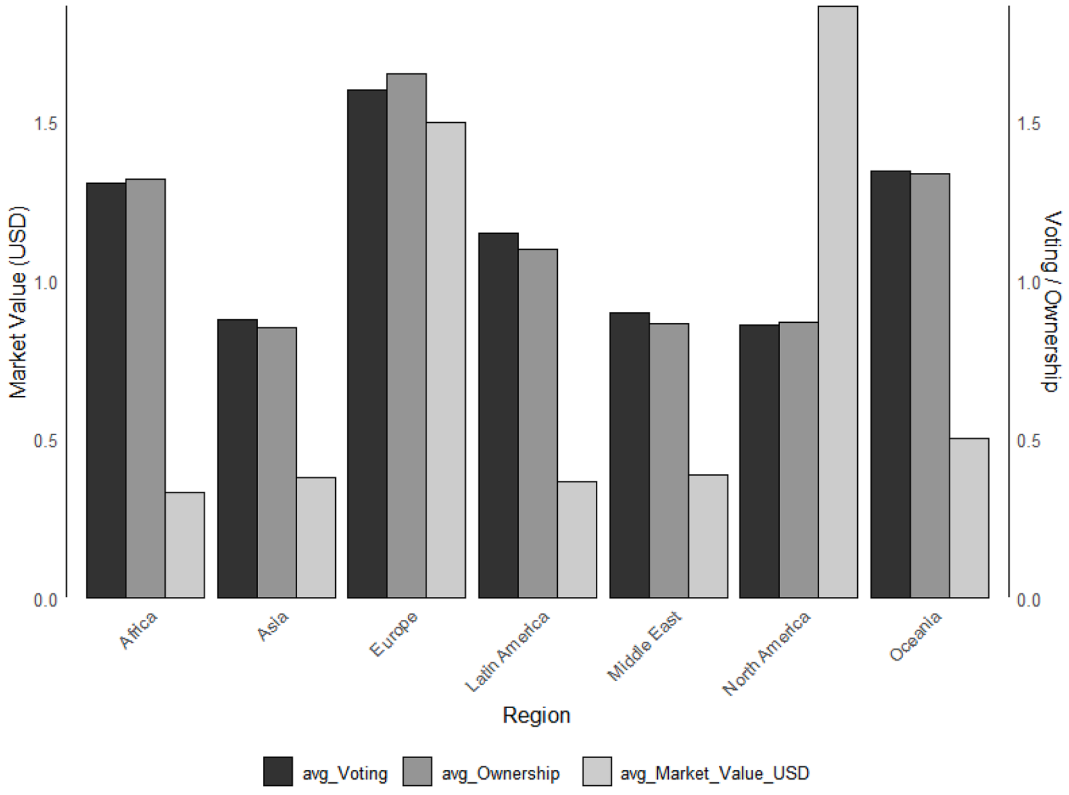


Fig. 1. Norwegian SWF average voting rights, ownership, and equity investments per region
Notes: This figure depicts the Norwegian SWF average voting rights, ownership, and equity investments per region. Voting rights and ownership are in percent. Market value data is in USD 100 million. Data is retrieved from https://www.nbim.no/en/the-fund/Market-Value/.

The Norwegian SWF is the largest SWF globally, with AUM of almost USD 1.4 trillion in 2021. The fund was established in 1990 to invest Norway's surplus oil revenues for future generations and is managed by Norges Bank Investment Management (NBIM). The investment portfolio is divided into four main asset classes: equities, fixed income, real estate, and renewable energy infrastructure. As of the end of 2021, the fund's allocation was approximately 72 % equities, 25.4 % fixed income, 2.5 % real estate, and 0.1 % renewable energy infrastructure. The equity portfolio is invested globally and includes both listed and unlisted companies with the highest ownership and voting rights in Europe (see Fig. 1). As of 2021, the fund held investments in over 9000 companies globally, with its largest equity holdings including large European firms such as Nestle SA, Roche Holding AG, Shell PLC, and Novo Nordisk A/S. The fixed-income portfolio is mainly invested in government bonds and investment-grade corporate bonds, while the real estate portfolio is invested in commercial properties in Europe, Asia, and the Americas. The Norwegian SWF investment strategy is focused on long-term value creation, and the fund has a responsible investment approach, incorporating sustainability factors into its decision-making process. The fund is also an active shareholder, engaging with companies to promote good governance and sustainable business practices (NBIM 2022).

3. Related literature and hypotheses development

In case insufficient (sustainability) performance threatens firm value, institutional investors engage with portfolio firms to monitor and improve (sustainability) performance (Appel et al. 2016; Hirschman 1970; McCahery et al. 2016; Pawliczek et al. 2021; Smith 1996). Due to (high) activism costs and free rider problems (Gillan and Starks 2000; Shleifer and Vishny 1986; Admati et al. 1994), solely large institutional investors have the resources to directly engage with portfolio firms. However, they only engage in cases when expected engagement benefits exceed engagement costs. Traditional forms of direct shareholder engagement—such as private meetings or shareholder proposals—incur relatively high costs, even though they often achieve the desired outcomes of changing firms' sustainability policies or reporting (Azar et al. 2021; Barko et al. 2022; Dyck et al. 2019; Flammer et al. 2021; Pawliczek et al. 2021). With respect to sustainability outcomes, Azar et al. (2021) find a negative relation between the direct engagements of the three largest asset managers (i.e., BlackRock, Vanguard, and State Street Global Advisors) and subsequent greenhouse gas (GHG) emissions.

Prior research shows that directly targeting top executives and guiding the change process in target firms are key success factors for sustainability engagement (Barko et al. 2022). In contrast, broad-based public sustainability engagement—as an indirect form of engagement—does not meet these factors. This raises the question: why should investors utilize this form of engagement at all? Since institutional investors have large and highly diversified portfolios, engagement-induced costs prevent direct engagement with all portfolio firms (Pawliczek et al. 2021; Shi et al. 2020). For this reason, broad-based public engagement offers an alternative approach that enables investors to *indirectly* engage with a wide range of portfolio firms at a relatively low cost. Consequently, institutional investors decide to engage indirectly as benefits derived from broad-based public engagement still outweigh the relatively low associated cost. Regarding engagement benefits, Pawliczek et al. (2021) provide evidence that indirect engagement triggers real effects in portfolio firms. More precisely, portfolio firms change reporting behavior following the publication of Larry Fink`s "Dear CEO letter". As a result, running a broad-based public engagement campaign by announcing a new voting strategy is a legitimate activity for a SWF to complement or substitute its *direct* engagement activities.

With respect to financial outcomes, prior studies find a positive relation between engagement and stock returns for traditional and direct forms of engagement, such as private meetings (Becht et al. 2021; Brav et al. 2008). Flammer (2015) shows that successful sustainability proposals (close to the majority threshold) yield positive stock returns. Both engagement-return relations would imply a positive announcement effect of the Norwegian SWF decision to vote against low sustainability-performing firms. Indeed, Liang and Vansteenkiste (2022) show a positive announcement effect following a board gender diversity campaign of the Norwegian SWF driven by large US and European firms. The authors argue that investors expect firms to increase their board gender diversity subsequent to the announcement of the campaign. This expectation triggers a positive stock market reaction.

For European firms within the Norwegian SWF's portfolio, we conjecture that the European civil law system—being stakeholder-oriented (La Porta et al., 2008)—along with the good governance view and shareholder wealth maximization implications of corporate sustainability (Ferrell et al. 2016), provides a solid foundation for predicting stock market reactions to the Norwegian SWF's announcement. Accordingly, the Norwegian SWF's announcement to vote against firms with low performance in the three sustainability pillars—i.e., environmental, social, and governance—could be perceived by investors as (negative) news about in general insufficient sustainability performance of portfolio firms, potentially threatening future financial performance. Prior studies show that investors perceive (high) climate risk to have (negative) financial implications (Krueger et al. 2020) and that negative news about firms' sustainability performance leads to negative investor reactions (Krüger 2015). Therefore, investors might sell stocks of portfolio firms around the announcement in December 2022. Moreover, the Norwegian SWF's announcement to vote against firms with low sustainability performance could also be interpreted as new information regarding potential future proprietary and political costs (Grewal et al. 2019).

