

Do Public ESG Concerns Affect Firm Performance?*

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Abstract

This paper explores the impact of rising public concerns about ESG issues on firm performance. To quantify these concerns, we construct an ESG Concerns Index using Google search volume data. Our analysis reveals that as public ESG concerns rise, firms with higher ESG scores experience a significant increase in profitability, driven by improved profit margins. These effects are more pronounced for firms operating in industries with greater differentiation opportunities, highly competitive markets, and those with higher investments in R&D and Advertising.

Keywords: ESG, Public attention, Online search volume, Firm performance.

JEL Codes: G30; M14.

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1 Introduction

“From tobacco company to tobacco harm reduction company. Moving beyond smoking.”

— Altria Group, Inc., 2022 Annual Report

As public awareness of Environmental, Social, and Governance (ESG) issues continues to grow, firms are under increasing pressure to integrate sustainability into their strategic and operational decisions. This shift is evident even in industries often perceived as less ESG-aligned. Altria Group, Inc., for example, has strategically repositioned itself by developing smoke-free alternatives that are claimed to reduce health risks compared to conventional tobacco products. While some may argue that these efforts are not fully aligned with sustainability principles, such initiatives may be considered rational for firms in the tobacco industry to address growing ESG pressures. Rather than divesting its core business or adopting ESG solely as a marketing label, the company shifts toward harm-reduction products to sustain its operations and ensure long-term viability. This approach aligns with the concept of *rational sustainability* (Edmans, 2024), which emphasizes long-term value creation through strategic and evidence-based responses to business and societal expectations, and with the idea that firms cater to the demands of consumers and shareholders (e.g., Baker and Wurgler, 2004). The growing share of smoke-free products in Altria’s portfolio not only reflects market acceptance but also contributes positively to the company’s financial performance.¹ Recent industry reports support this trend, showing that ESG-related products experienced 28% cumulative sales growth between 2017 and 2022, outpacing the 20% growth of non-ESG products. In addition, consumers are increasingly willing to pay a

¹According to Altria Group’s 2022 annual report, the profit margin for smoke-free products (66.3%) is higher than that of smokeable products (59.0%). Another example of a company transitioning towards sustainability is Ford, which offers gasoline, hybrid, and electric vehicles. In its 2024 Integrated Report, Ford emphasized that “customers are increasingly going electric through Ford Pro, a nearly \$60 billion industry-leading business that is helping streamline their path to electrification.” Ford Pro’s strong performance was reflected in its financial results, with the segment doubling its EBIT to \$7.2 billion in 2023, driven by increased adoption of digital services, software solutions, and fleet electrification. Supporting this transition, in February 2023, the US Postal Service announced the purchase of 9,250 E-Transit vans as part of its effort to electrify the country’s largest federal fleet.

green premium for sustainable products.² This shift in consumer preferences creates strong economic incentives for firms to launch sustainable products.

Prior research has extensively examined the relationship between ESG practices and financial performance (Gillan et al., 2021). Although many studies report a positive correlation between ESG performance and profitability (Lins et al., 2017; Cao et al., 2019; Cornett et al., 2016), others find less conclusive or contradictory effects (Di Giuli and Kostovetsky, 2014; Bhandari and Javakhadze, 2017). These mixed results may reflect that the impact of ESG efforts can vary depending on stakeholder expectations, which can vary over time (Pástor et al., 2021; Pelster et al., 2024; Whitson et al., 2014).

Empirical studies on stock returns show that firms with higher ESG scores outperform those with lower scores during periods of increased ESG concerns (Ardia et al., 2022; Choi et al., 2020; El Ouadghiri et al., 2021; Kvam et al., 2024; Santi, 2023; Serafeim, 2020; Yan et al., 2025). According to Pástor et al. (2021), this outperformance can be explained through two channels: (1) the *cash flow channel*, where sustainable firms benefit from increased revenue due to consumer preference for ESG-aligned products; and (2) the *discount rate channel*, where a reduction in the discount rate occurs as investors show a preference for sustainable investments. Although much of the literature focuses on the discount rate channel, fewer studies explore how public ESG concerns affect firm performance through cash flows. This paper addresses this gap by examining whether elevated public ESG concerns improve financial performance in firms with high ESG scores.

To examine this research question, we use quarterly data on US firms and develop a novel index for public ESG concerns. Drawing on previous studies that use Internet search data to capture changes in attention and sentiment (Da et al., 2011, 2015; Kvam et al., 2024; Choi et al., 2020), we construct an ESG Concerns Index based on Google search volume data. This index captures public concerns by tracking search frequency for ESG-related

²A joint report by McKinsey & Company and NielsenIQ "Consumers care about sustainability—and back it up with their wallets" and the World Economic Forum, in collaboration with Boston Consulting Group, "Winning in Green Markets: Scaling Products for a Net Zero World" show that consumers are willing to pay a green premium of up to 7% for sustainable products.

terms. Previous research has shown that Internet search volume is a robust predictor of economic behavior and public sentiment (Choi and Varian, 2012; Goel et al., 2010; Wu and Brynjolfsson, 2015; Vicente et al., 2015).³ Our index construction process involves identifying ESG-related terms from the literature (Dimson et al., 2015; Baier et al., 2020; Choi et al., 2020; El Ouadghiri et al., 2021; Kvam et al., 2024; Santi, 2023) and refining them through related search queries on Google Trends. We include the 20 most relevant terms for each ESG category and compute a standardized index using deviations from 12-month medians, aggregated quarterly to match financial reporting periods.

Using US firm-level financial data from Compustat (2004–2022), we analyze how the interaction between ESG scores and ESG concerns influences profitability, measured by return on assets (ROA). We find that the positive relationship between ESG scores and ROA is amplified when ESG concerns are high, an effect that is driven by higher profit margins rather than increased asset turnover. Importantly, these gains are persistent: when ESG concerns decline, financial performance remains stable. This pattern is consistent with the view that firms use ESG to differentiate their products (McWilliams and Siegel, 2001; Albuquerque et al., 2019), making their offerings more attractive when public sustainability concerns rise and allowing them to sustain higher margins.

To further validate this mechanism, we conduct industry-level analyses and find that the interaction between ESG scores and ESG concerns is more pronounced in industries with greater opportunities for product differentiation. We also examine our results in contexts where ESG-based differentiation is likely to be more effective, specifically firms’ competitive environments and differentiation capabilities. Consistent with theories of product differentiation under competitive pressure (Flammer, 2015; Gilbert and Matutes, 1993), the interaction effect is stronger for firms operating in highly competitive industries. Similarly, the interac-

³We follow Kvam et al. (2024) in using the term ‘ESG concerns’ to describe public searches related to ESG issues. While terms such as ‘attention’ or ‘interest’ could also be used, we adopt ‘concerns’ under the assumption that individuals search for these topics when they are concerned about them. Spikes in search activity, such as those related to global warming during periods of extreme temperatures, illustrate this dynamic (Choi et al., 2020).

tion effect is more pronounced for firms with higher R&D and advertising intensity, which reflect stronger differentiation capabilities (Balsam et al., 2011).

Our study makes several contributions. First, while existing research on climate change and ESG concerns has predominantly emphasized the investor’s perspective (Ardia et al., 2022; Choi et al., 2020; Santi, 2023; El Ouadghiri et al., 2021; Kvam et al., 2024; Serafeim, 2020; Yan et al., 2025), relatively little attention has been paid to the customer perspective—particularly through the lens of the cash flow channel. We address this gap by examining how public ESG concerns affect firms’ financial performance, focusing specifically on realized earnings outcomes. Unlike Ardia et al. (2022), who analyze the effect of climate concerns on stock returns by decomposing them into cash flow and discount rate components based on analysts’ forecasts, our approach directly analyzes actual earnings from financial statements. We complement the findings of Derrien et al. (2025), who document that ESG-related incidents negatively affect forecasted cash flows and subsequent earnings—primarily through anticipated sales declines. In contrast, our ESG Concerns Index, derived from Google Search Volume Index (SVI) data, captures a broader range of public concerns surrounding ESG issues that encompass both risk-based factors and rising sustainability awareness.⁴

Second, we extend the ESG–financial performance literature. Although numerous studies have investigated the link between ESG scores and firm performance (Servaes and Tamayo, 2013; Di Giuli and Kostovetsky, 2014; Bhandari and Javakhadze, 2017; Lins et al., 2017; Cornett et al., 2016; Albuquerque et al., 2019, 2020; Chen and Xie, 2022), our findings suggest that this relationship is conditional on the level of public ESG concerns. We find that ESG performance improves profitability, with stronger effects during periods of rising ESG concerns—particularly through higher profit margins. Conversely, when concerns diminish, we observe no reversal of this effect. Furthermore, we show that this conditional effect is

⁴Ren and Ren (2024) and Chen et al. (2025) also examine ESG-related public sentiment, but their focus differs from ours. Ren and Ren (2024) analyzes how environmental concerns influence firms’ ESG performance, while Chen et al. (2025) study the interplay between ESG disclosure in annual reports and public perception of firms’ ESG from social-media text.

moderated by both industry competition and firms’ capacity for product differentiation.

Third, we contribute to the emerging literature that employs internet search volume as a proxy for public attention (Da et al., 2015; Kvam et al., 2024; El Ouadghiri et al., 2021; Choi et al., 2020; Yan et al., 2025). We develop a novel ESG Concerns Index by compiling and refining a set of ESG-related search terms drawn from prior studies, expanding them using Google Trends data.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature. Section 3 outlines the construction of the ESG Concerns Index. Section 4 describes our dataset. Section 5 presents empirical results, and Section 6 concludes.

2 Literature Review

2.1 ESG Concerns and Firm Performance

A growing body of literature suggests that ESG attributes enhance firm profitability (Lins et al., 2017; Cao et al., 2019; Cornett et al., 2016). However, some studies present contrasting findings. For instance, Di Giuli and Kostovetsky (2014) report a negative relationship between ESG and profitability, arguing that ESG initiatives can be costly without enhancing a firm’s reputation or driving sales growth. Similarly, Bhandari and Javakhadze (2017) suggest that ESG investments deplete a firm’s capital and resources, reducing funds available for growth opportunities and, consequently, diminishing future performance.

A plausible explanation for these mixed findings is that the effects of ESG on firm performance are not static, but depend on changing stakeholder behavior towards sustainability. For example, Whitson et al. (2014) find that consumer preferences for environmentally friendly products have shifted considerably over time. Compared to the past, consumers in a more recent survey placed greater value on eco-labels and were more willing to pay higher prices for products that signal environmental responsibility.

Studies show that sustainability-related concerns significantly influence consumer motiva-

tion and behavior. Environmental and social concerns increase consumers' intention to purchase sustainable products (Lopes et al., 2024; Koenig-Lewis et al., 2014; Hosta and Zabkar, 2021; Zameer and Yasmeen, 2022). These concerns affect consumer decisions through various mechanisms. For example, environmental concerns mediate the relationship between consumers' rational evaluations of green product attributes, such as perceived quality, benefits, and price, and their purchase decisions (Lopes et al., 2024). Additionally, ESG concerns lead consumers to feel positive emotions such as pride and contentment when evaluating ecological products. These emotions then reinforce sustainable purchasing behavior (Koenig-Lewis et al., 2014). Environmental and social concerns also strengthen individuals' willingness to act in alignment with their personal norms and ethical ideologies (Hosta and Zabkar, 2021). Furthermore, environmental concerns help translate awareness into purchase intentions (Zameer and Yasmeen, 2022). Beyond purchase intention, sustainability-related concerns are also positively linked to consumers' willingness to pay a premium for sustainable offerings. For instance, Kang et al. (2012) show that consumers with stronger environmental concerns are more willing to pay a premium for green hotel initiatives, reflecting their identification with environmentally responsible brands. Wei et al. (2018) identify environmental concern as a key factor motivating consumers' willingness to pay for green products, even when they perceive their individual actions as having little impact.

As public ESG concerns intensify, consumer preferences increasingly shift toward sustainable products. Firms with strong ESG attributes are better positioned to capitalize on this trend, as they are more likely to develop and offer products that align with evolving market demands. For instance, Zheng et al. (2023), Wang et al. (2023), and Yang et al. (2024) find that firms with high ESG scores are more actively engaged in green innovation.

Based on this reasoning, we propose the following hypothesis:

H1: *Firms with stronger ESG attributes will exhibit superior financial performance during periods of heightened ESG concerns.*

The positive relationship between ESG attributes and financial performance can be at-

tributed to two key profitability drivers: higher profit margins and increased asset turnover. Firms with strong ESG commitments often achieve higher profit margins by differentiating their products, enabling them to charge premium prices (McWilliams and Siegel, 2001; Albuquerque et al., 2019). At the same time, higher asset turnover can enhance financial performance, as ESG-driven firms attract more customers and generate increased sales volumes (Zhou et al., 2022). Based on this reasoning, we propose the following hypotheses:

H2a: *Firms with stronger ESG attributes achieve higher profit margins.*

H2b: *Firms with stronger ESG attributes exhibit higher asset turnover.*

2.2 Market Competition and Product Differentiation

In the previous section, we argued that high-ESG firms benefit during periods of heightened ESG concerns because they are better positioned to meet consumers' growing demand for sustainable products. This mechanism relies on the assumption that firms leverage ESG as a product differentiation strategy. To further substantiate this mechanism and reinforce our first hypothesis, we examine two settings where ESG-based differentiation is expected to be more effective: market competition and firms' differentiation capabilities.

