Examining ESG and Corporate Investment Through the Lens of Industry Competition

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Abstract

In increasingly competitive industries, firms are expected to prioritize value-enhancing activities. If ESG engagement contributes to firm value, stronger competition should likewise encourage greater ESG investment. We find the opposite. As industry competition intensifies, corporate investment rises significantly, while average industry ESG scores decline. Controlling for changes in competition, larger increases in cash flows are associated with greater improvements in ESG performance. However, conditional on competition, industries in the highest competition quintile exhibit stronger growth in corporate investment without corresponding gains in ESG performance. Viewed through the lens of industry competition, the evidence provides limited support for ESG engagement as a value-enhancing activity. The results are robust to alternative ESG data sources, industry classification systems, and Census-based concentration measures.

Keywords: HHI (Herfindahl-Hirschman Index); ESG (Environmental, Social, and Governance)

JEL Classification: G30; G32

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I. Introduction

Whether a business should pay particular attention to environmental, social, and governance (ESG) issues has been a subject of debate among academicians and practitioners for several years. In a literature review, Starks (2023) suggests that both "value" and "values" motivations contribute to the choices of retail and institutional investors who consider for ESG investments. Starks et al. (2026) document that long-term institutional investors with information advantages in assessing firms' ESG profiles tilt their portfolios toward firms with stronger ESG performance. Although a firm's ESG profile and activities have been shown to be strongly associated with its market characteristics, leadership structure, ownership, and its risk, performance, and valuation, it is not clear that businesses gain if they prioritize environmental and social issues.

ESG activities may create firm value by increasing shareholder wealth and utility—whether through enhanced cash flows or reduced discount rates. Conversely, ESG engagement could reflect management agency problems, in that managers pursue such activities to serve their own interests rather than those of shareholders. This view suggests that firms with stronger financial performance or higher valuations might simply be able to allocate resources to ESG efforts—an extension of the free cash flow agency problem. Cheng et al. (2023) and Masulis and Reza (2015) provide evidence that an increase in effective managerial ownership leads to reduced corporate social responsibility (CSR) activities and corporate giving, consistent with an agency cost view of CSR.

A central question, then, is: Do ESG decisions influence firm performance and value, or is it the reverse: Firm performance and valuation drive ESG engagement? Our research seeks to answer this question through the lens of industry competition. We look at management decisions made in firms that face peer competition in their industry.

Theories suggest that strong ESG practices can enhance firm value by strengthening market position, attracting customers, improving employee productivity, and reducing systematic risk.[1] If ESG engagement indeed creates value, firms operating in more competitive industries should be more inclined to invest in ESG activities. Competitive pressure reduces

[1] See Baron (2008 and 2001), Albuquerque et al. (2019), and Eccles et al. (2014). Hoepner et al. (2024) provide empirical evidence that large institutional investors can significantly reduce the downside risk of their portfolio firms through active engagement in ESG or CSR-related activities. Throughout this study, we do not distinguish between CSR and ESG and use the two terms interchangeably.

managerial slack and enforces discipline, compelling managers to allocate resources toward activities that improve efficiency and firm value. Consistent with this view, Giroud and Mueller (2010) show that product-market competition mitigates managerial slack by subjecting managers to stronger external discipline.

In highly competitive industries, managers face persistent survival pressure and operate under tighter financial constraints. Under such conditions, managerial attention is likely to concentrate on activities with clear and immediate value implications. Stein (1989) provides a complementary perspective: when markets infer firm quality from observable managerial actions, managers may optimally distort real decisions to influence beliefs rather than fundamentals, leading to a signal-jamming equilibrium. The feasibility of such behavior depends on a firm's ability to undertake actions whose primary payoff is informational rather than value-enhancing. As product-market competition intensifies, profit margins compress and firm survival becomes more closely tied to cash-flow performance, reducing the scope for discretionary signal-jamming activities.