In sum, there is evidence that corporate announcements can lead to wealth effects (i.e., stock market reactions) through either real effects or—as in the case of the Norwegian SWF announcement—through information effects. While the former (i.e., real effects) lead

to positive stock market reactions, the latter (i.e., information effects) lead to zero or negative reactions on the stock market (Gillan and Starks 2000). As a result, we hypothesize the following:

HYPOTHESIS 1. *Within the event window, the stocks of European portfolio firms respond negatively to the Norwegian SWF's announcement to vote against firms with insufficient sustainability performance.*

Overall superior sustainability performance is positively correlated with financial performance (Margolis et al. 2009). More recent studies even provide a causal link between sustainability and financial performance. For instance, Azar et al. (2021) and Flammer (2013) show that this causal relation also holds for the reverse direction, i.e., inferior environmental performance decreases shareholder value. For this reason, we hypothesize the following:

HYPOTHESIS 2. *Within the event window, the negative response to the Norwegian SWF's announcement is more pronounced for portfolio firms with low sustainability performance.*

4. Data and methodology

4.1. Stock market and firm level data

We obtain stock return data from Refinitiv Datastream for all 1806 European firms covered by Refinitiv. Employing a fuzzy matching algorithm, we identify 1169 firms that are included in the Norwegian SWF's portfolio[7] as of December 2022 and construct two samples. First, we download stock prices and calculate returns for all portfolio firms between January 26 and November 7, 2022 for the estimation window sample. This period includes the 200 trading days leading up to the first event window used in the RDiT design, beginning 20 trading days prior to December 6, 2022.[8] Next, we download stock prices and calculate daily returns for the STOXX Europe 600 index, which is required as benchmark data for the market model.[9] The estimation window sample includes 232,956 observations. Second, we download stock prices and calculate daily stock returns for the event window sample between November 8 [−20 trading days before December 6] and the last trading day of 2022, December 30 [+18 trading days after December 6]. The event window sample comprises 44,071 observations for 1169 European Portfolio firms (see Table 1, Panel A). Fig. 2 depicts the construction of the estimation and event window samples.

To study the effects of different firm characteristics, firm-level data such as sustainability performance (*SustScore*) is obtained from Refinitiv Eikon and voting share data is obtained from the NBIM homepage.[10] Due to missing sustainability data, the number of observations reduces to 1115 for overall sustainability performance and 1109 for sub-scores of environmental, social, and governance performance, respectively. Table 1 depicts descriptive statistics for the event window sample. All variables are defined in Appendix 1.

4.2. Event window selection

To determine the event window of shareholder engagement, prior studies used, e.g., Schedule 13D filings (Brav et al. 2008). Since broad-based public engagements are not targeted toward specific firms (and filings are not required), identifying the event date from such filings is not feasible. For this reason, we follow a two-step approach to determine the event window for the Norwegian SWF announcement. First, we search for news articles including the search words "Norwegian sovereign wealth fund", "Norwegian oil fund", or "Oil fund Norway" within the week of the announcement (i.e., December 4 to December 11, 2022) on the platform Factiva. As can be seen in Panel A in Fig. 3, the first article for the previous search words is published on December 5. However, the first article addressing the new voting strategy is published on December 7. As the number of articles peaks on December 8, 2022, we argue that articles after December 8 do not deliver any additional information to market participants and set December 8 as the later boundary. Further, we select December 6, the day before the FT published the article on the Norwegian SWF new voting strategy, as the event day and December 5 as the early boundary to allow for information leakages and anticipation effects of well-informed investors (Grewal et al. 2019). Accordingly, we delimit the event window between these dates (i.e., December 5 and December 8; see blue dot-dashed line in Panel A of Fig. 3). In the second step, we verify the observed event window with a proxy for investor attention. GSV serves as an appropriate proxy, as prior studies have used it to measure attention (e.g., Da et al. 2011; Drake et al. 2012; Bonetti et al. 2022). Using the identical search words, Panel B of Fig. 3 reveals that the highest combined GSV is again observed between December 5[11] and December 8, 2022 (see blue dot-dashed line in Panel B of Fig. 3).

4.3. Methodology

To assess how the European portfolio firms respond to the Norwegian SWF's announcement to vote against firms that fail to

[7] Portfolio firm names are obtained from the NBIM homepage: https://www.nbim.no/en/the-fund/investments/#/.

[8] We also run the event study using the estimation window sample between February 12 and December 18, 2022 (see Fig. 2). The event study results stay similar both in magnitude and statistical significance.

[9] As we employ the Fama/French European 3 Factor Model as a robustness test, we further download factor data from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[10] https://www.nbim.no/en/the-fund/investments/#/

[11] Since December 4, 2022 was a Sunday (i.e., no trading day), expanding the event window to December 4 does not change the results.

Table 1
. Descriptive Statistics.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Median	Pctl(75)	Max
Panel A—Event window sample								
TotalReturn	44,071	0.108	2.304	−38.675	−1.006	0.000	1.138	57.424
BenchReturn	44,071	0.045	0.933	−2.847	−0.416	−0.025	0.629	2.748
predRetrun	44,071	0.050	1.113	−7.331	−0.465	0.003	0.610	6.706
abnormalReturn	44,071	0.058	2.093	−41.346	−0.875	0.012	0.947	58.107
Panel B—Firm-level variables								
MarketCap	1169	9314	18,274	137	1126	2763	8066	113,522
VotingShare	1169	1.555	1.445	0.000	0.720	1.340	2.100	25.750
SustScore	1115	65.606	15.939	4.756	55.768	67.308	77.916	95.725
EmissionsScore	1109	68.362	24.273	0.000	53.833	73.889	88.141	99.942
WorkforceScore	1109	76.167	18.658	4.286	64.245	80.429	91.199	99.915
ManagementScore	1109	67.468	22.135	3.488	51.423	70.538	86.212	99.926

Notes: This table shows descriptive statistics. N is the number of observations; St.Dev. is the standard deviation; Min is the minimum value; Pctl(25) is the 25 percent quantile; Pctl(75) is the 75 percent quantile: Max is the maximum value. MarketCap is shown in billion USD. USD are used because different currencies (e.g., Swiss franc or Norwegian krone) in Europe exist. The variable MarketCap, is winsorized at the 1st and 99th percentile to reduce the effect of outliers. A firm can be a portfolio firm even if the VotingShare is 0.00 % as the Norwegian SWF can hold shares that do not have a voting right. All variables are defined in Appendix 1.

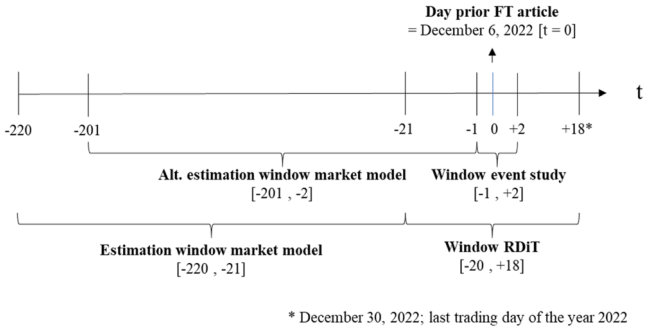


Fig. 2. Market Model and Event Study Windows.

perform well on sustainability issues (Hypothesis 1), we use the event study methodology in the derived event window [−1 day; +2 days] with December 6 as day [0]. This methodology is widely used in accounting, finance, and management research (see e.g., Gillan and Starks 2000; Krüger 2015; Flammer 2021; Liu et al. 2018; Wai Kong Cheung 2011). For the event window, we are interested in the CARs that are calculated as follows. We estimate the market model coefficients a_i and β_i using an Ordinary Least Square (OLS) estimator on 200 trading days starting on January 26 and ending on November 7, 2022. This period depicts the estimation window [−220; −21] of the market model (see Fig. 2). Nevertheless, we also calculate CARs for an alternative, i.e., a narrower estimation window [−201; −2]. All results stay qualitatively the same in magnitude and significance level when using this alternative window.