Product differentiation is essential for maintaining firm performance and resilience in highly competitive environments. Hombert and Matray (2018) argue that firms use differentiation to mitigate direct price competition by offering more unique, innovative, and higher-value products. Research further suggests that firms with strong R&D investments perform better under intense competition, experiencing smaller declines in profitability and higher stock returns (Hombert and Matray, 2018; Gu, 2016).

In response to competitive pressures, firms increasingly turn to ESG initiatives as a differentiation strategy. Flammer (2015) provide empirical evidence that firms intensify their ESG efforts when market competition increases. We therefore expect the interplay between ESG attributes and ESG concerns to be more pronounced in highly competitive environments. In such markets, firms have stronger incentives to align their products with rising sustain-

ability preferences, as failing to do so may weaken their competitive position. Moreover, firms in competitive environments tend to offer a greater variety of products (Lancaster, 1990; Gilbert and Matutes, 1993; Klemperer and Padilla, 1997), which facilitate consumer switching from conventional to sustainable alternatives as ESG concerns rise. Based on this reasoning, we propose the following hypothesis:

H3: *The positive effect of the interaction between ESG attributes and ESG concerns on financial performance is stronger in highly competitive markets.*

The effectiveness of ESG for product differentiation also depends heavily on a firm’s innovation and marketing capabilities. ESG differentiation is closely linked to both product and process innovation, both of which depend on R&D investment (McWilliams and Siegel, 2000, 2001). R&D enables the development of new product attributes, supports product launches, and facilitates modifications to existing offerings (Un et al., 2010). Firms with strong R&D and innovation capabilities are better positioned to expand their portfolios through vertical and horizontal innovation (Braguinsky et al., 2021) and to introduce a wider variety of related products (Rothaermel et al., 2006). Furthermore, R&D investment directly contributes to green innovation and sustainable product development (Zhang and Jin, 2021), reinforcing ESG differentiation.

In addition to innovation, advertising plays a crucial role in ESG differentiation by communicating sustainability attributes to consumers (McWilliams and Siegel, 2000, 2001). It helps enhance awareness of ESG-related product features, strengthens brand perception, and stimulates demand. Prior study find that ESG contributes little to firm value when advertising intensity is low but significantly enhances firm value when advertising intensity is high (Servaes and Tamayo, 2013).

R&D and advertising are widely used indicators for a firm’s product differentiation strategy (Balsam et al., 2011). Firms with stronger differentiation capabilities are generally more able to incorporate ESG attributes into their products and to communicate these attributes effectively to the market. When ESG concerns intensify and consumers shift toward more

sustainable alternatives, such firms are more likely to experience a stronger performance response. Accordingly, we propose the following hypothesis:

H4: *The positive effect of the interaction between ESG attributes and ESG concerns on financial performance is stronger for firms with higher R&D investments and advertising intensity.*

3 ESG Concerns Index

To investigate the impact of ESG concerns on firm financial performance, we need a measure of public concerns about ESG issues. Previous research has employed various measures to capture these concerns (see Table 1). For instance, Ardia et al. (2022) develop a media climate change concern index based on daily news from major US newspapers and newswires. Their findings reveal that unexpected increases in climate change concerns lead to higher stock prices for green firms and lower stock prices for brown firms, primarily due to changes in the discount rate of firms. Similarly, Choi et al. (2020) demonstrate that during periods of abnormally warm local temperatures, low-emission firms outperform high-emission firms, driven by retail investors' heightened awareness of climate risk and their tendency to avoid high-emission companies. Additionally, Santi (2023) find that positive investor sentiment toward climate issues, as analyzed through StockTwits posts, reduces demand for high-emission stocks and results in underperformance.

El Ouadghiri et al. (2021) assess public attention to environmental issues using media coverage, Google search volume, and global climate-related natural disasters data. They find that increased public attention positively affects the returns of US sustainability stock indexes while negatively impacting conventional stock indexes. This effect is attributed to sustainable investors reallocating their portfolios and opportunistic behavior by other investors who anticipate higher demand for sustainable firms' stocks. Expanding beyond environmental aspects, Kvam et al. (2024) include environmental, social, governance, and

overall ESG concerns in their research. By analyzing Google search volume and sentiment analysis on Twitter, they find that firms with high ESG scores experience higher returns during periods of increased ESG concerns. Similarly, Serafeim (2020) find that rising public sentiment regarding sustainability activities leads to higher valuation premiums for firms with strong ESG performance. By contrast, Yan et al. (2025) use a Baidu-based ESG attention index and document that heightened ESG attention is associated with lower stock returns for high-ESG firms, driven by declines in institutional ownership.

INSERT TABLE 1 HERE

While prior studies have used a variety of metrics to capture ESG concerns, we build on volume-based approaches by constructing a distinct index that differs in terms of its search term selection, filtering procedure, and index construction method. Using Google search volume is particularly effective for capturing public concerns for several reasons. First, internet usage has surged, with the percentage of US adults using the internet increasing from 52% in 2000 to 95% in 2023, with Google becoming the most visited site, surpassing social media platforms and traditional newspapers.⁵ Second, search volume reflects active public interest: specific Google search terms reveal users’ attention and concerns (Da et al., 2011; Wu and Brynjolfsson, 2015; Ettredge et al., 2005). Individuals typically search for a topic because they are interested in or concerned about the underlying issue. For example, searches related to global warming tend to spike during extreme temperature events (Choi et al., 2020). Third, previous research shows that search volume can predict various economic activities, including automotive and housing sales, unemployment rates, tourism, box-office and video game sales, music rankings, stock market movements, and even referendum outcomes (Choi and Varian, 2012; Goel et al., 2010; Wu and Brynjolfsson, 2015; Vicente et al., 2015; Da

⁵According to Semrush data, in December 2020, Google had 17.3 billion total web visits with an average time per visit of 24 minutes, surpassing social media platforms such as Facebook (3.75 billion visits, 23 minutes per visit), Twitter (914 million visits, 13 minutes per visit), and Instagram (871 million visits, 16 minutes per visit). Additionally, a 2020 global survey of internet users indicates that search engines are the primary channel for seeking information about brands, products, and services, accounting for 58.1%, compared to 31.7% on social networks. Data retrieved from <https://www.pewresearch.org/> and <https://wearesocial.com/us/blog/2021/01/digital-2021-us/>.

et al., 2011, 2015; Mavragani and Tsagarakis, 2016). These findings highlight the usefulness of search volume data as an indicator of public interest and behavior. Accordingly, we use US search data to match the scope of our firm-level sample.

3.1 ESG Search Terms

To construct our ESG Concerns Index, we first compile relevant ESG-related search terms from previous studies (Dimson et al., 2015; Baier et al., 2020; Choi et al., 2020; El Ouadghiri et al., 2021; Kvam et al., 2024; Santi, 2023). We exclude terms related to investing, such as “ESG investing”, “impact investing”, “ethical investing”, as our analysis takes a cash flow/consumer perspective.

To ensure no significant search terms are omitted, we follow Da et al. (2015) by examining the ten ‘top related queries’ for each of our initial search terms. Google provides these related queries based on popularity among users. We include relevant terms that were not initially on our list. For example, the term “extreme temperature” yields related queries such as “extreme cold”, “extreme heat”, “high temperature”, “body temperature”, “extreme temperature changes,” “extreme cold temperature”, “temperature definition”, and “extreme vaporizer”. We add the first two terms, as they are directly related to climate issues, and exclude terms like “high temperature”, “body temperature”, “temperature definition”, and “extreme vaporizer” due to their broader scope and lack of relevance to environmental concerns. Other terms, such as “extreme temperature changes” and “extreme cold temperature”, are already captured by including “extreme temperature” and “extreme cold.”

We also use quotation marks to specify phrases with distinct meanings based on word order. For instance, the term “fair trade”, which refers to ethical trade practices, may generate related queries like “trade fair”, which refers to a commercial exhibition. By using the search term “fair trade” in quotes, we ensure that only the exact phrase is captured, avoiding irrelevant results.

Next, we refine our search terms to account for variations in terminology. For example,

the term “csr” generates related queries like “csr car”, “csr racing”, and “csr racing 2”, which refer to a car racing video game rather than “corporate social responsibility”. Panel A of Figure 1 shows the impact of irrelevant terms, with spikes in search volume for “csr” occurring in July 2012 and July 2016, corresponding to the release dates of the game sequels on June 28, 2012, and June 28, 2016, respectively. To filter out these irrelevant results, we add the punctuation “-” so that our search term becomes “csr -car -racing” instead of only “csr”.

Finally, we adjust for singular and plural forms by using the “+” symbol. For example, the term “greenhouse gas” generates related queries of “greenhouse gases”. Panel B of Figure 1 plots search volume data for “greenhouse gas”, “greenhouse gases”, and a combined search query that includes both terms. If only “greenhouse gas” is used as the search term, searches for “greenhouse gases” will not be captured.

INSERT FIGURE 1 HERE

After reviewing the top related queries, we end up with 165 search terms across the environmental, social, governance, and overall ESG dimensions. To focus our research on the terms most commonly used by the public, we select only the top 20 search terms for each environmental, social, and governance dimension. These top 20 terms are selected based on their relative search volume, comparing each term with the highest search volume terms in Google Trends for each dimension. For the overall ESG dimension, we include all four search terms due to the limited number available.⁶ Table 2 presents Google search terms for the overall ESG and individual dimensions.

INSERT TABLE 2 HERE

⁶To ensure the robustness of our results, we conducted a test using an ESG Concerns index constructed from the top 20 search terms for each environmental, social, and governance dimension, rather than the four overall ESG terms. The results are consistent with our reported findings.

3.2 Construction of the ESG Concerns Index

We use a multi-step process to construct the ESG Concerns Index for the overall ESG and each individual ESG dimension. Following Da et al. (2011) and Kvam et al. (2024), we calculate search volume deviations from the median of the previous search volume index (SVI) to capture unexpected shifts in public ESG concerns. Specifically, we compute the natural logarithm of the current month’s search volume and subtract the natural logarithm of the median search volume from the preceding 12 months. This approach helps mitigate the impact of time trends (ESG is becoming increasingly popular) and seasonal effects, while highlighting unusual surges in public concerns (Da et al., 2011).

To illustrate the seasonality in raw SVI data, Figure 2 plots the average search volume over 2004-2022 for each calendar month, and for the overall ESG and each individual ESG dimension before deseasonalization. The graph confirms notable seasonal effects. Search volume decreases in June and December, reaching its lowest point in July. These low points could be attributed to holiday periods, where people may be less concerned with ESG issues. Using a 12-month median mitigates these seasonal fluctuations compared to shorter median periods, as it captures variations across an entire year. However, to explore whether the public may respond more quickly to ESG issues, we conduct a robustness test by constructing the ESG Concerns Index using deviations from 3- and 6-month medians. This deseasonalization method is preferable to, e.g., regression models with monthly dummies, which incorporate the entire sample period and may introduce look-ahead bias.

INSERT FIGURE 2 HERE

Since our study links search volume to quarterly financial performance, we aggregate our monthly data into quarterly figures by summing the monthly shifts in search volume. Following Da et al. (2015), we standardize each search term by scaling it by its standard deviation to enhance comparability. The ESG Concerns Index is then constructed by averaging the four terms for overall ESG and the top 20 search terms for each ESG dimension.

Figure 3 displays the overall ESG Concerns Index (Panel A) and the concerns index for each ESG dimension (Panel B). Because our ESG Concerns Index is based on deviations from the 12-month median search volume, data are available from Q1 2005 onward, given that Google SVI data are available starting from January 2004. This results in 72 unique quarterly data points from Q1 2005 to Q4 2022. As shown in Figure 3, the concerns indices for overall ESG and each ESG dimension generally move in the same direction, with correlations ranging between 72.3% and 89.0%.

INSERT FIGURE 3 HERE

4 Data and Methodology

Our sample includes all US firms available in the Refinitiv ESG database from 2004 to 2022. Our sample starts in 2004 as this is when Google Search Volume data first became available. We integrate ESG data from Refinitiv with quarterly accounting data obtained from Compustat. We exclude financial firms (Servaes and Tamayo, 2013; Lins et al., 2017; Buchanan et al., 2018; Bae et al., 2021) and firms that do not meet specific asset and sales thresholds (Bhandari and Javakhadze, 2017; Chen and Chen, 2012). To ensure robustness and reduce the impact of outliers, we require that firms have at least \$10 million in assets and \$1 million in quarterly sales in the previous year. Table 3 defines all variables used in our study.