Consequently, while intensified competition strengthens incentives for value-enhancing corporate investment, it weakens incentives to undertake discretionary actions—such as ESG engagement—that are less directly linked to near-term cash flows and more susceptible to belief-manipulation motives. Whether CSR/ESG activities constitute prioritized value-enhancing investments or discretionary signal-jamming behavior is therefore an empirical question.[2]

By examining managerial behavior in competitive industries, we provide a revealed-preference perspective on how managers value ESG investments and their implications for firm value. Our findings complement the existing literature that focuses primarily on how investors value ESG engagement.[3]

[2] Borghesi et al. (2014) find that corporate social responsibility investment may be part of a broader strategy to create goodwill and/or help maintain good political relations. Even though ESG investments may enhance a firm's or a manager's political connections, such connections are unlikely the first-order objective in a highly competitive industry.

[3] Quite a few studies have examined the performance of ESG portfolios (or firms). Conclusions vary as to whether ESG attributes add to corporate value. See the literature review by Starks (2023). Using a revealed preference approach, Baker et al. (2024) quantify the value that investors place on ESG objectives over time. They find that the premium that investors assign to index funds with an ESG mandate rose from 3 basis points in 2019 to a peak of 17 basis points in 2020, before turning negative in 2022 and falling to a negative 33 basis points in 2023.

Examination of causality issue of ESG decision making on the basis of industries rather than individual firms has several advantages. First, ESG engagement by all firms in an industry reveals the aggregate view of ESG value among stakeholders with different motivations who are exposed to the same economic shocks associated with the industry. Further, a study of ESG value from the industry perspective removes the endogeneity issue in cross-firm studies. Hong et al. (2012) observe that empirical studies that are cross-firm in nature suffer from potential omitted variables problems. They show that financial constraints are indeed an important driver of corporate social responsibility.

Second, industry competition forces managers to make corporate decisions more selectively. Albuquerque et al. (2019) model CSR as an investment that enhances product differentiation, and predict that firms engaging in CSR activities exhibit lower systematic risk and higher firm value. Firms may alternatively allocate capital expenditures to CSR-neutral but cost-effective innovations to achieve product differentiation. Given limited resources, managers face trade-offs as they allocate capital, and are therefore compelled to prioritize competing corporate investments, particularly in highly competitive industries.[4]

To evaluate the argument that managers concentrate on activities that directly enhance firm value when facing heightened competitive pressure, we apply the same analysis to corporate investment. Prior research shows that corporate investment is positively related to firm value (McConnell and Muscarella, 1985). Firms therefore invest in growth opportunities to enhance value and preserve market position. In more competitive industries, managers face stronger survival pressure and tighter constraints, making them more likely to pursue investments with positive net present value. Consistent with this intuition, we find that corporate investment increases as industry competition intensifies.

Certain ESG-enhancing activities—particularly those related to environmental mitigation, energy efficiency, and workplace safety—also require investment in long-lived

[4] On April 19, 2024, *The Guardian* reported that Unilever announced plans to scale back its commitments on plastic usage, attributing the decision to heightened shareholder pressure to reduce costs and refocus on profitability. Unilever operates in the "All Other Miscellaneous Food Manufacturing" industry (NAICS 311999), where major competitors include General Mills Inc., Conagra Brands Inc., and Cargill Inc. According to the 2022 U.S. Census, this industry has a Herfindahl–Hirschman Index (HHI) of 301, indicating a highly competitive market structure. With respect to the HHI's origin, Hirschman (1964) notes that he first developed the index in a trade study conducted in the 1940s, whereas Herfindahl (1950) formalized the index in the form commonly used today in his Ph.D. dissertation.

physical assets.[5] Whether such ESG-related investments are similarly prioritized as competitive pressure intensifies, however, remains an open empirical question.

In competitive industries, an optimal response to new investment opportunities may be to invest more aggressively or earlier than rivals. As a result, average investment rates are expected to be higher in more competitive industries than in more concentrated ones. If ESG engagement similarly enhances firm value, competitive pressure should also encourage greater ESG investment. To the extent that some ESG activities generate benefits that are diffuse, long-horizon, or primarily reputational rather than tied to near-term cash flows, however, competitive pressure may not uniformly encourage ESG engagement, even if such activities are value-enhancing in the long run. These considerations lead to the following testable hypotheses:

H1a: Firms operating in industries with more intense peer competition exhibit higher levels of corporate investment, on average.