The market model is used to calculate the CARs. Therefore, we first estimate the following regression model for the estimation window [−220; −21]:

$$R_{it} = a_i + \beta_i \, x \, R_{mt} + \varepsilon_{it}$$

where R_{it} is the return of firm i on trading day t and R_{mt} is the market return of the STOXX Europe 600[12] on trading day t. The market model intercept is a_i, β_i is a firm-specific coefficient, and ε_{it} is the error term. Next, using the event study window [−1; +2], we calculate the predicted returns $\widehat{R}_{it}$ for all firms:

$$\widehat{R}_{it} = \widehat{a}_i + \widehat{\beta}_i \, x \, R_{mt}.$$

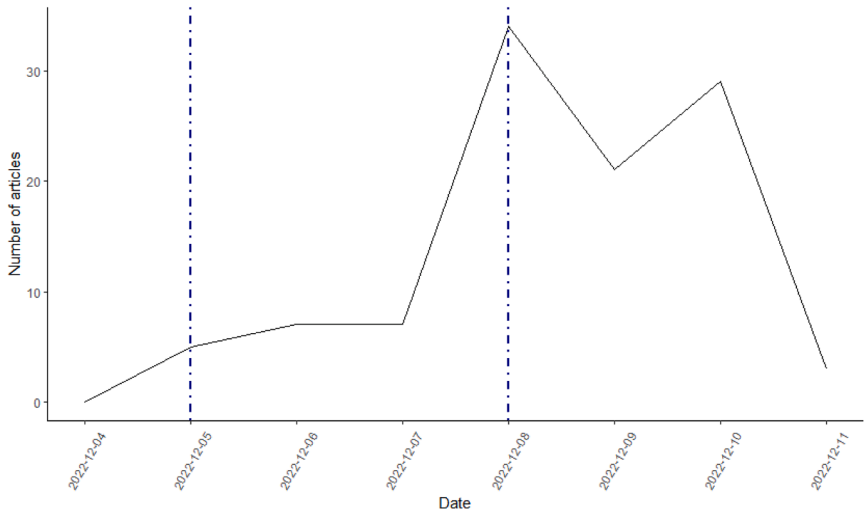
After that step, we observe $\widehat{R}_{it}$ for firm i on trading day t, and daily ARs are calculated as follows:

$$AR_{it} = R_{it} - \widehat{R}_{it}.$$

In the final step, we calculate the CAR for firm i in the event study window [−1; +2]. We draw inference from a t-statistic and a Wilcoxon Signed Rank test (Bauer 1972). To examine heterogeneous announcement effects across portfolio firms with high and low

[12] Prior studies show that using global stock market indices provides similar results as country-specific stock market indices (see. e.g., Flammer 2021).

Panel A: Factiva news search



Panel B: Google search volume

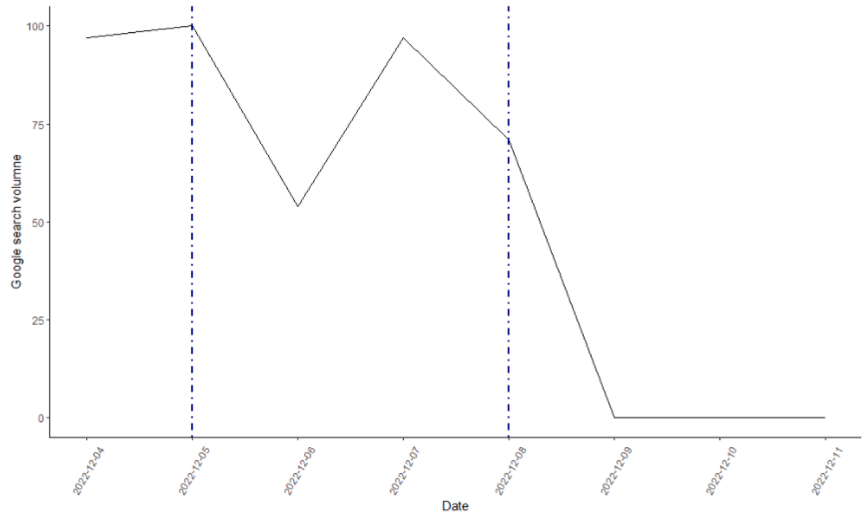


Fig. 3. Event Selection Process

Notes: In Panel A, the solid line displays the number of news articles by Factiva for the search words "Norwegian sovereign wealth fund", "Norwegian oil fund", and "Oil fund Norway", respectively. In Panel B, the solid line displays the combined Google search volume (GSV) for the identical search words, respectively.

Table 2
CAR – Stock market reaction in Europe for portfolio firms held by the Norwegian SWF.

Window	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−5; −2]	1169	0.0655	0.5655	−1.7104	1.72132	(− or +)
[−1; +2]	1169	−0.4252***	−3.7631	−2.2141	1.4520	(−)***
[+3; +6]	1169	−0.0425	−0.3512	−1.9236	1.7054	(− or +)

Notes: This table presents the CARs around the media announcement for firms in the Norwegian SWF portfolio. The analysis considers three windows: the event window [−1, +2], the pre-event window [−5, −2], and the post-event window [+3, +6]. The columns Mean, 1st Quartile, and 3rd Quartile display the mean, 25th, and 75th percentile CAR, respectively. The column *t*-Stat shows mean-difference test statistic. The Wilcoxon Signed Rank test, displayed in column Sign test, is a test of the mean CAR is negative (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

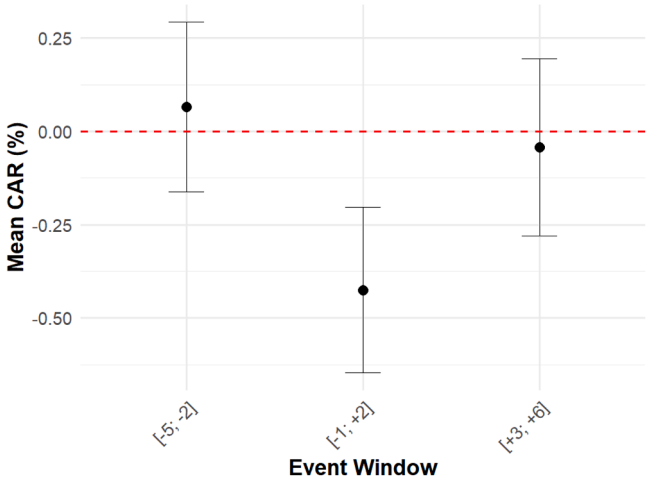


Fig. 4. Stock market reaction in Europe for portfolio firms held by the Norwegian SWF
Notes: This figure depicts the mean CAR (in %) and 95 % confidence intervals for the Norwegian SWF's announcement in the event window [−1, +2], the pre-event window [−5, −2], and the post-event window [+3, +6].

sustainability performance (Hypothesis 2), we divide the sample based on the industry-median sustainability performance.[13]

5. Results

5.1. Event study results

5.1.1. Overall announcement effect

Regarding Hypothesis 1, Table 2 and Fig. 4 provide the results for the event study window [−1; +2], a pre-event window [−5; −2], and a post-event window [+3; +6] with December 6, 2022 (the identified event day; see Fig. 3) as day [0], respectively. The event window CAR [−1; +2] is −0.43 % and is statistically significant at the 1 % level while we do not find a significant effect for the pre- and post-event window. The negative CAR in combination with the very narrow event window implies that the Norwegian SWF announcement triggered a negative response for European portfolio firms. Regarding the economic relevance, the mean 4-trading day CAR of −0.43 % and mean market capitalization of USD 9.3 billion adds up to an average loss in firm value of USD 39.99 million.[14]

The findings support Hypothesis 1 and relate to the shareholder engagement literature as follows. Investors engage with portfolio firms when they recognize a need for improvement in particular areas, such as sustainability issues (Hirschman 1970; McCahery et al. 2016). Accordingly, the negative effect around the Norwegian SWF announcement indicates that stock market participants perceive

[13] This is a common approach in event study designs. For instance, Flammer (2013) splits the sample into three decades to observe the change in CARs over time.