4.1 Firm Performance

Our dependent variable is firm performance, measured using three indicators. We first examine whether heightened public ESG concerns are associated with increased profitability. Profitability is measured using *return on assets (ROA)*, calculated as operating income divided by total assets (Servaes and Tamayo, 2013; Lins et al., 2017; Albuquerque et al., 2020). Since a higher ROA can stem from either an increased profit margin or enhanced

asset turnover, we incorporate both metrics into our analysis. We calculate the *operating profit margin (OPM)* as operating income divided by sales (Albuquerque et al., 2020) and *asset turnover (AT)* as sales divided by total assets (Albuquerque et al., 2020; Zhou et al., 2022).

4.2 ESG Scores

We use Refinitiv ESG scores to evaluate firms’ environmental, social, and governance (ESG) attributes. Refinitiv assesses sustainability performance based on publicly reported data across three dimensions: Environmental (E), Social (S), and Governance (G). Each dimension comprises several categories: the Environmental dimension includes resource use, emissions, and innovation; the Social dimension covers workforce, human rights, community, and product responsibility; and the Governance dimension encompasses management, shareholders, and CSR strategy.

Within each category, specific themes are addressed. For instance, the emissions category covers four themes: emissions, waste, biodiversity, and environmental management systems. Similarly, the product responsibility category includes themes such as responsible marketing, product quality, and data privacy. Refinitiv calculates scores for each ESG dimension, as well as an overall ESG score, by multiplying the weight of each category by its respective score. The weights for the Environmental and Social categories vary by industry, while the weight for the Governance dimension remains consistent across all industries. ESG scores range from 0 to 100, with 100 indicating excellent ESG performance and a high level of transparency in publicly reporting ESG matters.⁷ In our analysis, we use both the overall ESG score and the individual scores for each ESG dimension, scaled by dividing each by 100.

⁷Details on Refinitiv ESG scores can be found in <https://www.refinitiv.com/en/sustainable-finance/esg-scores#methodology>.

4.3 Control Variables

Following extant literature (Servaes and Tamayo, 2013; McWilliams and Siegel, 2001; Albuquerque et al., 2019, 2020; Zhou et al., 2022), we control several factors that may influence financial performance beyond ESG scores.

We include *Size* as the logarithm of total assets at the end of quarter t . Larger firms typically possess greater resources and capabilities to invest in ESG initiatives, which can affect both their ESG scores and profitability.

Advertising is represented by the ratio of selling, general, and administrative (SG&A) expenses to sales at the end of quarter t . Due to the unavailability of quarterly advertising expenditure data, SG&A expenses serve as a proxy for advertising costs. Following Servaes and Tamayo (2013), a value of zero is assigned when SG&A expense data are missing. Their research suggests that the benefits of ESG initiatives are more pronounced for firms with high public visibility, often proxied by advertising expenditures.

R&D is the ratio of R&D expenses to sales during quarter t , while *Capex* is the ratio of capital expenditures to total assets during the same period. Our research, which examines the impact of ESG concerns from a customer perspective, aligns with the view that ESG attributes serve as forms of product differentiation (McWilliams and Siegel, 2001; Albuquerque et al., 2019). Albuquerque et al. (2019) emphasize that, in addition to advertising, R&D and Capex intensity are critical components of a firm’s product differentiation strategy. Firms pursuing product differentiation often incur substantial costs and investments to innovate and enhance their offerings, which can positively influence financial performance if successful. To differentiate the effects of ESG from those related to product differentiation, we include *R&D* and *Capex* as control variables in our analysis. This approach ensures that our measurement of ESG remains distinct from the impact of product differentiation efforts.

Leverage is calculated as the ratio of total debt to total assets at the end of quarter t , while *Cash* is measured as the ratio of cash and short-term investments to total assets during the same period. These variables influence a firm’s financial flexibility, as less constrained

firms tend to allocate more resources to ESG initiatives (Hong et al., 2012). Furthermore, financial leverage affects a firm’s capital structure, which can, in turn, impact its overall performance.

4.4 ESG Concerns

We construct our *ESG Concerns Index* as detailed in Section 3. To do this, we download the search volume index (SVI) for each search term from Google Trends from January 2004 to December 2022. Google Trends provides search volume data for various terms and topics within specific geographic regions and time frames. The data are normalized by dividing each data point by the maximum number of searches in a given area and period, resulting in an index of relative popularity rather than absolute search volumes. These normalized values are scaled on a range from 0 to 100, where 100 represents the peak search interest for the specified period and location. We limit our search volume data to the US, as our sample consists of US firms.

INSERT TABLE 3 HERE

4.5 Summary Statistics

Table 4 presents the summary statistics. All firm-level variables, except for ESG scores and size, are winsorized at the 1st and 99th percentiles. The dataset includes 2,220 US firms, totaling 66,561 firm-quarter observations. Panel A of Table 4 shows our financial performance variables. ROA has a mean of 2.35% (median 2.85%) with a standard deviation of 4.27%. OPM shows a mean value of -5.80% (median 14.56%) with a standard deviation of 120.77%.⁸ Finally, AT has a mean of 22.63 (median 18.43) with a standard deviation of 16.86.

⁸The high variability and negatively skewed distribution of operating profit margin are primarily driven by firms in SIC code 283 (biopharmaceuticals), which tend to have low sales but incur significant R&D expenses. When we exclude these firms, the mean OPM increases to 11.62%, which is closer to the median value. We rerun the regressions excluding these firms, and the main results remain consistent.

Panel B of Table 4 presents the summary statistics for ESG levels as measured by the Refinitiv ESG score. The mean ESG score is 0.41 (median 0.39), with a standard deviation of 0.19. Among the three ESG dimensions, the environmental dimension has the lowest mean score at 0.28, with 27.55% of observations scoring zero, while the governance dimension has the highest mean score at 0.50. These figures are consistent with Kvam et al. (2024).

Panel C of Table 4 provides an overview of the summary statistics for the control variables. The mean value for size (log-transformed) is 7.98 with a standard deviation of 1.78. Firms, on average, allocate a larger portion of sales to advertising (27.9%) than to R&D (18.9%). The R&D-to-sales ratio has median of 0.00, indicating that at least half of the firms report no R&D expenditures in a given quarter. Capex exhibits a low quarterly mean (0.01) and median (0.007), suggesting that firms' investment levels are modest when compared to the size of their total assets. Leverage has a standard deviation of 0.22, which is lower than its mean of 0.30, indicating limited variation across firms. On average, debt accounts for approximately one-third of total assets. Cash and short-term investments have a mean of 0.178 and a median of 0.10, indicating that these assets account for roughly 17.8% of total assets.

Panel D of Table 4 presents the variables that measure ESG concerns. The mean ESG Concerns Index is 0.10 (median 0.20), with a standard deviation of 0.71. Among the three ESG dimensions, environmental concerns exhibit the highest variation, as reflected by a standard deviation of 0.72. This suggests that public attention towards environmental issues fluctuates more than the other categories. In contrast, governance concerns show the least variation, indicating a more consistent level of public interest in governance-related topics.

INSERT TABLE 4 HERE

4.6 Methodology

We use panel regressions to examine how ESG concerns affect firm performance. We estimate the following regression:

$$Perf_{it} = \beta_0 + \beta_1 ESG_{it-1} + \beta_2 ESG_{it-1} \times Concerns_{t-1} + \beta_3 Controls_{it} + \eta_i + \tau_t + \epsilon_{it} \quad (1)$$

where $Perf_{it}$ represents the financial performance of firm i in quarter t , ESG_{it-1} denotes the Refinitiv ESG score for firm i in quarter $t-1$, $Concerns_{t-1}$ measures public ESG concerns in quarter $t-1$, and $Controls_{it-1}$ is a vector of control variables.⁹ Our model includes industry, η_i , and quarter, τ_t , fixed effects. The industry fixed effects are based on the Fama-French 12 industry classifications as per Albuquerque et al. (2019, 2020). Incorporating industry fixed effects is crucial because Refinitiv ESG scores are weighted differently across industries, especially for the environmental and social dimensions. We exclude $Concerns_{t-1}$ as a standalone variable since ESG concerns do not vary across firms, and thus their effect is subsumed by the quarter fixed effects. In this regression, we are primarily interested in β_2 , which captures the interaction effect between firms' ESG scores and the ESG concerns index.

5 Results

This section presents our results. Section 5.1 examines whether firms with higher ESG scores outperform those with lower scores during periods of increased ESG concerns and investigates the key drivers behind this increased profitability. In section 5.2 we address any potential endogeneity concerns in our main specification. Section 5.3 analyzes how the interaction between ESG scores and ESG concerns varies across ESG dimensions and industries. In Section 5.4, we assess these effects in relation to varying levels of market competition and degrees of product differentiation. Finally, Section 5.5 performs a series of robustness tests

⁹We lag both ESG concerns and ESG scores by one-quarter to account for a time delay in public reactions and their eventual impact on firm performance.

to confirm the reliability of our results.

5.1 The Impact of ESG Scores and Concerns on Firm Financial Performance

Table 5 presents the estimation results for Equation (1), where we examine how a firm’s ESG score influences financial performance and whether increased ESG concerns amplify this relationship. Column (1) shows that firms with higher ESG scores achieve a higher ROA, consistent with previous findings (Lins et al., 2017; Cao et al., 2019; Cornett et al., 2016). This effect becomes more pronounced when public ESG concerns increase, as indicated by the positive interaction between ESG scores and ESG concerns. This significant interaction effect remains after including our control variables in Column (2), suggesting that firms with strong ESG performance experience greater profitability when ESG concerns increase. These findings align with Hypothesis 1, which posits that firms with stronger ESG attributes exhibit superior financial performance when ESG concerns are high. Our finding can be explained by firms leveraging ESG as a product differentiation strategy by integrating sustainable products into their offerings (McWilliams and Siegel, 2001; Albuquerque et al., 2019). Prior studies suggest that sustainability-related concerns influence both purchase intention and consumers’ willingness to pay for sustainable products (e.g., Hosta and Zabkar, 2021; Zameer and Yasmeen, 2022; Kang et al., 2012; Wei et al., 2018). As ESG concerns intensify, firms with strong ESG profiles are better positioned to align with shifting consumer preferences, allowing them to improve profitability.

To investigate whether the increased profitability due to high ESG concerns is indeed related to consumer choice, we decompose ROA into OPM and AT and analyze the interaction effect of ESG scores and ESG concerns on OPM (Columns 3–4) and AT (Columns 5–6). The results reveal a significant interaction effect between ESG scores and ESG concerns on OPM, while the interaction effect on AT is insignificant. This suggests that the observed profitability gains (ROA) in Columns 1 and 2 are due to higher OPM rather than

increased AT. These findings support Hypothesis 2a, which states that firms with stronger ESG attributes achieve higher profit margins, an effect that intensifies during periods of increased ESG concerns. We find no support for Hypothesis 2b, which proposes that asset turnover contributes to financial gains. Our finding is in line with the notion that as ESG concerns heighten, more consumers switch from conventional to sustainable products, which typically yield higher margins. This change in consumer demand allows ESG-aligned firms to strengthen their profit margins, ultimately contributing to the higher ROA.

The impact of ESG concerns on the relationship between ESG scores and financial performance, documented in Table 5, is also economically significant. Using the results reported in Column (2), a one standard deviation increase in ESG concerns (0.713) for a firm with a median ESG score (0.389) leads to a 0.12% increase in ROA. Given the median ROA of 2.85%, this impact is economically meaningful. A similar pattern emerges for OPM (Column 4). A one standard deviation increase in ESG concerns results in a 2.23% increase in OPM. Considering the median OPM of 14.56%, this effect is substantial.

INSERT TABLE 5 HERE

In Table 5, we also find that firm size is positively associated with ROA and OPM but negatively with AT. This pattern suggests that larger firms benefit from economies of scale and stronger market positions (Lee, 2009), whereas the lower asset turnover may reflect their relatively larger asset base in relation to sales volume. Both advertising and R&D intensity exhibit negative coefficients with profitability, consistent with Servaes and Tamayo (2013). Intangible investments such as advertising and R&D tend to reduce short-term profitability because they are expensed immediately, thereby lowering accounting earnings within the same period (Kim et al., 2018; Karna et al., 2022). Capital expenditures are positively associated with profitability, while leverage is negatively associated with all performance metrics. These results align with prior evidence that profitable firms tend to rely more on internal financing for investment activities (Inci et al., 2009; Lee and Nohel, 1997) and are less dependent on external capital (Rajan and Zingales, 1995). Lastly, we find mixed

results for cash holdings, with a negative effect on ROA but a positive effect on OPM. Prior research suggest a non-linear relationship between cash holdings and firm performance: while moderate levels of cash facilitates liquidity and investment flexibility, excessive cash may lead to suboptimal resource allocation and increased agency costs (Banjade and Diltz, 2022).