H1b: Firms operating in industries with more intense peer competition exhibit higher ESG scores, on average.

Our results strongly support H1a: firms in more competitive industries exhibit significantly higher levels of corporate investment. In contrast, we find no evidence supporting H1b, as increased competition is not associated with higher ESG scores.

However, ESG practices exhibit a strong industry component. Borghesi et al. (2014) document substantial cross-industry variation in corporate social responsibility, with consumer goods and computer hardware industries exhibiting above-average scores, and aircraft and petroleum and natural gas industries exhibiting below-average scores. To mitigate confounding arising from persistent industry characteristics, we focus on changes rather than levels in industry-average corporate investment and ESG scores.

[5] Intel's 2024–25 Corporate Responsibility Report identifies HVAC upgrades and heat-recovery projects, greenhouse-gas abatement equipment, and water-reclamation facility upgrades as eligible project areas for green finance (see https://csrreportbuilder.intel.com/pdfbuilder/pdfs/CSR-2024-25-Full-Report.pdf). These expenditures correspond to long-lived assets that are typically capitalized as property, plant, and equipment (PPE). As such, these ESG-related initiatives constitute corporate investment and are consistent with higher Refinitiv ESG scores.

If increases in product-market competition intensify survival pressure, firms may respond by accelerating value-enhancing activities. In particular, heightened competition may prompt firms to advance corporate investment in growth opportunities or to enhance ESG engagement, as the risk of preemption reduces the value of delaying such actions. These arguments lead to the following testable hypotheses:

H2a: Increases in industry competition lead firms to accelerate corporate investment in growth opportunities.

H2b: Increases in industry competition lead firms to accelerate activities aimed at improving their ESG scores.

We find strong support for H2a: increases in industry competition are associated with significant accelerations in corporate investment. In contrast, we find no evidence supporting H2b, as heightened competition is not associated with accelerated improvements in ESG performance.

Our results contribute to the ESG literature in several ways. First, we exploit variation in industry competition to study whether ESG activities behave like value-enhancing investments when firms face heightened competitive pressure. If ESG engagement contributes to firm value, managers operating in more competitive industries—where the cost of inefficiency is high—should prioritize ESG activities alongside other value-enhancing investments. We evaluate this prediction by examining ESG outcomes and corporate investment decisions through the same competitive lens.

Second, we document that as industry competition intensifies, changes in corporate investment rise significantly, while changes in the industry's average ESG score fall significantly. This divergence suggests that when competition constrains managerial discretion, firms reallocate resources toward investments more directly tied to cash flow generation. At the same time, conditional on changes in industry competition, larger increases in cash flow are associated with stronger ESG improvements, indicating that ESG engagement is more likely to expand when financial slack increases rather than when competitive pressure intensifies.

Third, we extend the analysis by jointly considering changes in industry competition and industry organizational structure. Conditional on changes in competition, industries in the highest competition quintile exhibit a 0.3815 higher percentile increase in corporate

investment, but no corresponding increase in ESG. Similarly, conditional on changes in cash flow, industries in the highest competition quintile show a 0.1651 higher percentile increase in corporate investment, again without a comparable change in ESG.