[14] We also conducted the overall analysis for non-portfolio firms (see Table OA1 in the Online Appendix). The results indicate that the effect persists and is even more pronounced in the event window [−1; +2], suggesting a spillover effect for non-portfolio firms. Additionally, we matched non-portfolio firms to their nearest neighbors among portfolio firms based on revenue, return on equity (ROE), total liabilities, total assets, and sustainability score (see Table OA2 in the Online Appendix). This analysis shows a negative announcement effect for both portfolio and non-portfolio firms (see Table OA3 in the Online Appendix). However, these results should be interpreted with caution due to the substantial reduction in the number of non-portfolio firms. We therefore encourage future research to examine the potential spillover effects in greater detail, using a larger sample of non-portfolio firms.

the announcement as new information of poor sustainability performance and respond negatively. This finding is in line with the view that corporate sustainability is a form of value-maximizing governance mechanism that contributes not only to societal goals but also enhances shareholder value (Ferrell et al. 2016). As such, the announcement in the FT signals the need for the Norwegian SWF to address the poor sustainability performance of its portfolio firms. This leads investors to reallocate capital away from these firms, reinforcing the notion that sustainability practices are integral to long-term shareholder value creation.

5.1.2. Heterogeneous effects across high and low sustainability-performing firms

Regarding Hypothesis 2, we begin our analysis by calculating the industry median for the variable *SustScore*, serving as our proxy for sustainability performance. We define *high* sustainability-performing firms as those with a *SustScore* above the industry median and all remaining firms as *low* sustainability performance firms. With *SustScore* data available for 1115 portfolio firms, the sample size is slightly reduced, though this has no implications for the comparability of the results. For instance, the mean abnormal return is 0.06 % in the estimation window sample (see Table 1), while for the 1115 portfolio firms for which we observe *SustScore* data, the mean abnormal return is 0.05 %.

Table 3 reports the event study results for high (in Panel A) and low sustainability-performing firms (in Panel B). As can be seen in Panel A, there is no (negative or positive) announcement effect for high sustainability-performing firms within the event window [−1; +2]. In contrast, Panel B reveals a significant negative effect of −0.65 % for low-performing firms within the event window. This implies that the negative overall effect (i.e., −0.43 %) observed in our main analysis (see Table 2) is driven by portfolio firms with low sustainability performance. Fig. 5, which shows the average abnormal returns across the four event window days (December 5 to 8), supports this by illustrating that the abnormal returns on the event day (December 6) are significantly lower for the low sustainability performance group compared to the high sustainability performance group. This difference remains significant when comparing the CARs of high and low-performing firms (difference in average CARs = −0,52 %, $p < 0.05$). Additionally, the lack of significant stock market reactions at the 5 % confidence level in both the pre- and post-event windows further supports our choice of event window (see Fig. 3).

In Table 4, we provide the results for *EmissionsScore, WorkforceScore*, and *ManagementScore*, which serve as proxies for the announcement topics net zero targets, salary gap, and board diversity. Panels A and B of Table 4 show that there is a negative stock market reaction for firms with emissions or workforce scores below the industry median but not for high-performing firms. In Panel C, the results for the management score are inconclusive, pointing to the debate about whether corporate governance is a product of managerial rent extraction or value-maximizing contracts between managers and shareholders (Larcker et al. 2011). The higher variety of corporate governance issues (spanning from audit committee independence to board diversity or executive sustainability compensation incentives) might depict another reason for the inconclusive results regarding the management score.

Overall, the results support Hypothesis 2 and imply that good sustainability performance mitigates negative investor reactions after a broad-based public sustainability engagement. Moreover, our results indicate that indirect engagement exerts greater pressure on portfolio firms with low sustainability performance, as the negative stock market reaction is concentrated within this group. Our findings are in line with and expand prior studies, which provide evidence that positive (negative) news concerning a firm's environmental performance causes positive (negative) stock market reactions (Klassen and McLaughlin 1996; Flammer 2013). In the social pillar, firms treating their employees well show superior long-run stock returns (Edmans 2011).

6. Auxiliary analyses

6.1. Norwegian SWF's voting share

In this section, we examine whether the Norwegian SWF's voting share in portfolio firms moderates the observed negative market reaction among firms with low sustainability performance. A high voting share implies potential improvements in future sustainability performance through increased (successful) engagement, suggesting a long-term positive effect on stock prices due to enhanced firm prospects (see for engagement success, e.g., Barko et al. 2022; Chen et al. 2020). At the same time, a higher voting share is linked to intensified focus and monitoring efforts by the Norwegian SWF (Iliev et al. 2021), leading to a more reliable evaluation of the actual sustainability performance, indicating a short-term negative effect. This clearer performance picture, given that we focus on portfolio firms with low sustainability performance, is likely to be perceived as negative news by investors and triggers a more pronounced negative stock market reaction. Taken together, the stock market reaction in high voting share firms remains ex-ante ambiguous.[15] To shed light on this empirically unanswered question, we exploit voting share data provided on the NBIM homepage.[16] First, we calculate the median voting share of the Norwegian SWF in our portfolio firms, which is 1.34 %. We then divide the sample of 564 low sustainability-performing firms into two groups: firms with a voting share above 1.34 %—designated as the high voting share group—and the remaining firms as the low voting share group.

Table 5 presents the results of the event study for both groups. The negative stock market reaction is no longer significant (at the 5 % significance level) for low sustainability-performing firms in which the Norwegian SWF has a relatively low voting share (−0.43 %, p

[15] An alternative possibility is that investors may not consider the Norwegian SWF's voting share in their investment decisions. If this is the case, we would expect the voting share to have no measurable impact on stock returns. This scenario serves as our null hypothesis, against which we test the alternative voting share effects.

[16] https://www.nbim.no/en/the-fund/investments/#/

Table 3
Heterogeneous stock market reactions across portfolio firms

Panel A: CAR – Stock market reaction for portfolio firms with above median *SustScore*						
Window	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−5; −2]	551	−0.1053	−0.8271	−1.7240	1.3614	(− or +)
[−1; +2]	551	−0.1338	−0.9852	−1.8572	1.5612	(− or +)
[+3; +6]	551	−0.2443*	−1.8229	−1.8338	1.3164	(−)*
Panel B: CAR – Stock market reaction for portfolio firms with below median *SustScore*						
Window	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−5; −2]	564	0.0477	0.2477	−1.7812	1.9446	(− or +)
[−1; +2]	564	−0.6549***	−3.5403	−2.5484	1.1917	(−)***
[+3; +6]	564	0.1032	0.4981	−2.0739	1.9368	(− or +)

Notes: This table presents the CARs around the media announcement for portfolio firms with *SustScore* above (Panel A) or below (Panel B) the industry median sustainability performance. The analysis considers three windows: the event window [−1, +2], the pre-event window [−5, −2], and the post-event window [+3, +6]. The columns Mean, 1st Quartile, and 3rd Quartile display the mean, 25th, and 75th percentile CAR, respectively. The column *t*-Stat shows mean-difference test statistic. The Wilcoxon Signed Rank test, displayed in column Sign test, is a test of the mean CAR is negative (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

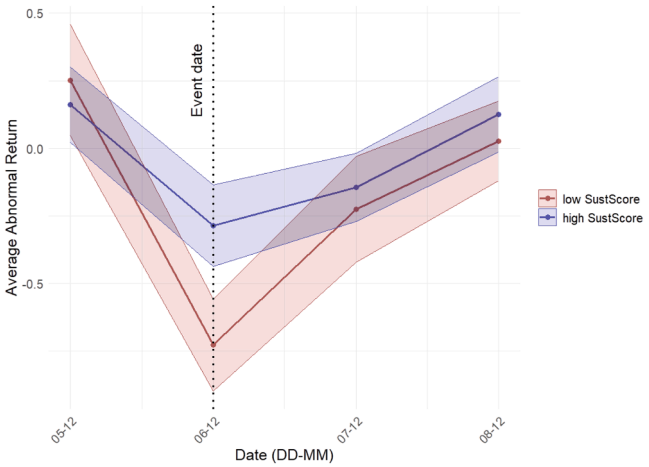


Fig. 5. Stock market reaction for portfolio firms conditional on sustainability performance
Notes: This figure depicts the average abnormal returns (in %) and 95 % confidence intervals for the Norwegian SWF's announcement, comparing high and low sustainability-performing firms between December 5 and December 8, with the event data centered on December 6.