To examine the effect of ESG concerns on performance in an alternative way, we construct a dummy variable where we compare the ESG Concerns Index with its median value over the past 12 months. The dummy variable equals one during periods of increasing ESG Concerns (above the median in the last 12 months) and zero during declining concerns (below the median in the last 12 months). We replace the continuous ESG Concerns Index in Equation (1) with this dummy variable. The first row in Columns (1)-(3) of Table 6 presents the baseline results for periods of declining ESG concerns. The findings indicate that high-ESG firms achieve higher ROA, primarily driven by increased asset turnover. When ESG concerns increase, consistent with Table 5, high-ESG firms experience a significant improvement in ROA, mainly due to higher OPM. This shift suggests that increased ESG concerns cause a shift in consumer demand toward more sustainable, higher-margin alternatives, typically offered by high-ESG firms. The effect of declining ESG Concerns is insignificant, indicating that when ESG Concerns subside, consumers do not revert to less sustainable products. An explanation for this could be that consumers have developed a preference for the sustainable product when they switched to that product. As a result, operating profit margins remain stable even during periods of reduced ESG Concerns, highlighting sustained consumer loyalty enjoyed by high-ESG firms.

INSERT TABLE 6 HERE

So far, we have observed that the profitability of high-ESG firms increases in times of increased ESG Concerns due to higher profit margins. We have explained this finding by arguing that consumers shift to more sustainable product offerings with higher margins. While we do not have any firm-level data on consumer purchase behavior, we can assess whether

firms strategically adjust their marketing efforts in response to increased ESG concerns.¹⁰ The results, presented in Table 7, show that firms increase their advertising intensity as public ESG concerns rise. Advertising levels are higher during calendar quarters 1 and 2—when ESG concerns typically peak—and also during periods corresponding to the top quartile (Q4) of ESG concerns distribution. This response likely reflects firms’ efforts to bridge consumer knowledge gaps, as many consumers remain hesitant to purchase sustainable products due to uncertainty about their benefits and a lack of familiarity with their attributes (Gleim et al., 2013). By increasing advertising, firms can inform consumers and strengthen their market position in the growing sustainable products sector.

INSERT TABLE 7 HERE

5.2 Endogeneity

In this section, we address potential endogeneity concerns. Following recent studies that use search-based measures to capture public attention to ESG issues (Ardia et al., 2022; Santi, 2023; Yan et al., 2025; Kvam et al., 2024), we treat the ESG Concerns Index as exogenous. The index aggregates national-level online search activity and reflects broad shifts in public attention, making it unlikely that any single firm or industry can meaningfully influence macro-level search patterns. Even if a firm-specific event temporarily increases ESG-related searches, such fluctuations do not systematically affect the financial outcomes of unrelated firms and thus the potential bias should be minimal.

Furthermore, because the ESG Concerns Index is defined as the deviation from the 12-

¹⁰Research suggests that firms often implement targeted campaigns during anticipated increases in product demand. For example, Genesove and Simhon (2015) argue that advertising is more effective when consumer interest is already elevated, since more consumers are willing to engage with the product. They show that firms increase advertising expenditures during such high-interest periods. Similarly, Radas and Shugan (1998) find that launching new products during peak seasons can boost initial demand and accelerate adoption, especially when firms can anticipate demand fluctuations. While ESG Concerns exhibit seasonal patterns, such fluctuations are not entirely predictable. Nonetheless, firms can utilize tools to better anticipate surges in consumer interest. Prior studies show that data-driven platforms like Google Trends can help firms analyze behavioral patterns, forecast demand, and refine marketing strategies (Kim and Hanssens, 2017; France et al., 2021; Cham et al., 2022).

month median, it captures unexpected shocks to public attention rather than predictable trends or seasonal patterns. Consequently, time variation in the index is unlikely to be driven by firm-level characteristics that correlate with financial performance.

A more credible source of endogeneity arises from the ESG scores themselves. A substantial literature shows that ESG scores are endogenous to firm performance outcomes (Albuquerque et al., 2019; Gao and Zhang, 2015; Bhandari and Javakhadze, 2017), as financially strong firms may self-select into higher ESG commitments. As a result, observed ESG scores may partially reflect unobserved firm quality, creating the potential for upward bias in estimating the relationship between ESG and performance. To address this concern, we adopt an instrumental variables (IV) approach consistent with prior research. Specifically, we use two instruments for ESG scores: (1) industry peer ESG scores (Fatemi et al., 2018); and (2) state-level political leaning (Di Giuli and Kostovetsky, 2014; Albuquerque et al., 2019; Cornett et al., 2016).

As a first instrument, we use industry peer ESG scores. Prior studies show that corporate policies are strongly shaped by peer firms, either through competitive pressures or through managerial learning and informational acquisition (Cao et al., 2019; Hoberg et al., 2014; Leary and Roberts, 2014). Peer ESG performance is likely to be correlated with a firm’s own ESG decisions, yet the ESG behavior of other industry peers is unlikely to directly influence the focal firm’s profitability. We therefore expect this instrument to satisfy both the relevance and exclusion restrictions. We construct peer ESG scores as the average ESG score of all other firms in the same two-digit SIC industry and year, excluding the focal firm.

As a second instrument, we use the political leaning of the state in which a firm is headquartered. Firms located in Democratic-leaning states tend to adopt stronger ESG practices because of greater stakeholder pressure for socially responsible behavior (Di Giuli and Kostovetsky, 2014). However, state-level political preferences are unlikely to directly affect firm profitability, thereby supporting the exclusion restriction. Following prior work (Di Giuli and Kostovetsky, 2014; Albuquerque et al., 2019; Cornett et al., 2016), we construct

three measures of political leaning: (1) *President Vote D%*, defined as the proportion of votes for the Democratic candidate in the most recent presidential election; (2) *Congress Delegation D%*, calculated as 0.5 x the proportion of Democratic senators plus 0.5 x the proportion of Democratic congressman; and (3) *State Government D%*, defined as 0.5 if the governor is a Democrat, plus 0.25 if Democrats control the upper chamber, and plus 0.25 if they control the lower chamber.

Panel A of Table 8 reports the instrumental variable estimates for our baseline results. Columns (1)–(4) use peer ESG as the instrument, while Columns (5)–(8) use state-level political leaning as an alternative instrument. Columns (1) and (5) present the first-stage regressions, where lagged ESG scores are regressed on the instruments, control variables, and fixed effects. In Column (1), the coefficient on peer ESG is positive and significant, consistent with the instrument relevance condition. In Column (5), among the political leaning variables, only Congress Delegation D% is positive and significant, while the other measures exhibit weaker or opposite signs, likely due to multicollinearity.¹¹ Columns (2)–(4) and (6)–(8) present the second-stage regressions, where firm performance is regressed on the fitted values of ESG and its interaction with lagged ESG concerns. The interaction term consistently remains positive and significant across all specifications, reinforcing our baseline findings.

We conduct standard diagnostic tests to evaluate instrument strength and validity. The Kleibergen–Paap Wald F-statistic equals 15.63 for the peer ESG instrument, indicating sufficiently strong instrument. For political leaning, the corresponding F-statistic is 8.47, suggesting weaker instrument strength due to multicollinearity. Nevertheless, the Hansen J-statistic of 0.761 (p-value = 0.684) indicates no evidence of overidentification concerns, supporting the validity of the instruments.

To further verify that our results are not driven by time-varying unobservable shocks, we re-estimate our model including state-by-quarter and industry-by-quarter fixed effects.

¹¹Pairwise correlations among the three variables range from 71.13% to 86.49%. When regressed individually, each measures display a positive and significant coefficient.

The state-by-quarter fixed effects capture location-specific shocks such as climate events or changes in state-level regulations, while the industry-by-quarter fixed effects absorb sector-specific shocks, including regulatory developments or supply chain disruptions. Panel B of Table 8 reports the results. The interaction between ESG scores and ESG concerns remains positive and significant for both ROA and OPM, consistent with our baseline estimates. Taken together, these analyses confirm that our main findings are robust to concerns regarding endogeneity and unobserved heterogeneity.

5.3 ESG Dimensions and Industry Analysis

Our main model examines the interaction effect between firms' overall ESG scores and ESG concerns on firm performance. This section investigates this relationship by analyzing each ESG dimension individually and assessing how each dimension interacts with its corresponding concerns. We also conduct industry-specific analyses to assess whether interaction effects vary across industries.

Table 9 presents the regression results for each ESG dimension. Columns (1)–(3) report findings for the environmental dimension, Columns (4)–(6) for the social dimension, and Columns (7)–(9) for the governance dimension. The results show that heightened environmental concerns enhance profit margins (Column 2) for firms with strong environmental performance, thereby increasing return on assets (Column 1). Similarly, firms with higher social scores achieve higher profit margins (Column 5), with the effect being twice that observed for the environmental dimension. However, not all consumers are willing to pay a premium for more sustainable products, while others hesitate to purchase conventional alternatives due to increased sustainability awareness. This shift in consumer behavior reduces overall product demand, as reflected in lower asset turnover (Column 6). Results for the governance dimension align with those of the environmental dimension, showing a positive and significant effect on return on assets (Column 7) and operating profit margins (Column 8).

To address the high correlations among ESG dimensions (which range from 40.5% to 72.6%), we include interaction terms for all three dimensions in a single model (Columns 9–12). When controlling for other dimensions, the previously positive and significant interaction effects of the environmental and governance dimensions on operating profit margins disappear (Column 11). In contrast, the social dimension’s effects remain robust. However, the interaction term for return on assets in the social dimension turns significantly negative, likely due to a decline in asset turnover (Column 12). Despite this, the positive contributions from the environmental and governance dimensions help offset this negative effect, resulting in an overall positive impact on profitability.

INSERT TABLE 9 HERE

Next, we examine the interaction effect between ESG scores and ESG concerns across industries. We conduct separate regressions for each industry using the Fama-French 12 industry classification. Table 10 presents the results, with Columns (1)–(3) reporting the estimates for ESG scores and Columns (4)–(6) reporting those for the interaction term. In Column (2), we find no significant relationship between ESG scores and operating profit margin, consistent with previous findings suggesting that ESG attributes alone do not enhance profit margins without increased ESG Concerns. Columns (4) and (5) reveal that the interaction term between ESG Scores and ESG Concerns is positive and significant for OPM and ROA in several industries, including consumer durables and non-durables, manufacturing, business equipment, and healthcare, medical equipment, and drugs. These industries provide greater opportunities for product differentiation. According to Besedeš and Prusa (2006), differentiated goods typically exhibit varied characteristics across suppliers, are often tailored to consumer needs, and lack standardized reference prices. These features, common in products from these industries, allow firms to integrate ESG attributes into their offerings and command a higher price.

INSERT TABLE 10 HERE

In contrast, industries with insignificant interaction terms, such as oil and gas, chemicals and allied products, telephone and television transmission, utilities, and wholesale and retail, mostly offer commodities or less differentiated goods. In these industries, firms have limited flexibility to leverage ESG attributes and justify premium pricing. As a results, we observe no significant interaction effect. These results align with McWilliams and Siegel (2001), supporting that ESG attributes are more impactful in industries where product differentiation is a key factor.

5.4 Market Competition and Product Differentiation

The previous section showed that high-ESG firms experience increases in OPM and ROA during periods of increased ESG Concerns. We explain this finding from the perspective that ESG is a product differentiation strategy (McWilliams and Siegel, 2001; Albuquerque et al., 2019). Firms that differentiate their products through ESG attributes are rewarded when ESG concerns intensify. During such periods, consumer preferences and willingness to pay for sustainability typically rise, leading to increased demand for sustainable alternatives. Furthermore, our results suggest that the interaction effects between ESG scores and ESG concerns are more pronounced in industries with greater opportunities for product differentiation.

To further support our arguments, we conduct an analysis based on a firm’s level of competition and degree of differentiation. The rationale is that not all high-ESG firms necessarily pursue ESG-based differentiation strategies. Some may lack sufficient R&D and advertising investment, while others may operate in industries where high levels of differentiation are impossible. Therefore, if high-ESG firms leverage ESG as a differentiation strategy, they should exhibit high R&D and advertising intensity or operate in highly competitive environments that drive the need for extensive differentiation. As a result, the positive effects of ESG attributes on financial performance should be more pronounced in these firms.

5.4.1 Product Market Competition

To assess whether the effects of ESG concerns vary across firms operating in highly competitive versus less competitive environments, we split our sample into two groups based on product market fluidity, a measure developed by Hoberg et al. (2014). Product market fluidity captures the intensity of competitive pressure by quantifying the degree to which rival firms modify their product offerings relative to a firm’s product space. This metric is derived from textual analysis of a firm’s 10-K filings, which identifies annual changes in overlap between its product space and that of its competitors. Firms with product fluidity scores above the sample median in a given year are classified as operating in highly competitive environments, those below the median operate in less competitive environments. Product market fluidity is particularly relevant to our study because it reflects competition intensity driven by continuous product modifications. Firms in high-fluidity environments face stronger pressures to innovate and adapt, making them more likely to incorporate ESG considerations into their product offerings in response to heightened ESG concerns.

Table 11 presents the results for firms operating in high- (Columns 1–3) and low-competition environments (Columns 4–6). In the high-competition group, the interaction between ESG scores and ESG concerns is significant and positive at the 1% level for both ROA and OPM (Columns 1 and 2). In the low-competition group, the interaction term is also positive for ROA and OPM, but its coefficient and significance is lower (Columns 4–5). A test on the difference between the high- and low-competition groups reveals significant differences in OPM at the 5% level. These findings support Hypothesis 3, indicating that the positive effects of higher ESG scores during periods of heightened ESG concerns are more pronounced in competitive environments. In markets characterized by rapid product modifications, firms face increased pressure to differentiate. A common strategic response is the integration of sustainable products into their offerings.

INSERT TABLE 11 HERE

To ensure that the coefficients of other variables remain consistent across the two groups, we validate our findings with a series of regressions that include triple interaction terms between ESG score, ESG concerns, and high product fluidity dummy variables. The results, presented in Table A1 in the Appendix, offer several key insights. Consistent with Table 11, the triple interaction terms are positive and significant at 1% for OPM. The coefficient for the product fluidity dummy, representing the high-competition group, is negative for both ROA and AT. This outcome is expected, as intense competition exerts downward pressure on financial performance. Unlike previous studies that show that competition can alter the relationship between ESG attributes and financial performance (Long et al., 2020; Brueninghaus et al., 2025; Jung and Yoo, 2023; Gupta and Krishnamurti, 2021), we find no significant coefficient for the interaction between ESG scores and the product fluidity dummy. This suggests that ESG concerns act as a mediating factor through which competition influences the relationship between ESG attributes and financial performance. Specifically, high competition encourages firms to adapt to rising ESG concerns by aligning their products with sustainability factors. Finally, the interaction term between ESG concerns and the product fluidity dummy is negative and significant for OPM (Column 2), indicating that firms in highly competitive markets face heightened pressures to respond to external demands, such as increasing ESG concerns. Failure to do so could weaken their competitive position. However, how effectively firms leverage ESG attributes in their product differentiation strategies can mitigate this negative impact. These findings underscore that both public ESG concerns and competition intensity act as moderating factors in shaping the relationship between ESG attributes and financial performance.

5.4.2 R&D and Advertising Intensity

This section investigates whether the interaction effects between firms' ESG scores and ESG concerns are more pronounced for firms with a higher degree of product differentiation. We utilize two variables, R&D intensity and advertising intensity, to assess the extent of

firms' product differentiation. For each variable, we divide the sample into two groups. Firms exhibit high R&D intensity if their average R&D-to-sales ratio over the past five years exceeds the sample median for the corresponding year. Similarly, firms have high advertising intensity if their average selling, general, and administrative expense (SG&A)-to-sales ratio over the past five years exceeds the sample median for the corresponding year. Following Balsam et al. (2011), we employ a five-year average to capture firms' long-term strategic orientation.

Panel A of Table 12 presents the regression results for firms with high and low R&D intensity. The interaction terms between ESG scores and ESG concerns are significant only for firms with high R&D intensity (Columns 1–3), while firms with low R&D intensity show no significant interaction terms (Columns 4–6). Additionally, the interaction term for asset turnover is negative and significant. High-ESG firms with high R&D intensity innovate by developing sustainable products, which are often priced at a premium. As ESG concerns increase and consumer preferences shift, some consumers hesitate to purchase these products due to their higher price, while others become reluctant to buy conventional products because of heightened sustainability awareness. Although the interaction term has a negative effect, it is only significant at the 10% level. Despite this, these firms still achieve higher profitability (Column 1). Panel B of Table 12 presents the regression results for the high and low advertising intensity groups. The interaction effects are stronger for firms with higher advertising intensity. In the low-advertising intensity group, the interaction effect on operating profit margin (Column 5) remains significant. However, the coefficients and significance levels are lower compared to the high-advertising intensity group.

We perform coefficient difference tests between the high- and low-R&D intensity groups (Panel A) and the high- and low-advertising intensity groups (Panel B). The results indicate significant differences (at 1%) between the high- and low-intensity groups for both OPM and ROA. These findings support Hypothesis 4, confirming that the positive relationship between ESG attributes and financial performance is stronger for firms with higher R&D

investments and advertising intensity.

INSERT TABLE 12 HERE

To validate these findings, we perform regressions incorporating triple interaction terms between ESG scores, ESG concerns, and differentiation measures (R&D and advertising intensity). The results, presented in Table A2 in Appendix, show that the benefits of ESG are more pronounced for firms pursuing product differentiation strategies. This is evidenced by the positive and significant interaction coefficients between ESG scores and high R&D (high advertising) dummies, particularly when ESG concerns increase, as reflected in the triple interaction coefficients. These results align with those in Table 12, which show that the interaction effects between ESG scores and ESG concerns are stronger in firms that engage in differentiation strategies through R&D or marketing activities.

Overall, the results in this section demonstrate that the benefits of high ESG attributes during periods of heightened ESG concerns are more pronounced for firms operating in competitive markets and for firms with high R&D and advertising intensity. These firms are more effective at leveraging ESG as a product differentiation strategy by integrating sustainable products into their portfolios, enabling them to better adapt to shifting consumer preferences for sustainability.

5.5 Robustness Tests

We perform several robustness checks to verify the reliability of our findings. First, we introduce US state fixed effects as an alternative to industry fixed effects. Social and environmental activist groups, along with local communities, can exert influence over firms' ESG initiatives (Bhandari and Javakhadze, 2017). Additionally, state-level variations in laws (Gao and Zhang, 2015) and political influences (Di Giuli and Kostovetsky, 2014) may cause firms to adopt ESG practices differently across states. We hypothesize that these regional factors could also shape the relationship between ESG scores, ESG concerns, and financial

performance metrics. To account for these regional effects, we incorporate state fixed effects into our model. Panel A of Table 13 demonstrates that the interaction terms between ESG scores and ESG concerns have positive and significant effects on ROA and OPM, consistent with our main findings.

Next, we conduct robustness tests using alternative methods to construct the ESG Concerns Index. Initially, we capture shifts in public ESG concerns by calculating deviations in the current month’s search volumes from the median of the previous 12 months. To address potential variation in public responsiveness, we also compute the index using 6-month and 3-month medians as alternative baselines. Panels B and C of Table 13 show that results are consistent with our main findings. The interaction terms between ESG scores and ESG concerns remain positive and significant for both ROA and OPM.

Finally, we examine the robustness of the interaction between ESG scores and ESG concerns by using alternative dependent variables. We replace return on assets with return on equity (ROE) and operating profit margin with gross profit margin. ROE is calculated by dividing net income by the book value of equity, excluding firms with negative equity to avoid distortion. Gross profit margin is calculated as the difference between sales and the cost of goods sold, divided by sales. In addition, we include operating cash flow to evaluate the prediction of Pástor et al. (2021), which suggests that firms with higher ESG attributes benefit from increased net cash flow due to shifts in customer preferences toward sustainable products. While return on assets reflects accounting treatments and adjustments, operating cash flow provides a clearer picture of the actual cash flow impact of rising ESG concerns. Operating cash flow is calculated by dividing net operating cash flow by total assets. Panel D of Table 13 shows that the interaction terms between ESG scores and ESG concerns have positive and significant effects on return on equity and gross profit margin, in line with our main findings. The interaction terms also positively affect operating cash flow. This suggests that as ESG concerns intensify, firms with higher ESG scores not only experience improved accounting profitability but also benefit from greater real cash flow from operations.

INSERT TABLE 13 HERE

6 Conclusion

Pástor et al. (2021) argue that green firms are more likely to outperform brown firms when ESG concerns rise unexpectedly, operating through two primary channels, the cash flow channel and the discount rate channel. This study focuses on the cash flow channel, specifically examining how rising public ESG concerns influence a firm’s financial performance. To measure public ESG concerns, we use Google search volume data, expanding and refining a list of ESG-related search terms based on prior research. We calculate deviations in monthly search volumes from the median of the previous 12 months, aggregate them quarterly, and standardize and average these deviations to create an overall ESG Concerns Index, as well as concerns specific to each ESG dimension.

While Derrien et al. (2025) show that ESG concerns, measured through firm-level ESG incident news, influence profitability via changes in sales demand, our study extends these findings. We emphasize that heightened ESG concerns can enhance profitability by driving up profit margins, particularly for firms with strong ESG attributes. As ESG concerns grow, consumers increasingly favor sustainable, often premium-priced products, providing a competitive advantage to firms with strong ESG performance. Our results reveal that high-ESG firms experience significant improvements in profit margins only during periods of heightened ESG concerns, with no corresponding effect when these concerns subside.

We further show that the positive effects of higher ESG scores on financial performance during periods of heightened ESG concerns are most pronounced for firms operating in industries with greater differentiation opportunities and higher levels of competition. These firms, especially those with greater R&D and advertising intensity, are better equipped to leverage their ESG attributes and differentiate their products in response to heightened public concerns. This analysis supports the idea that the beneficial impact of ESG during

periods of rising concerns is moderated through firms' product differentiation strategies, where R&D and advertising efforts facilitate the integration of sustainable products into their portfolios, allowing consumers to shift from ordinary to sustainable alternatives.

Given that public ESG concerns are dynamic and largely beyond the control of individual firms, often driven by external factors like environmental events or media attention, firms cannot control shifts in public focus. However, they can manage and enhance their own ESG attributes. By consistently integrating sustainable practices into their offerings, firms can remain competitive and sustain strong financial performance. Our findings suggest that firms leveraging ESG as a differentiation strategy not only enjoy higher profitability during periods of heightened ESG concerns but also foster long-term consumer loyalty, particularly when such concerns subside.

For investors, our study underscores the value of incorporating ESG into investment strategies, especially during periods of heightened public concern. Firms with strong ESG performance are more likely to achieve superior financial returns during such times, driven by their ability to capitalize on a stronger bottom line. Overall, this study demonstrates how ESG concerns can facilitate the transition toward more sustainable products and highlights the enduring benefits of strong ESG performance in an increasingly conscientious market.

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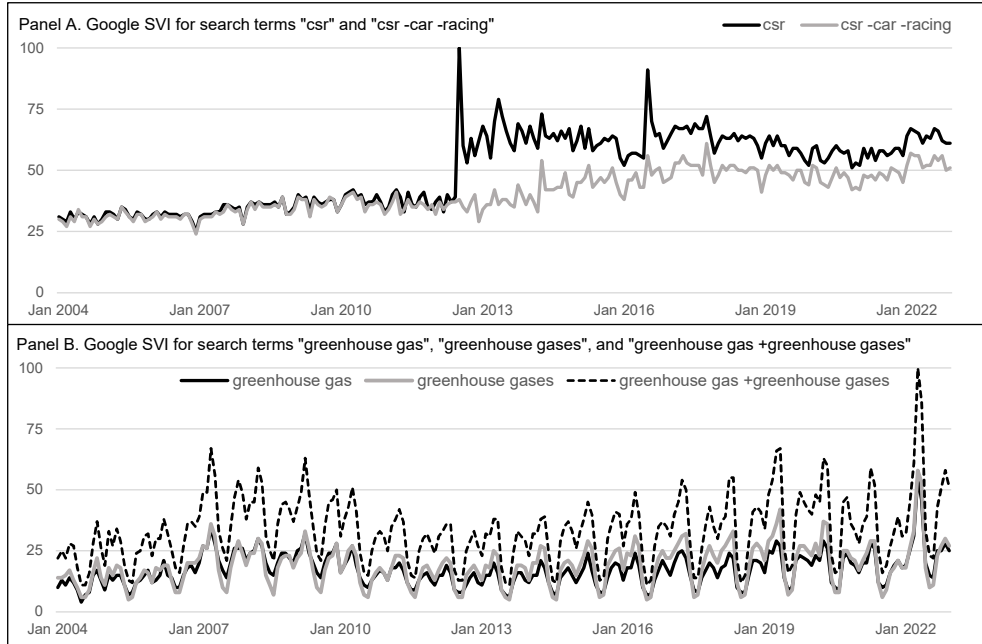


Figure 1. Examples of search term refinements using “+” and “-” punctuation

This figure presents the monthly search volume index data from January 2004 to December 2022. Panel A compares the search terms “csr” with and without the exclusions of terms ‘car’ and ‘racing’. Panel B compares the search terms “greenhouse gas”, “greenhouse gases”, and “greenhouse gas +greenhouse gases”.