< 0.10) but is more negative for firms with a relatively high voting share (−0.96 %, $p < 0.01$). In a further untabulated test, we find that the Norwegian SWF's voting share is not relevant when focusing on high sustainability-performing firms (i.e., above the industry median). Focusing on firms with low performance in the *EmissionsScore, WorkforceScore*, and *ManagementScore*, we rerun the event study in the voting share setting. Table 6 presents the results, revealing that the negative effect is again concentrated among low-performing firms where the Norwegian SWF holds a larger share. In this test, firms with a low *ManagementScore* and a high voting share also show significant negative abnormal returns. In sum, the results suggest that investors tend to avoid low-performing portfolio firms with a high Norwegian SWF voting share. In line with our short-term effect argument, investors seem to anticipate that increased monitoring leads to a more accurate evaluation of actual sustainability performance and are, thus, more likely to divest from high voting share firms with low sustainability performance, amplifying the negative stock market reaction.

6.2. ESG score uncertainty

Finally, given the nascent evidence of ESG score divergence (e.g., Berg et al. 2022) and its impact on investors' decision-making (Avramov et al. 2022), we assess whether ESG score uncertainty influences investors' decision-making in our setting. We follow

Table 4
Heterogeneous stock market reactions across E, S, and G performance

Panel A: CAR – EmissionsScore							
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	Above median	548	−0.1510	−1.1882	−1.8220	1.3610	(− or +)
[−1; +2]	Below median	561	−0.6260***	−3.2562	−2.6840	1.5302	(−)***
Panel B: CAR – WorkforceScore							
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	Above median	547	−0.0709	−0.5273	−1.7317	1.6233	(− or +)
[−1; +2]	Below median	562	−0.7031***	−3.7639	−2.6931	1.1875	(−)***
Panel C: CAR – ManagementScore							
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	Above median	550	−0.3781**	−2.5434	−2.0341	1.4570	(−)**
[−1; +2]	Below median	559	−0.4042**	−2.2757	−2.2731	1.4599	(−)**

Notes: This table presents the CARs around the media announcement for portfolio firms with *EmissionsScore, WorkforceScore*, and *ManagementScore* above or below the industry median performance. The analysis considers the event window [−1, +2]. The columns Mean, 1st Quartile, and 3rd Quartile display the mean, 25th, and 75th percentile CAR, respectively. The column *t*-Stat shows mean-difference test statistic. The Wilcoxon Signed Rank test, displayed in column Sign test, is a test of the mean CAR is negative (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table 5
Norwegian SWF voting share and portfolio firms' sustainability performance.

Panel A: CAR – Below median *SustScore*							
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	High Voting	238	−0.9633***	−3.2959	−2.5399	1.0218	(−)***
[−1; +2]	Low Voting	326	−0.4296*	−1.8044	−2.5770	1.3894	(−)***

Notes: This table presents the CARs around the media announcement for portfolio firms in which the Norwegian SWF holds a high voting share (i.e., above the median vote share) conditional on portfolio firms' sustainability performance (i.e., *SustScore* score above and below the median). The analysis considers the event window [−1, +2]. The columns Mean, 1st Quartile, and 3rd Quartile display the mean, 25th, and 75th percentile CAR, respectively. The column *t*-Stat shows mean-difference test statistic. The Wilcoxon Signed Rank test, displayed in column Sign test, is a test of the mean CAR is negative (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table 6
Additional analysis – Voting and low E, S, and G performance

Panel A: CAR – Low EmissionsScore							
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	High Voting	283	−0.8359***	−3.1813	−2.5284	1.4462	(−)***
[−1; +2]	Low Voting	278	−0.4112	−1.4679	−2.7666	1.8586	(−)**
Panel B: CAR – Low WorkforceScore							
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	High Voting	261	−0.9286***	−3.4240	−2.7233	1.0617	(−)***
[−1; +2]	Low Voting	301	−0.5076**	−1.9714	−2.6011	1.4975	(−)***
Panel C: CAR – Low ManagementScore							
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	High Voting	219	−0.6106**	−1.9938	−2.3588	1.4632	(−)**
[−1; +2]	Low Voting	340	−0.2713	−1.2595	−2.1196	1.3974	(−)**

Notes: This table presents the CARs around the media announcement for portfolio firms in which the Norwegian SWF holds a high voting share (i.e., above the median vote share) conditional on portfolio firms' E, S, or G performance. The analysis considers the event window [−1, +2]. The columns Mean, 1st Quartile, and 3rd Quartile display the mean, 25th, and 75th percentile CAR, respectively. The column *t*-Stat shows mean-difference test statistic. The Wilcoxon Signed Rank test, displayed in column Sign test, is a test of the mean CAR is negative (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Avramov et al. (2022) in constructing our uncertainty measure. However, data availability constraints restrict our measure to ESG scores provided by Refinitiv, MSCI, and Sustainalytics. We first sort our portfolio firms from the best to the worst performance[17] for the three scores and then calculate a normalized percentile rank (between zero and one) for each ESG score and stock. Using the calculated percentile ranks, we compute three uncertainty scores, each representing the standard deviation between the respective pair of ESG scores, e.g., between the Refinitiv and MSCI scores. In the final step, we calculate average ESG uncertainty if at least two uncertainty scores are available. We observe this uncertainty score for 1011 portfolio firms and the mean ESG score uncertainty (*ESGuncertainty*) in our sample is 0.199, which is lower than the average uncertainty of 0.52 reported by Avramov et al. (2022). We attribute this to the fact that our study includes a smaller set of ESG scores, a reduced sample of firms, and a shorter time period. To contextualize our ESG score uncertainty results, we refrain from using our previous measure for sustainability performance, i.e., *SustScore*. Instead, we calculate sustainability performance (*SustCombined*) as the mean rank across the three ESG scores from Refinitiv, MSCI, and Sustainalytics.

To test the ESG score uncertainty effect, we first split the sample at the median of the overall uncertainty measure *ESGuncertainty* into a high and low uncertainty sample. Within both samples, we again divide the firms into high and low sustainability-performing firms. Table 7 shows the event study results and reveals that firms with low ESG score uncertainty and low sustainability performance (*SustCombined*) show the most negative market reaction (-0.87 %, $p < 0.01$). Since low ESG score uncertainty allows investors to form a more accurate view of a firm's sustainability performance, they shy away from low-performing firms following the Norwegian SWF's announcement. Interestingly, high ESG score uncertainty leads to insignificant returns for firms with high and low sustainability performance, implying that it helps low-performing firms to mask their sustainability performance. Therefore, our results support efforts by European policymakers to regulate and harmonize ESG scores (European Commission 2024; Reuters 2024), facilitating more effective resource allocation toward sustainable firms.

7. Robustness tests

7.1. Different event study settings

To further strengthen the robustness of the previous results, we conduct several robustness tests. First, ARs are winsorized on the 1st and 99th percentile to mitigate the impact of outliers. Next, since the two-digit FTSE RUSSEL ICB industry code includes investment banking and brokerage service firms—which also engage with portfolio firms—we exclude financial firms. Finally, due to a public holiday in Finland on December 6, we exclude all Finish firms. As can be seen in Table 8 (Panels A to C), CARs in the event window stay qualitatively the same. As extreme events (e.g., the Russian invasion of Ukraine) in the estimation window might bias market model coefficients, we apply the stricter Fama/French European 3 Factor Model based on Fama and French (1993). We obtain factor data from the Kenneth French website[18] and show the results in Appendix 2, which stay qualitatively the same although they indicate that the market model underestimates the effect size. Overall, the robustness tests support our previous results.