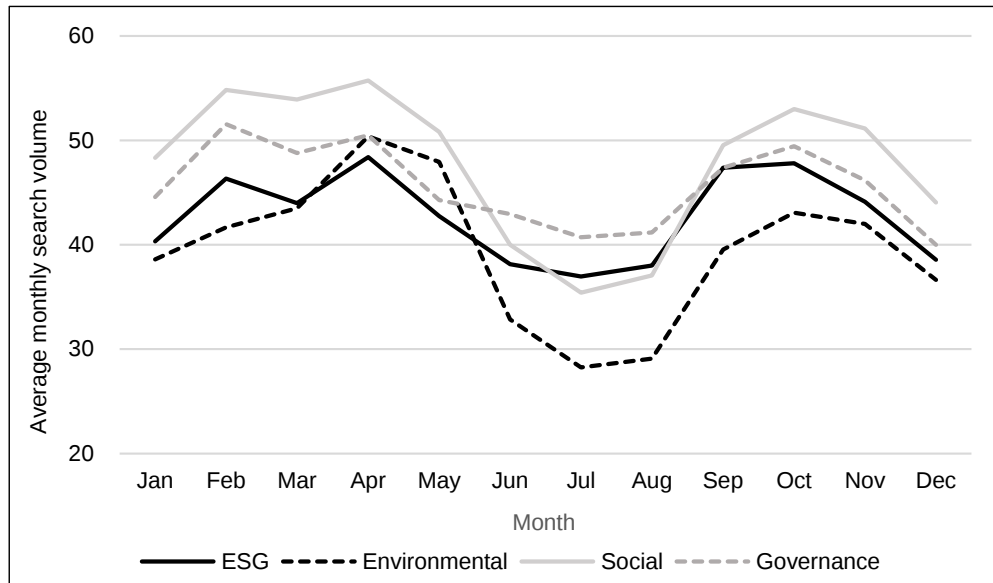


Figure 2. Average monthly search volume index

This figure displays the average search volume index (SVI) for each calendar month (January to December), averaged across the years 2004 to 2022, for overall ESG as well as for each individual ESG pillar.

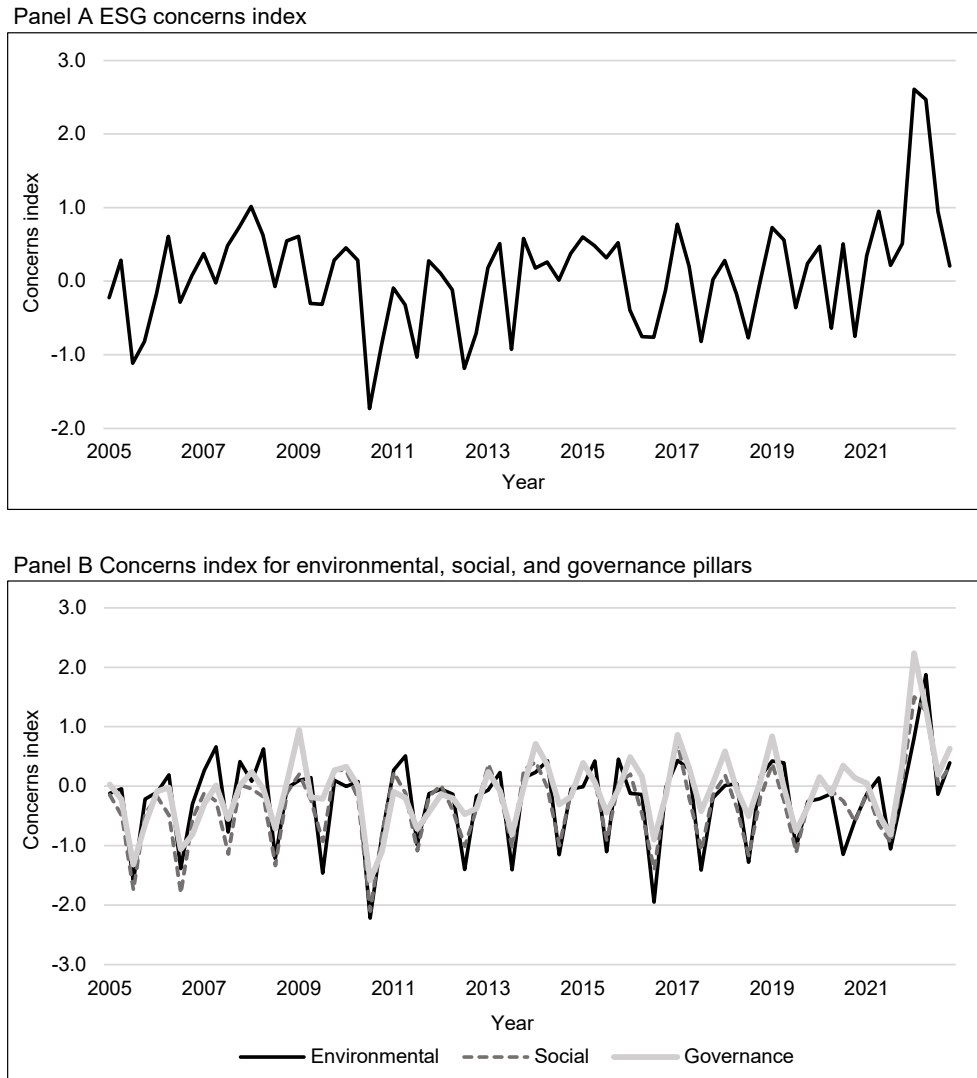


Figure 3. ESG concerns index

This figure presents the ESG concerns index. Panel A displays the overall ESG concerns index, while Panel B illustrates the concerns index for each individual pillar: environmental, social, and governance.

Table 1. Measures of climate change and ESG concerns

	Ardia et al. (2022)	Choi et al. (2020)	Santi (2023)	El Ouadghiri et al. (2021)				Kvam et al. (2024)		Serafeim (2020)
Scope of ESG dimensions	Environmental	Environmental	Environmental	Environmental				ESG		ESG
Measure of concerns	Media Climate Change Concerns (MCCC) index	Abnormal local temperature	Sentiment analysis on StockTwits	Media attention	Google search volume index	Climate-related weather disasters	Google search volume index	Sentiment analysis on Twitter	Sentiment data from TruValue Labs	
Aims to capture	Unexpected change in climate change concerns	Public attention to global warming	Investor sentiment on climate change	Public attention to climate change & pollution	Public attention to climate change & pollution	Public attention to climate change & pollution	Public attention to ESG	Investor sentiment on ESG	Public sentiment on corporate sustainability performance	
Description	Concern scores are calculated based on the number of articles and their associated levels of negativity and risk, sourced from ten major U.S. newspapers and two major newswires (MCCC index). Unexpected changes in the MCCC index are determined by the prediction errors of autoregressive time series model.	Abnormal local temperature is defined as the residual obtained from regressing a city's monthly temperature on its historical average monthly temperature and the deviation for the same month from its historical average	The monthly sentiment score is obtained by aggregating scores from multiple StockTwits posts. Sentiment analysis is performed using the R package sentimentr.	The number of articles published weekly in four US newspapers.	Normalized weekly search volume for specific keywords.	Dummy variable that equals one if a global climate-related natural disaster occurred during the week.	Abnormal daily search volume index (SVI) for overall ESG and each of its dimensions. The SVI for each dimension is derived by averaging the daily values of all relevant search terms within the respective topic.	Abnormal daily volume of Twitter posts containing specific keywords is calculated for both positive and negative sentiments. Sentiment analysis is performed using TextBlob, VADER, and Flair.	Measures ESG sentiment for a company over the past 12 months. TruValue aggregates unstructured data from over 100,000 sources and uses natural language processing to generate sentiment scores.	
Selection of articles or keywords	Only articles labeled as 'climate change' by the publishers were included, and articles with keywords related to the stock market were removed.	Abnormal local temperature is calculated for the 74 cities that host major stock exchanges.	StockTwits posts include the following strings: 'climate change', 'global warming', 'emission', 'pollution', 'extreme weather', 'extreme temperature', and 'environmental'.	Articles related to 'climate change' and 'pollution'.	Using two keywords: 'climate change' and 'pollution'	Climate-related natural disasters such as storms, extreme temperatures, floods, wildfires, and droughts.	Each dimension includes several keywords (a list of keywords is available in the article's internet appendix)	Posts containing the keywords 'climate change', 'corporate governance', 'ESG', 'social responsibility', and 'sustainability' are selected.	ESG-relevant articles for each company are sourced from analyst reports, media outlets, NGOs, and government regulators.	
Data source	DowJones Factiva, ProQuest, and LexisNexis databases	Global Surface Summary of Day Data	StockTwits	LexisNexis databases	Google Trends	EM-DAT	Google Trends	Twitter	TruValue Labs	

This table provides an overview of the different measures of climate change and ESG concerns employed in prior research.

Table 2. Google search terms used in ESG concerns index

ESG	Environmental	Social	Governance
csr -car -racing -certificate -generate -ssl +corporate social responsibility	acid rain	animal testing +animals testing	board members +board member -federal -hoa
esg +environmental social governance	biodiversity	career development	board of directors
sustainability	climate change	child labor	business ethics
sustainable development	natural disasters +natural disaster	customer complaints +customer complaint	company policies +company policy -insurance
	conservation -mass -law	equal rights	corporate governance
	deforestation	human rights	executive compensation
	emission +emissions -spectrum -spectra	equality -mathematics -math -mathematical -equation -equivalence -property -properties	political influence
	endangered species	inequality -graph -calculator -solve -triangle -sign -compound -linear -math -an	risk management
	energy use	"fair trade"	internal control -locus
	environmental	health and safety	internal audit
	global warming	public health	executive board
	greenhouse gas +greenhouse gases	social security	money laundering
	pollution	social responsibility	embezzlement
	recycling	"working conditions" + "work conditions"	ethical business
	renewable energy	professional development	business fraud
	waste disposal	civil rights	financial fraud
	water use	women rights	bank fraud
	ecosystem +ecosystems	occupational health	tax fraud
	endangered animals	free speech	security fraud
	recycle	freedom speech	executive pay

This table lists all the search terms used to construct the concerns index for overall ESG and each individual ESG dimension. We initially compile ESG-related terms from prior studies (Dimson et al., 2015; Baier et al., 2020; Choi et al., 2020; El Ouadghiri et al., 2021; Kvam et al., 2024; Santi, 2023). To expand this list, we incorporate relevant terms identified through Google’s top ten related queries for each initial search term. We further refine the terms by accounting for variations in terminology, including singular and plural forms, as well as using punctuation such as ‘-’, ‘+’, and quotation marks. Finally, we select the top 20 search terms for each ESG dimension based on their relative search volumes compared to the highest-ranking term in Google Trends. For the overall ESG concerns index, we include a comprehensive set of search terms representing all three ESG dimensions.

Table 3. Variable definitions

Variables	Definitions	Source
Panel A. Financial performance		
Return on assets (ROA)	Calculated as operating income during quarter t divided by total assets at the end of quarter t, multiplied by 100	Compustat
Operating profit margin	Calculated as ratio of operating income to sales during quarter t, multiplied by 100	Compustat
Asset turnover	Calculated as sales during quarter t divided by total assets at the end of quarter t, multiplied by 100	Compustat
Panel B. ESG level		
ESG score	Refinitiv overall ESG (environmental, social, and governance) score, divided by 100	Refinitiv ESG
(E)nvironmental score	Refinitiv score for environmental dimension, divided by 100	Refinitiv ESG
(S)ocial score	Refinitiv score for social dimension, divided by 100	Refinitiv ESG
(G)overnance score	Refinitiv score for governance dimension, divided by 100	Refinitiv ESG
Panel C. Control variables		
Size	Calculated as the natural logarithm of total asset at the end of quarter t	Compustat
Advertising	Calculated as the ratio of selling, general, and administrative expenses to sales during quarter t. Value of zero is assigned when selling, general and administrative expense data is missing	Compustat
R&D	Calculated as the ratio of R&D expenses to sales during quarter t. Value of zero is assigned when R&D expense data is missing	Compustat
Capex	Calculated as the ratio of capital expenditures during quarter t to total assets at the end of quarter t	Compustat
Leverage	Calculated as the ratio of total debt to total assets at the end of quarter t	Compustat
Cash	Calculated as the ratio of cash and short-term investments to total assets at the end of quarter t	Compustat
Panel D. ESG concerns		
ESG concerns	Index to measure public concerns on environmental, social, and governance issues, constructed using internet search volume	Google Trends
(E)nvironmental concerns	Index to measure public concerns on environmental issues, constructed using internet search volume	Google Trends
(S)ocial concerns	Index to measure public concerns on social issues, constructed using internet search volume	Google Trends
(G)overnance concerns	Index to measure public concerns on governance issues, constructed using internet search volume	Google Trends

This table provides definitions and data sources for all key variables used in the analysis.

Table 4. Summary statistics

Variables	Obs.	Mean	Std	25%	Median	75%
Panel A. Financial performance						
Return on asset (%)	65,812	2.348	4.266	1.518	2.851	4.319
Operating profit margin (%)	65,731	-5.795	120.767	6.413	14.556	23.988
Asset turnover	66,499	22.630	16.864	11.110	18.434	29.344
Panel B. ESG level						
ESG	66,561	0.414	0.190	0.267	0.389	0.544
Env	66,561	0.275	0.278	0.000	0.192	0.495
Soc	66,561	0.434	0.217	0.262	0.400	0.588
Gov	66,561	0.500	0.221	0.324	0.503	0.677
Panel C. Control variables						
Size	66,524	7.981	1.780	6.800	7.988	9.144
Advertising	66,427	0.279	0.327	0.086	0.196	0.350
R&D	66,427	0.189	0.833	0.000	0.000	0.074
Capex	66,330	0.011	0.012	0.003	0.007	0.014
Leverage	64,436	0.299	0.218	0.137	0.280	0.416
Cash	66,524	0.178	0.205	0.035	0.098	0.235
Panel D. ESG concerns						
ESG concerns	72	0.096	0.713	-0.308	0.204	0.507
Environmental concerns	72	-0.230	0.721	-0.675	-0.059	0.211
Social concerns	72	-0.298	0.640	-0.620	-0.178	0.072
Governance concerns	72	-0.076	0.593	-0.428	-0.057	0.216

This table presents summary statistics for the main variables used in the analysis. Panel A reports statistics for the financial performance measures. Panel B covers the overall ESG score along with each individual ESG dimension. Panel C presents statistics for the control variables, and Panel D displays statistics for the ESG concerns measures. All financial performance and control variables, except for firm size, are winsorized at the 1st and 99th percentiles to mitigate the influence of outliers.

Table 5. Interaction effects of ESG scores and ESG concerns on financial performance measures

Dependent variable	Return on assets (1)	Return on assets (2)	Opr. profit margin (3)	Opr. profit margin (4)	Asset turnover (5)	Asset turnover (6)
lag ESG	3.457*** (0.282)	1.047*** (0.254)	61.692*** (6.166)	1.945 (2.560)	-0.086 (1.412)	6.480*** (1.598)
lag ESG x lag ESG concerns	1.231*** (0.150)	0.433*** (0.115)	33.865*** (4.291)	8.022*** (1.579)	0.796 (0.506)	-0.544 (0.476)
Size		0.184*** (0.039)		3.040*** (0.486)		-2.086*** (0.216)
Advertising		-4.493*** (0.215)		-56.447*** (5.640)		-9.688*** (0.700)
R&D		-2.362*** (0.078)		-137.819*** (1.157)		-3.847*** (0.186)
Capex		32.716*** (3.816)		121.100*** (46.346)		-28.008 (25.576)
Leverage		-1.619*** (0.317)		-14.870*** (3.982)		-9.098*** (1.354)
Cash		-0.754** (0.379)		26.256*** (4.661)		-2.450* (1.441)
Constant	0.801*** (0.131)	2.386*** (0.295)	-34.669*** (3.181)	8.212** (3.832)	22.580*** (0.607)	43.610*** (1.617)
Observations	65,812	63,392	65,731	63,392	66,499	64,032
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.226	0.511	0.168	0.872	0.338	0.416

This table presents regression results analyzing the relationship between firms' ESG scores, their interaction with ESG concerns, and various financial performance measures, as indicated at the top of each column. Both ESG scores and ESG concerns are lagged by one quarter. Columns 1, 3, and 5 report models without control variables, while Columns 2, 4, and 6 include them. All regressions incorporate industry and quarter fixed effects, with standard errors clustered at the firm level. Robust standard errors are reported in parentheses. *, **, and *** denote significant coefficients at the 10%, 5%, and 1% levels, respectively.

Table 6. Interaction effects of ESG scores and ESG concerns increase on financial performance

Dependent variable	Return on assets (1)	Opr. profit margin (2)	Asset turnover (3)
lag ESG	0.885*** (0.270)	-2.164 (2.670)	6.947*** (1.662)
lag ESG x lag positive ESG concerns	0.393*** (0.137)	8.964*** (1.626)	-0.894 (0.567)
Size	0.184*** (0.039)	3.043*** (0.487)	-2.086*** (0.216)
Advertising	-4.500*** (0.215)	-56.562*** (5.642)	-9.683*** (0.700)
Research	-2.364*** (0.078)	-137.852*** (1.157)	-3.845*** (0.186)
Capex	32.702*** (3.817)	120.866*** (46.455)	-27.996 (25.579)
Leverage	-1.621*** (0.317)	-14.904*** (3.985)	-9.097*** (1.354)
Cash	-0.759** (0.379)	26.176*** (4.667)	-2.447* (1.441)
Constant	2.392*** (0.295)	8.316** (3.836)	43.606*** (1.618)
Observations	63,392	63,392	64,032
Industry FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Adj. R-squared	0.511	0.872	0.416

This table presents regression results examining the effects of firms' ESG scores and their interaction with a dummy variable for increasing ESG concerns on various financial performance measures, as indicated at the top of each column. The dummy equals 1 when the concerns index is above its median over the past 12 months, and 0 otherwise. Both ESG scores and the dummy variable are lagged by one quarter. All regressions include industry and quarter fixed effects, with standard errors clustered at the firm level. Robust standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 7. Firms' response to heightened ESG concerns

Dependent variable	Advertising intensity		
	(1)	(2)	(3)
Time trend	0.001*** (0.000)	0.000** (0.000)	0.000*** (0.000)
Quarter 1	0.011*** (0.002)		0.004* (0.002)
Quarter 2	0.008*** (0.001)		0.004** (0.002)
Quarter 4	-0.001 (0.001)		-0.003** (0.002)
ESG concerns Q2		-0.001 (0.002)	-0.002 (0.002)
ESG concerns Q3		0.013*** (0.002)	0.012*** (0.002)
ESG concerns Q4		0.025*** (0.003)	0.023*** (0.003)
Constant	0.411*** (0.028)	0.418*** (0.028)	0.416*** (0.028)
Observations	66,852	65,991	65,991
Control	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Adj. R-squared	0.300	0.300	0.300

This table presents regression results examining whether firms adjust their advertising intensity in response to heightened ESG concerns. The dependent variable is advertising intensity, while the explanatory variables include quarterly time trend, calendar quarter dummies, ESG concerns quartile dummies, and control variables such as firm size, R&D expenditures, capital expenditures (capex), leverage, cash holdings, and ESG scores. We also include industry fixed effects to control for industry-specific differences. Quarter 3 and quartile 1 serve as the reference groups, as these periods exhibit the lowest levels of ESG concerns. Standard errors are clustered by firm and are reported in parentheses. Statistical significance is indicated by *, **, and *** for the 10%, 5%, and 1% levels, respectively.

Table 8. Endogeneity concerns

Panel A. Instrumental variable regressions								
Dependent variable	Instrument: Peer ESG scores				Instrument: State-level political leaning			
	Lag	Return	Opr. profit	Asset	Lag	Return	Opr. profit	Asset
	ESG scores (1)	on assets (2)	margin (3)	turnover (4)	ESG scores (5)	on assets (6)	margin (7)	turnover (8)
lag peer ESG	0.188*** (0.048)							
lag President Vote D%					-0.060 (0.069)			
lag Congress Delegation D%					0.071*** (0.017)			
lag State Government D%					-0.018* (0.009)			
Instrumented ESG		4.651 (4.122)	8.965 (33.793)	-1.215 (26.677)		3.537 (3.440)	143.012*** (36.855)	8.259 (19.247)
Instrumented ESG x lag ESG concerns		2.201*** (0.214)	17.295*** (3.933)	1.426** (0.705)		2.065*** (0.214)	16.752*** (3.916)	1.150 (0.703)
Constant	-0.152*** (0.026)	2.734*** (0.423)	9.460** (4.377)	43.163*** (2.490)	-0.074** (0.033)	2.658*** (0.395)	19.992*** (5.072)	43.811*** (2.224)
Observations	64,600	63,112	63,112	63,744	64,642	63,098	63,098	63,726
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.351	0.512	0.872	0.413	0.352	0.512	0.873	0.412
KP Wald F-stat	15.411				8.501			
Panel B. Controlling for common shocks								
Dependent variable	Return	Opr. profit	Asset					
	on assets (1)	margin (2)	turnover (3)					
lag ESG	0.853*** (0.258)	1.008 (2.641)	5.258*** (1.636)					
lag ESG x lag ESG concerns	0.447*** (0.117)	7.524*** (1.583)	-0.312 (0.523)					
Constant	2.297*** (0.294)	10.358** (4.124)	43.622*** (1.605)					
Observations	62,898	62,898	63,538					
Control	Yes	Yes	Yes					
State-by-quarter FE	Yes	Yes	Yes					
Industry-by-quarter FE	Yes	Yes	Yes					
Adj. R-squared	0.534	0.874	0.430					

This table presents results from empirical specifications that address endogeneity concerns. Panel A reports instrumental variable estimates using industry peer ESG scores (Columns 1–4) and state-level political leaning measures (Columns 5–8) as instruments for lagged ESG scores. Columns 1 and 5 present the first-stage regressions, while Columns 2–4 and 6–8 report the corresponding second-stage estimates in which firm performance is regressed on the instrumented ESG score and its interaction with lagged ESG concerns. Panel B presents estimates from a specification that incorporates state-by-quarter and industry-by-quarter fixed effects to account for location-specific and industry-level time-varying shocks. All regressions include control variables, as well as industry and quarter fixed effects for Panel B. Standard errors are clustered at the firm level and reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 9. The interaction effects of each environmental, social, and governance dimension

Dependent variable	Environmental			Social			Governance			Combined		
	Return on assets	Opr. profit margin	Asset turnover	Return on assets	Opr. profit margin	Asset turnover	Return on assets	Opr. profit margin	Asset turnover	Return on assets	Opr. profit margin	Asset turnover
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
lag Env	0.422** (0.211)	-3.299 (2.123)	4.898*** (1.283)							-0.065 (0.253)	-10.801*** (2.798)	1.920 (1.456)
lag Env x lag Env. concerns	0.325*** (0.059)	2.641*** (0.763)	-0.069 (0.224)							0.410*** (0.076)	-0.174 (0.932)	0.379 (0.285)
lag Soc				0.818*** (0.250)	9.196*** (2.724)	6.344*** (1.567)				0.673** (0.300)	18.877*** (3.667)	3.739** (1.794)
lag Soc x lag Soc. concerns				0.121 (0.096)	6.159*** (1.449)	-0.754* (0.394)				-0.359*** (0.126)	5.735*** (1.757)	-1.159** (0.503)
lag Gov							0.552*** (0.185)	-5.512** (2.284)	5.060*** (1.102)	0.425** (0.196)	-6.403*** (2.421)	3.607*** (1.197)
lag Gov x lag Gov. concerns							0.372*** (0.102)	3.324** (1.432)	0.058 (0.465)	0.306*** (0.112)	1.079 (1.476)	0.302 (0.512)
Constant	2.521*** (0.322)	5.825 (4.083)	46.048*** (1.737)	2.514*** (0.303)	10.159** (3.968)	44.790*** (1.679)	2.201*** (0.293)	9.107** (3.817)	42.167*** (1.624)	2.329*** (0.328)	7.424* (4.174)	44.568*** (1.806)
Observations	63,392	63,392	64,032	63,392	63,392	64,032	63,392	63,392	64,032	63,392	63,392	64,032
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.509	0.872	0.416	0.510	0.872	0.416	0.510	0.872	0.416	0.510	0.873	0.419

This table presents regression results that analyze the environmental, social, and governance (ESG) dimensions separately, along with their interactions with the corresponding ESG concerns indices, across various financial performance measures, as indicated at the top of each column. All ESG dimension scores and concerns indices are lagged by one quarter. Columns 1–3 report results for the environmental dimension, Columns 4–6 for the social dimension, Columns 7–9 for the governance dimension, and Columns 10–12 present models that include all three ESG dimension scores along with their respective interaction terms. All regressions include control variables, as well as industry and quarter fixed effects. Standard errors are clustered at the firm level and reported in parentheses. *, **, and *** denote significant coefficients at the 10%, 5%, and 1% levels, respectively.