7.2. Regression discontinuity in time

By conducting the above event studies, we caution that the observed CARs do not allow a causal interpretation due to endogeneity concerns. Other unobserved factors or news within the event window—even though it was chosen very narrowly—might trigger the negative effect. To mitigate endogeneity concerns, we apply an RDiT design. Compared to the standard regression discontinuity (RD) design, which uses a cross-sectional threshold, such as firm size or vote shares,[19] RDiT designs use time, i.e., a treatment date, as a threshold (Hausman and Rapson 2018). In our setting, the FT[20] published their article concerning the Norwegian SWF's new voting strategy on December 7. Given potential information leakages and anticipation effects of well-informed investors (Grewal et al. 2019), market participants should have been aware of the new voting behavior the day before (consistent with our previous event window and event date selection; see Fig. 3). For this reason, we define December 6 as the threshold in time.

According to Hausman and Rapson (2018), we see important conditions for the application of an RDiT design fulfilled. First, there is no cross-sectional variation in the announcement. Therefore, no (clear) control group is available,[21] and a difference-in-difference design cannot be applied. Second, stock returns are available on a daily basis. Third, in the absence of the Norwegian SWF announcement, it is reasonable to assume that ARs of European portfolio firms and other time-varying confounders, on average, would have changed smoothly across the announcement date. Moreover, we solely rely on observations near the threshold (i.e., do not

[17] For the Refinitiv Combined Score the best performance is 100 (95.72 in our sample) and the worst is 0 (4.76 in our sample), for the Sustainalytics Rank, a sustainability risk score, the best performance is 0 (i.e., no risk; 4.67 is the lowest risk value in our sample) and the worst in our sample is 86.4, and the MSCI IVA, using a seven-tier rating scale, the best performance is AAA (also in our sample) and the worst is CCC (also in our sample).

[18] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[19] Size thresholds can be observed in sustainability reporting mandates and vote shares can be observed for shareholder proposals. For instance, see Flammer (2015) for a cross-sectional RD design using shareholder proposals.

[20] Besides defining the threshold, we argue that the publication in the FT (see Appendix 3) also indicates the relevance of the announcement. This is important since McWilliams and Siegel (1997) criticized that events in prior event studies were not noticed and published by newspapers relevant to stock market participants.

[21] As European non-portfolio firms differ significantly in characteristics such as size, capital structure, and sustainability performance, they do not represent a suitable control group.

Table 7
ESG score uncertainty.

Panel A: CAR – Above median ESG score uncertainty							
Window	Percentile	N	Mean(%)	*t*-Stat	1st Quartile(%)	3rd Quartile(%)	Sign test
[−1; +2]	High SustCombined	235	−0.1369	−0.7101	−1.7627	1.4075	(− or +)
[−1; +2]	Low SustCombined	271	−0.0989	−0.3353	−2.2162	2.1269	(− or +)
Panel B: CAR – Below median ESG score uncertainty							
Window	Percentile	N	Mean(%)	*t*-Stat	1st Quartile(%)	3rd Quartile(%)	Sign test
[−1; +2]	High SustCombined	268	−0.3978**	−2.0839	−1.9406	1.3868	(−)*
[−1; +2]	Low SustCombined	237	−0.8720***	−3.3924	−2.5958	1.0511	(−)***

Notes: This table presents the CARs around the media announcement for portfolio firms with high ESG score uncertainty (i.e., above the median uncertainty) and low ESG score uncertainty (i.e., below the median uncertainty). The analysis considers the event window [−1, +2]. The columns Mean, 1st Quartile, and 3rd Quartile display the mean, 25th, and 75th percentile CAR, respectively. The column *t*-Stat shows mean-difference test statistic. The Wilcoxon Signed Rank test, displayed in column Sign test, is a test of the mean CAR is negative (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table 8
Robustness test results.

Panel A: Winsorized CAR (1st and 99th percentile)						
Window	N	Mean (%)	*t*-Stat	1st Quartile(%)	3rd Quartile(%)	Sign test
[−1; +2]	1169	−0.3993***	−4.1431	−2.1974	1.4356	(−)***
Panel B: CAR – Exclude financial firms						
Window	N	Mean (%)	*t*-Stat	1st Quartile(%)	3rd Quartile(%)	Sign test
[−1; +2]	986	−0.4729***	−3.928	−2.2920	1.4313	(−)***
Panel C: CAR – Exclude Finish firms (Public holiday on December 6)						
Window	N	Mean (%)	*t*-Stat	1st Quartile(%)	3rd Quartile(%)	Sign test
[−1; +2]	1128	−0.3986***	−3.4320	−2.1983	1.4836	(−)***

Notes: This table reports CARs around the media announcement considering the event study window [−1; +2] and specified robustness test settings, respectively. The columns Mean, 1st Quartile, and 3rd Quartile display the mean, 25th, and 75th percentile CAR, respectively. The column *t*-Stat shows mean-difference test statistic. The Wilcoxon Signed Rank test, displayed in column Sign test, is a test of the mean CAR is negative (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

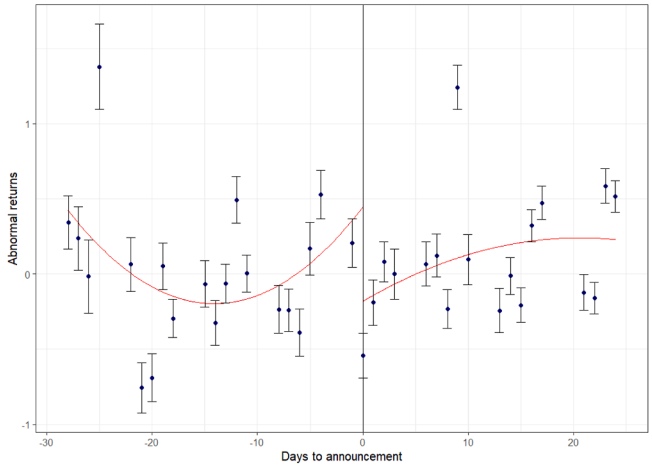
expand *T*) to mitigate the potential bias of unobservable confounding events. Finally, we use a large panel dataset of portfolio firms (i.e., a large N) to investigate the announcement effect.

In our RDiT design, identification of the potential causal effect of the Norwegian SWF announcement stems from the discontinuous change in information available to stock market participants on December 6 (i.e., as a sharp threshold in time). Thus, we exploit a sharp RDiT design around the announcement with days *t* as the running variable in the RDiT window [−20; +18] (see Fig. 2). More precisely, estimation is conducted using a nonparametric local linear ($p = 1$) and second-order polynomial ($p = 2$) form with a triangular kernel to show the relation between the running variable *t* and the outcome variable AR. Moreover, we apply a mean squared error (mserd) optimal bandwidth selection (Imbens and Kalyanaraman 2012) without controls and calculate bias-corrected standard errors following Calonico et al. (2014) to provide a robust coefficient of the average treatment effect (ATE).

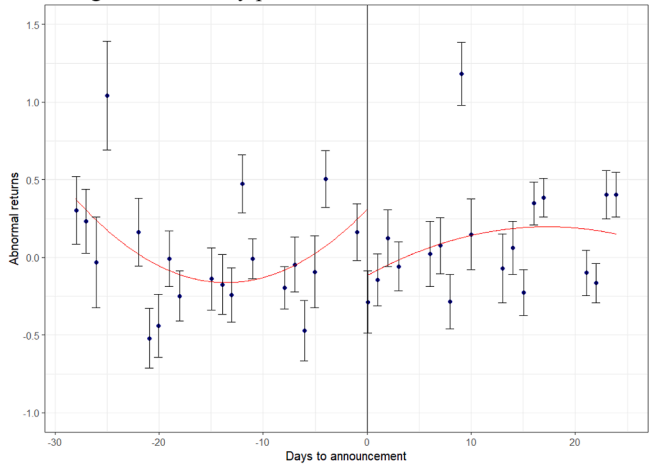
We start the interpretation of the RDiT results with a graphical examination of discontinuities in the outcome variable AR. Panel A of Fig. 6 plots average values of portfolio firms' AR, 99 percent confidence intervals, and evenly spaced bins with *Days to announcement* as the running variable. As can be seen, there is a discontinuity in portfolio firms' AR on December 6, which is our event date. These results indicate that investors responded to the announcement negatively, which is consistent with the previous event study results. Panel B provides the RDiT plots for high sustainability performance firms and Panel C for low performance firms (based on *SustScore*). As can be seen, the negative effect is stronger for low performance firms and, thus, the RDiT results support our previous findings.