Table 10. The interaction effects across industries

Dependent variable	Return on assets (1)	Opr. profit margin (2)	Asset turnover (3)	Return on assets (4)	Opr. profit margin (5)	Asset turnover (6)
	ESG			ESG x ESG concerns		
(1) Consumer Nondurables	1.344* (0.733)	3.813 (3.257)	2.776 (4.228)	0.864* (0.464)	4.105** (1.796)	-0.396 (1.359)
(2) Consumer Durables	1.157 (1.009)	-0.341 (7.123)	7.457 (4.509)	1.243* (0.674)	33.330** (14.081)	0.103 (2.490)
(3) Manufacturing	2.288*** (0.482)	3.960 (3.426)	14.173*** (3.312)	0.619** (0.264)	5.445** (2.355)	0.219 (1.037)
(4) Oil, Gas, and Coal	-0.147 (0.599)	10.956 (12.228)	-8.365 (5.211)	-0.181 (0.493)	4.023 (4.202)	-2.555 (1.718)
(5) Chemicals and Allied Products	1.352 (1.313)	6.187 (5.242)	5.766 (3.907)	-0.395 (0.575)	-2.808 (3.582)	0.977 (1.636)
(6) Business Equipment	1.105* (0.565)	2.863 (5.936)	6.979*** (1.927)	0.442** (0.212)	8.765*** (2.823)	-0.319 (0.676)
(7) Telephone and Television Transmission	0.680 (1.031)	-4.175 (20.993)	7.567 (4.796)	-0.400 (0.486)	-1.413 (8.892)	-5.647** (2.313)
(8) Utilities	-0.128 (0.233)	-2.293 (5.723)	-0.400 (1.947)	0.150 (0.234)	-1.389 (2.684)	2.078* (1.127)
(9) Wholesale, Retail, and Some Services	2.845*** (0.672)	2.760 (4.908)	7.075 (7.326)	0.080 (0.344)	6.183 (3.790)	-5.081* (2.608)
(10) Healthcare, Medical Equipment, and Drugs	-0.357 (0.869)	2.508 (12.904)	4.893** (1.941)	0.751** (0.323)	28.073*** (6.871)	0.241 (0.655)
(11) Others	0.892 (0.689)	7.417 (8.448)	5.578 (5.242)	0.496* (0.285)	1.488 (2.836)	0.129 (1.556)

This table presents industry-specific regressions of ESG scores and their interaction with ESG concerns, based on the Fama-French 12-industry classification. Regressions are run on financial performance measures, listed at the top of each column. Columns 1–3 report the estimated coefficients for ESG scores, while Columns 4–6 present the coefficients for the interaction between ESG scores and ESG concerns. Both ESG scores and ESG concerns are lagged by one quarter. All regressions include control variables and quarter fixed effects, with standard errors clustered at the firm level. Robust standard errors are reported in parentheses. *, **, and *** denote significant coefficients at the 10%, 5%, and 1% levels, respectively.

Table 11. Impact of ESG concerns in high- vs low-competition environments

Dependent variable	High competition			Low competition		
	Return on assets (1)	Opr. profit margin (2)	Asset turnover (3)	Return on assets (4)	Opr. profit margin (5)	Asset turnover (6)
lag ESG	0.258 (0.307)	1.211 (4.255)	4.613*** (1.537)	1.671*** (0.321)	4.038* (2.343)	7.105*** (2.236)
lag ESG x lag ESG concerns	0.566*** (0.167)	11.079*** (2.415)	-0.282 (0.569)	0.366** (0.155)	3.828** (1.707)	-0.662 (0.744)
Constant	1.556*** (0.403)	10.815* (6.425)	36.534*** (1.758)	3.301*** (0.364)	7.732** (3.348)	50.953*** (2.288)
Observations	30,910	30,910	31,210	31,338	31,338	31,672
Control	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.572	0.888	0.347	0.301	0.491	0.407

This table presents regression results analyzing firms' ESG scores and their interaction with ESG concerns across various financial performance measures, as indicated at the top of each column. The sample is divided into two groups based on product market fluidity scores (Hoberg et al., 2014). Firms are classified as operating in highly competitive environments if their fluidity scores exceed the annual median, and as operating in less competitive environments if their scores fall below the median. Columns 1–3 report results for high-competition industries, while Columns 4–6 present results for low-competition industries. ESG scores and ESG concerns are lagged by one quarter. All regressions control for relevant variables and include industry and quarter fixed effects, with standard errors clustered at the firm level. Robust standard errors are reported in parentheses. *, **, and *** denote significant coefficients at the 10%, 5%, and 1% levels, respectively.

Table 12. Impact of ESG concerns in high- vs. low-differentiation firms

Panel A. High and low R&D intensity						
Dependent variable	High R&D			Low R&D		
	Return on assets (1)	Opr. profit margin (2)	Asset turnover (3)	Return on assets (4)	Opr. profit margin (5)	Asset turnover (6)
lag ESG	1.286*** (0.379)	1.270 (3.094)	6.757*** (1.577)	0.940*** (0.324)	3.506 (3.472)	4.855 (3.119)
lag ESG x lag ESG concerns	0.824*** (0.163)	9.219*** (2.248)	-0.943* (0.567)	-0.034 (0.170)	1.043 (1.136)	-0.269 (0.925)
Constant	2.347*** (0.424)	-3.667 (4.893)	40.074*** (1.477)	3.123*** (0.396)	18.179** (7.689)	49.692*** (3.425)
Observations	24,610	24,610	24,828	24,694	24,694	24,833
Control	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.457	0.876	0.353	0.143	0.127	0.438
Panel B. High and low advertising intensity						
Dependent variable	High advertising			Low advertising		
	Return on assets (1)	Opr. profit margin (2)	Asset turnover (3)	Return on assets (4)	Opr. profit margin (5)	Asset turnover (6)
lag ESG	1.554*** (0.348)	3.008 (2.700)	7.936*** (1.649)	0.372 (0.312)	0.728 (3.064)	4.312 (2.854)
lag ESG x lag ESG concerns	0.668*** (0.167)	7.904*** (2.071)	-0.302 (0.591)	-0.153 (0.159)	2.027* (1.195)	-0.945 (0.890)
Constant	3.178*** (0.434)	7.936 (6.190)	43.716*** (1.579)	2.635*** (0.390)	5.556 (4.895)	47.607*** (3.133)
Observations	23,886	23,886	24,097	25,418	25,418	25,564
Control	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.427	0.52	0.471	0.315	0.813	0.429

This table presents regression results examining firms' ESG scores and their interaction with ESG concerns across various financial performance measures, as indicated at the top of each column. Panel A classifies firms as high R&D intensity if their five-year average R&D-to-sales ratio exceeds the annual sample median. Panel B identifies firms as high advertising intensity if their five-year average SG&A-to-sales ratio is above the corresponding median. ESG scores and ESG concerns are lagged by one quarter. All regressions control for relevant variables and include industry and quarter fixed effects, with standard errors clustered at the firm level. Robust standard errors are reported in parentheses. *, **, and *** denote significant coefficients at the 10%, 5%, and 1% levels, respectively.

Table 13. Robustness tests

Panel A. State fixed effects			
Dependent Variables	Return on assets	Opr. profit margin	Asset turnover
	(1)	(2)	(3)
lag ESG	1.001*** (0.276)	3.809 (2.762)	5.209*** (1.847)
lag ESG x lag ESG concerns	0.490*** (0.117)	8.443*** (1.606)	-0.268 (0.570)
Constant	2.906*** (0.294)	6.168 (4.065)	49.990*** (1.815)
Observations	63,392	63,392	64,032
Control	Yes	Yes	Yes
States FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Adj. R-squared	0.496	0.869	0.209
Panel B. ESG concerns - deviation from 6-month search volume median			
Dependent Variables	Return on assets	Opr. profit margin	Asset turnover
	(1)	(2)	(3)
lag ESG	1.101*** (0.252)	2.324 (2.543)	6.455*** (1.582)
lag ESG x lag ESG concerns	0.304*** (0.100)	7.733*** (1.481)	-0.681 (0.417)
Constant	2.401*** (0.295)	8.298** (3.833)	43.661*** (1.627)
Observations	63,835	63,835	64,489
Control			
Industry FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Adj. R-squared	0.510	0.871	0.416
Panel C. ESG concerns - deviation from 3-month search volume median			
Dependent Variables	Return on assets	Opr. profit margin	Asset turnover
	(1)	(2)	(3)
lag ESG	1.120*** (0.251)	2.705 (2.540)	6.384*** (1.577)
lag ESG x lag ESG concerns	0.182*** (0.068)	4.637*** (1.053)	-0.267 (0.280)
Constant	2.409*** (0.295)	8.355** (3.834)	43.680*** (1.632)
Observations	64,062	64,062	64,719
Control	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Adj. R-squared	0.510	0.871	0.416
Panel D. Additional dependent variables			
Dependent Variables	Return on equity	Gross profit margin	Opr. cash flow
	(1)	(2)	(3)
lag ESG	3.264*** (1.091)	1.661 (2.188)	0.663*** (0.218)
lag ESG x lag ESG concerns	1.474*** (0.562)	4.661*** (1.560)	0.343*** (0.122)
Constant	-4.694*** (1.040)	-6.935* (3.816)	0.577** (0.258)
Observations	60,390	63,975	64,032
Control	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Adj. R-squared	0.171	0.840	0.338

This table reports regression results examining firms' ESG scores and their interaction with ESG concerns across various financial performance measures, as indicated at the top of each column. Panel A replaces industry fixed effects with U.S. state fixed effects. Panels B and C test alternative constructions of the ESG concerns index, based on deviations from the 6-month and 3-month medians of search volumes, respectively. Panel D uses alternative dependent variables: (1) return on equity (net income/book value of equity), (2) gross profit margin ((sales – cost of goods sold)/sales), and (3) operating cash flow (net operating cash flow/total assets). ESG scores and ESG concerns are lagged by one quarter. All regressions include control variables, quarter fixed effects, and industry fixed effects (except in Panel A). Standard errors are clustered at the firm level. Robust standard errors are reported in parentheses. *, **, and *** denote significant coefficients at the 10%, 5%, and 1% levels, respectively.

Appendix A

Table A1. Triple interaction: ESG, ESG concerns, and competition

Dependent variable	Return on assets (1)	Opr. profit margin (2)	Asset turnover (3)
lag ESG	0.916*** (0.319)	1.201 (3.010)	6.100*** (2.060)
lag ESG x lag ESG concerns	0.316** (0.152)	2.767 (1.756)	-0.354 (0.743)
high fluidity	-0.531*** (0.174)	0.033 (2.061)	-3.401*** (1.013)
lag ESG x high fluidity	0.200 (0.372)	2.641 (4.384)	0.370 (2.122)
lag ESG concerns x high fluidity	-0.082 (0.113)	-4.979*** (1.634)	0.645 (0.466)
lag ESG x lag ESG concerns x high fluidity	0.270 (0.219)	8.929*** (2.867)	-0.345 (0.929)
Constant	2.610*** (0.303)	9.166** (3.939)	44.733*** (1.707)
Observations	62,248	62,248	62,882
Control	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year-quarter FE	Yes	Yes	Yes
Adj. R-squared	0.514	0.874	0.422

This table reports regression results examining the effects of firms' ESG scores and their interaction with ESG concerns and competition intensity. The dependent variables are indicated at the top of each column. *High fluidity* is a dummy variable equal to 1 if a firm's product market fluidity score (Hoberg et al., 2014) exceeds the sample median in a given year, and 0 otherwise. ESG scores and ESG concerns are lagged by one quarter. All regressions include a set of control variables, along with industry and year-quarter fixed effects. Standard errors, clustered at the firm level, are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A2. Triple interaction: ESG, ESG concerns, and differentiation

Panel A. Interaction with R&D intensity			
Dependent variable	Return on assets (1)	Opr. profit margin (2)	Asset turnover (3)
lag ESG	0.193 (0.328)	-4.315 (3.003)	7.638*** (2.809)
lag ESG x lag ESG concerns	0.045 (0.170)	2.026* (1.199)	-0.013 (0.916)
high R&D	-0.324 (0.242)	8.073*** (2.142)	-1.056 (1.467)
lag ESG x high R&D	1.727*** (0.447)	8.558** (3.947)	-2.468 (2.976)
lag ESG concerns x high R&D	-0.727*** (0.123)	-4.525*** (1.555)	0.285 (0.537)
lag ESG x lag ESG concerns x high R&D	0.733*** (0.228)	5.936** (2.528)	-1.161 (1.082)
Constant	2.954*** (0.313)	-0.914 (4.052)	45.288*** (2.086)
Observations	49,304	49,304	49,661
Control	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year-quarter FE	Yes	Yes	Yes
Adj. R-squared	0.327	0.739	0.415
Panel B. Interaction with advertising intensity			
Dependent variable	Return on assets (1)	Opr. profit margin (2)	Asset turnover (3)
lag ESG	-0.028 (0.285)	-5.859* (3.006)	7.318*** (2.573)
lag ESG x lag ESG concerns	-0.009 (0.157)	2.222* (1.164)	-0.955 (0.879)
high adv	0.745*** (0.218)	8.653*** (2.700)	-2.640* (1.424)
lag ESG x high adv	2.029*** (0.410)	13.244*** (4.099)	-1.861 (2.808)
lag ESG concerns x high adv	-0.761*** (0.124)	-3.547*** (1.370)	-0.767 (0.564)
lag ESG x lag ESG concerns x high adv	0.611*** (0.226)	4.866** (2.292)	0.357 (1.077)
Constant	2.560*** (0.291)	-1.787 (3.741)	46.134*** (2.028)
Observations	49,304	49,304	49,661
Control	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Year-quarter FE	Yes	Yes	Yes
Adj. R-squared	0.359	0.742	0.419

This table presents regression results examining the effects of firms' ESG scores and their interaction with ESG concerns, moderated by R&D intensity (Panel A) and advertising intensity (Panel B). High R&D and High advertising are dummies equal to 1 if a firm's previous five-year average R&D-to-sales or SG&A-to-sales ratio, respectively, exceeds the sample median for that year. ESG scores and ESG concerns are lagged by one quarter. Robust standard errors, clustered at firm level, are reported in parentheses. *, **, and *** denote significant coefficients at the 10%, 5%, and 1% levels, respectively.