Table 9 reports the ATE for the described RDiT designs (i.e., nonparametric local linear in Panel A and second-order polynomial in Panel B). The total number of daily ARs is 44,071, and the effective number used after optimal bandwidth selection is 2338 observations before and 4634 observations after the discontinuity point. As can be seen, both designs reveal a negative ATE after the announcement. More precisely, at the threshold, ARs are −0.44 % in the local linear design (see Panel A1) and somewhat smaller in the second-order polynomial design −0.40 % (see Panel A2). Nevertheless, both ATEs are significant in the robust setting proposed by Calonico et al. (2014) and are similar in magnitude for both the first- and second-order polynomial specifications, mitigating concerns

Panel A: All portfolio firms



Panel B: Portfolio firms with high sustainability performance



Panel C: Portfolio firms with low sustainability performance

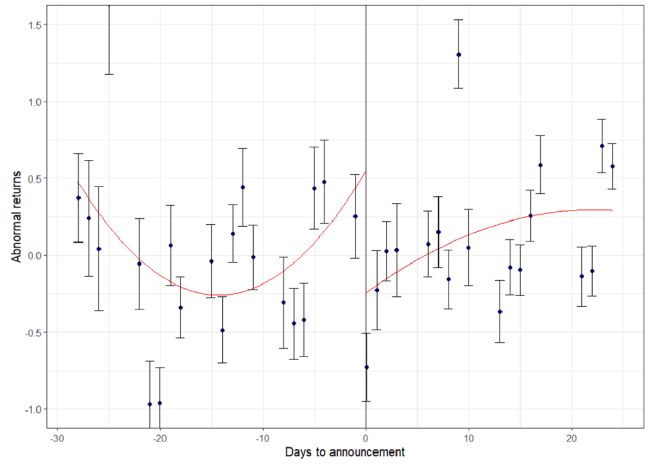


Fig. 6. RDiT – Stock market response to the Norwegian SWF announcement
Notes: This figure plots average values of portfolio firms' AR, 99 percent confidence intervals, and evenly spaced bins with Days to announcement as the running variable for the second-order polynomial ($p = 2$) form. Panel A shows the overall effect, Panel B shows the effect for portfolio firms with high sustainability performance (SustScore), and Panel C for low sustainability performance (SustScore).

Table 9
RDiT – Announcement effect.

Panel A: Overall effect						
	Panel A1: local linear ($p = 1$)			Panel A2: second-order polynomial ($p = 2$)		
Method	ATE	z	[95 % C.I.]	ATE	z	[95 % C.I.]
Bias-corrected	−0.439*** (0.099)	−4.452	[−0.663, −0.246]	−0.400** (0.171)	−2.336	[−0.735, −0.064]
Overall Obs.	44,071			44,071		
BW type	mserd			mserd		
Kernel	Triangular			Triangular		
Number of Obs.	23,333	20,738		23,333	20,738	
Eff. Number of Obs.	2338	4634		3507	4634	
Order est. (p)	1	1		2	2	
Order bias (q)	2	2		3	3	
Panel B: High sustainability performance						
	Panel B1: local linear ($p = 1$)			Panel B2: second-order polynomial ($p = 2$)		
Method	ATE	z	[95 % C.I.]	ATE	z	[95 % C.I.]
Bias-corrected	−0.277** (0.113)	−2.445	[−0.499, −0.055]	−0.307** (0.126)	−2.445	[−0.554, −0.061]
Overall Obs.	20,800			20,800		
BW type	mserd			mserd		
Kernel	Triangular			Triangular		
Number of Obs.	11,012	9788		11,012	9788	
Eff. Number of Obs.	1653	2183		3306	4938	
Order est. (p)	1	1		2	2	
Order bias (q)	2	2		3	3	
Panel C: Low sustainability performance						
	Panel C1: local linear ($p = 1$)			Panel C2: second-order polynomial ($p = 2$)		
Method	ATE	z	[95 % C.I.]	ATE	z	[95 % C.I.]
Bias-corrected	−0.665*** (0.163)	−4.568	[−0.985, −0.346]	−0.706** (0.280)	−2.519	[−1.255, −0.157]
Overall Obs.	21,242			21,242		
BW type	mserd			mserd		
Kernel	Triangular			Triangular		
Number of Obs.	11,259	9983		11,259	9983	
Eff. Number of Obs.	1128	2239		1692	2239	
Order est. (p)	1	1		2	2	
Order bias (q)	2	2		3	3	

Notes: This table reports the ATE for all portfolio firms around the announcement and the ATE for high and low sustainability-performing firms, respectively. The column *ATE* shows the average ARs at the threshold December 6. In brackets and in column *z*, Calonico et al. (2014) proposed standard errors and test statistics are shown. *[95 % C.I.]* shows the respective 95 % confidence interval. (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

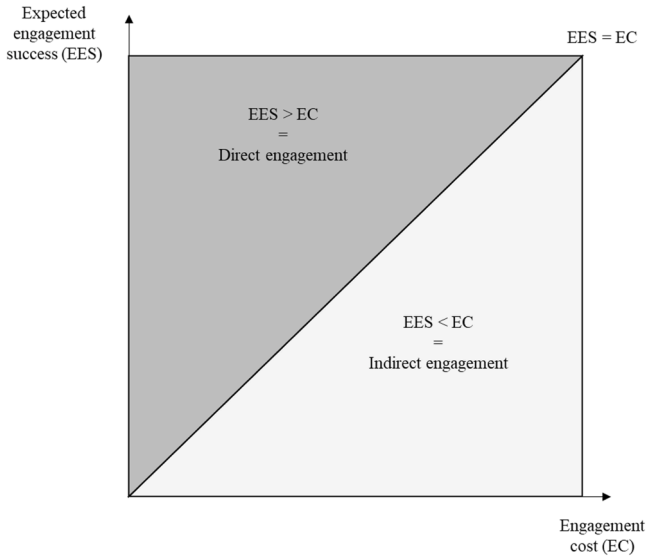


Fig. 7. A multifacet approach – The combination of direct and indirect sustainability engagement.

of overfitting. Overall, the results support the previous event study results and indicate that stocks of portfolio firms respond negatively to the Norwegian SWF's broad-based public sustainability engagement (i.e., suggest a causal link). Moreover, we report the ATEs for high (see Panel B) and low (see Panel C) sustainability-performing firms (based on *SustScore*) in Table 9. The results support our event study findings. Collectively, our RDiT results mitigate endogeneity concerns.

8. Discussion and conclusion

This study is the first to examine the stock market response following a broad-based public sustainability engagement by the Norwegian SWF. Broad-based sustainability engagement, as opposed to more direct forms of engagement, such as private meetings with portfolio firms, is less cost-intensive, but evidence remains limited on its potential to exert pressure on firms. By conducting an event study, we find that the stocks of European portfolio firms respond negatively to the mere announcement of the Norwegian SWF to vote against low sustainability-performing firms. However, high overall sustainability performance, as well as high emissions and workforce scores, act as an insurance mechanism that protects firms against the negative announcement effect. Beyond that, our results suggest that negative returns are concentrated in low-performing firms where the SWF has a high voting share. Concerning ESG score uncertainty, our results reveal a strong negative stock market reaction for low sustainability firms when uncertainty is low, but no reaction when uncertainty is high. This implies that firms with low sustainability performance and high ESG score uncertainty can disguise their insufficient performance.

Our results have three important practical implications. First, following a broad-based sustainability engagement, there is a negative stock market reaction in European firms that are part of the Norwegian SWF's portfolio. This implies that institutional investors can exert pressure on firms and discipline them. For this reason, combining traditional forms of direct sustainability engagement (that are primarily targeted towards large firms) with the indirect form of broad-based sustainability engagement seems to be a reasonable strategy to engage with firms. This approach is particularly beneficial because our results show that the negative effect after indirect engagement is concentrated in firms with low sustainability performance. In Fig. 7, we depict how the engagement decision of institutional investors should be made. If the expected engagement success (e.g., tones of CO_2 emission reduction or increase in board diversity) exceeds the cost of engagement (e.g., expenses for staff involved in the engagement process), investors should choose direct forms of engagement (e.g., private meetings; dark gray area in Fig. 7). However, if the cost is higher than the expected success, then investors should choose indirect engagement (light gray area in Fig. 7). Institutional investors should consider that the negative reaction is concentrated in firms where they hold a higher voting share, which could increase both the cost of indirect engagements and pressure on portfolio firms due to a decrease in market capitalization.

Second, our results show that superior sustainability performance provides an insurance-like mechanism for portfolio firms against indirect engagements of large institutional investors. In line with prior studies, which show that the effect occurs for firm-specific negative events (Shiu and Yang 2017) and macroeconomic shocks (Habermann and Fischer 2023), our results further justify

resource allocation to long-term strategic sustainability activities. Finally, our findings suggest that ESG score uncertainty allows low-performing firms to obscure their insufficient sustainability performance, potentially hindering capital flows toward (more) sustainable firms. This underscores the importance of current policy efforts to regulate and standardize ESG scores from a capital market perspective (Reuters 2024; European Commission 2024).

One limitation of this study is that it focuses solely on one event, i.e., the Norwegian SWF's announcement of a new voting strategy. Nevertheless, we argue that this study still provides valuable contributions to the literature. We support this claim by following Leuz (2022, p. 4) that we can learn from "narrower samples and particular settings in order to achieve identification" but we acknowledge that this limitation also underscores the need for further research in this area. Future studies could try to identify more broad-based public engagement events or even campaigns and, by doing so, provide larger-scale evidence on stock market reactions. Finally, future studies could use a different setting with a larger amount of non-portfolio firms to provide robust evidence on whether and to what extent non-portfolio firms are impacted by indirect engagement (i.e., spillover effects). Leaving the limitations aside, our study is the first to show the stock market reactions for European portfolio firms following a broad-based public engagement campaign of the largest SWF.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Florian Habermann reports financial support was provided by Swiss National Science Foundation. Florian reports financial support was provided by Bavarian Research Alliance GmbH. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We thank the Editor, the Associate Editor, an anonymous reviewer, seminar participants at Free University of Berlin, University of Bamberg, and participants at the EAA Annual Congress 2024 for their insightful comments and suggestions. Florian Habermann gratefully acknowledges the valuable comments and support of his PI Nicolas Rudolf and the Swiss National Science Foundation (Project No 220038). He further acknowledges funding from the Bavarian Research Alliance (BaylntAn_KUEI_2024_08).

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jebo.2025.106915.

Appendix 1

Variable	Description	Source
Returns		
TotalReturn	The variable TotalReturn incorporates the daily price change and any relevant dividends. Compounded daily return for the specified period is used to calculate TotalReturn and it's effectively the dividend reinvested TotalReturn methodology. The most recently completed trading day is set as the default period. The dividend type used is the most widely reported dividend for a market and it is either Gross or Net.	Datastream
BenchReturn	The variable BenchReturn incorporates the daily price change and any relevant dividends of the STOXX Europe 600 Index.	Datastream
PredRetrun	PredReturn is calculated as follows: $\widehat{R}_{i,t} = \widehat{a}_i + \widehat{\beta}_i \, x \, R_{m,t}$	Calculated
AbnormalReturn	AbnormalReturn is calculated as follows $AR_{i,t} = R_{i,t} + \widehat{R}_{i,t}$	Calculated
Sustainability variables		
SustScore	SustScore is an overall company score based on the self-reported information in the Refinitiv environmental, social and corporate governance pillars.	Eikon
EmissionsScore	Emission category score measures a company's commitment and effectiveness towards reducing environmental emission in the production and operational processes.	Eikon
WorkforceScore	Workforce category score measures a company's effectiveness towards job satisfaction, healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for its workforce.	Eikon
ManagementScore	Management category score measures a company's commitment and effectiveness towards following best practice corporate governance principles.	Eikon
SustCombined	SustCombined measures sustainability performance as the mean rank across the three ESG scores from Refinitiv, MSCI, and Sustainalytics.	Eikon, MSCI, and Sustainalytics
Other variables		
MarketCap	MarketCap (in Million USD) is the share price multiplied by the number of ordinary shares in issue. The amount in issue is updated whenever new tranches of stock are issued or after a capital change.	Datastream
VotingShare	Voting share held by the Norwegian SWF in the respective portfolio firm.	NBIM
ESGuncertainty	A measure representing the average standard deviation between the respective pair of ESG scores constructed following Avramov et al. (2022).	Eikon, MSCI, and Sustainalytics

Appendix 2

The table below shows the results of our main analysis recalculated using the Fama/French 3 Factor Model. Factor data is obtained from the Kenneth French website[22] and replicates all main analyses initially conducted using the market model.

Table A1

Table A1
Robustness test: Fama & French 3 factor model

Panel A: CAR – Stock market reaction in Europe for portfolio firms held by the Norwegian SWF						
Window	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	1169	−0.7575***	−6.5991	−2.5660	1.1794	(−)***
Panel B: CAR – Heterogeneous stock market reactions across portfolio firms						
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	High SustScore	551	−0.4517***	−3.2410	−2.1725	1.3226	(−)***
[−1; +2]	Low SustScore	564	−1.0045***	−5.3708	−2.8476	0.9595	(−)***
Panel C: CAR – Norwegian SWF voting share and below median *SustScore* portfolio firms						
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	High Voting	238	−1.3290***	−4.4806	−3.1671	0.7512	(−)***
[−1; +2]	Low Voting	326	−0.7676***	−3.1988	−2.6144	1.1125	(−)***
Panel D1: CAR – Above median ESG score uncertainty						
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	High SustCombined	235	−0.4871**	−2.4715	−2.1292	1.1265	(−)***
[−1; +2]	Low SustCombined	271	−0.3928	−1.3147	−2.9907	0.7706	(−)**
Panel D2: CAR – Below median ESG score uncertainty						
Window	Percentile	N	Mean (%)	*t*-Stat	1st Quartile (%)	3rd Quartile (%)	Sign test
[−1; +2]	High SustCombined	268	−0.7642***	−3.9179	−2.2652	1.2040	(−)***
[−1; +2]	Low SustCombined	237	−1.2266***	−4.6799	−2.8382	1.1794	(−)***

Notes: This table presents the CARs, calculated using the Fama/French 3 Factor Model, around the media announcement for firms in the Norwegian SWF portfolio. The analysis considers the event window [−1, 2]. The columns Mean, 1st Quartile, and 3rd Quartile display the mean, 25th, and 75th percentile CAR, respectively. The column *t*-Stat shows mean-difference test statistic. The Wilcoxon Signed Rank test, displayed in column Sign test, is a test of the mean CAR is negative (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

[22] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Appendix 3

The figure below provides an excerpt from the FT article that mentions the Norwegian oil fund's new strategy to vote against firms showing insufficient sustainability performance.

Norway's Oil Fund

Norwegian oil fund to vote against companies without net zero targets

Nicolai Tangen says $1.3tn sovereign wealth investor will also look at groups that overpay executives

Nicolai Tangen said: 'We can vote more against the companies where we have different expectations about how they behave' © Financial Times

Richard Milne in London YESTERDAY

The world's largest sovereign wealth fund will become a more vocal shareholder and plans to vote against companies that fail to set a net zero emissions target, overpay their top leaders, or do not have sufficiently diverse boards.

Nicolai Tangen, chief executive of the $1.3tn Norwegian oil fund, told the Financial Times' Global Boardroom event that the fund would become more aggressive on environmental, social and governance (ESG) issues as well as aim to be a more contrarian and long-term investor.

"Yes, we can be [more vocal] and I think we will be . . . we can vote more against the companies where we have different expectations about how they behave," Tangen said in London, a day before the fund unveils its new mid-term strategy.

Figure: FT article – Norwegian oil fund new voting strategy
Source: https://www.ft.com/content/d681cabf-3189–442c-a9ed-2fd51b2f68fd

Data availability

The authors do not have permission to share data.

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