Taken together, these findings suggest that ESG activities do not behave like value-enhancing investments in competitive environments. Instead, ESG engagement appears more sensitive to financial capacity than to competitive discipline. Our conclusions are robust to alternative ESG data from S&P Global, the exclusion of financials and utilities, six-digit NAICS industry classifications, and Census-based measures of industry concentration that capture revenues of both public and private firms

Our findings are also consistent with a signal-jamming mechanism in the spirit of Stein (1989). In his model, managers facing short-term performance evaluation may distort real investment decisions to influence market beliefs, particularly when competitive pressure heightens the cost of appearing weak. Applied to our setting, intensified industry competition increases the marginal value of demonstrating near-term operational strength, leading managers to prioritize tangible, cash-flow-generating investments over ESG activities whose payoffs are more diffuse, longer-horizon, or less verifiable. ESG engagement, in this framework, functions as a weaker signal of firm quality under competitive pressure and is therefore more likely to be deferred unless supported by sufficient financial slack. This interpretation helps reconcile the observed divergence between rising corporate investment and declining ESG performance in highly competitive industries.

The paper is organized as follows. Section II describes the data. Section III presents empirical results on tests of Hypothesis 1, while Section IV shows results on tests of Hypothesis 2. Section V further examines whether the link between changes in ESG activities and changes in industry competition is conditional on current industry organization. Section VI conducts robustness checks. Section VII concludes.

II. Data

Our main data source is Standard & Poor's Compustat and the London Stock Exchange Group's Refinitiv. We extract accounting variables as well as SIC codes from Compustat. The accounting variables include total assets (TA) in $millions, total sales, Tobin's Q (Q), cash flow (CF), and corporate investment (Inv). We follow Foucault and Fresard (2014) to construct Q,

CF, and Inv.[6] To account for the role of private firms in defining industry competition, in robustness checks we use industry concentration information from the U.S. Census Bureau.[7]

Our primary measure of industry competition is the Herfindahl–Hirschman Index (HHI), defined as the sum of squared market shares and widely used in the industrial organization literature. We construct industry-level HHIs using firms' annual sales from Compustat when available and supplement them with Census industry concentration measures in robustness analyses.

An increase in industry concentration does not necessarily imply a decline in competition if it reflects efficiency gains by more productive firms that expand market share by offering higher-quality products at lower prices. However, examining U.S. industries over the past two decades, Grullon et al. (2019) document that more than 75% have experienced rising concentration and show that firms in more concentrated industries have become more profitable primarily through higher profit margins rather than improved efficiency. These findings suggest that increased concentration is more likely to be associated with weaker product-market competition. Accordingly, a higher HHI is interpreted as indicating lower competitive intensity.

We obtain ESG and component scores from Refinitiv, which assesses firms' ESG performance using verifiable information disclosed in the public domain. Core ESG metrics are updated annually in accordance with firms' disclosure cycles, with interim updates when material changes in reporting practices or corporate structure occur. In addition, ESG-related news and controversies are monitored continuously through global media sources and incorporated as events arise. As a result, Refinitiv ESG scores, including controversy measures, are refreshed on a weekly basis. To the extent that ESG-related investments by publicly traded firms receive public disclosure or media coverage, such information is incorporated into

[6] TA is book value of total assets (Compustat variable: at). Tobin's Q is [book value of assets (at) − book value of equity (ceq) + market value of equity (csho × prcc_f)] / book value of assets (at). CF (cash flow) is income before extraordinary items (ib) plus depreciation (dp) divided by total assets. Inv (investment) is capital expenditures (capx) divided by lagged PPE (property, plant, and equipment [ppent]). We exclude firm-year observations with negative sales or missing information on total assets, capital expenditure, fixed assets (property, plant, and equipment (PPE)), and (end of year) stock prices.

[7] The economic census data are obtained from the U.S. Census Bureau (https://www.census.gov/programs-surveys/economic-census/data/tables.html). Concentration measures are not recorded consistently across Census years. For example, in earlier years, the fifty-firm concentration ratio is recorded as zero and flagged as "N," while in more recent years it is reported as 100% once the twenty-firm concentration ratio reaches 100%. In addition, although HHIs are typically reported alongside the fifty-firm concentration ratio, they are occasionally reported next to the twenty-firm concentration ratio instead. We systematically clean and harmonize these irregularities in the concentration measures.

Refinitiv's updates. The Refinitiv ESG universe covers more than 11,000 companies worldwide. Our sample period spans 2002–2024.[8]

Table 1 provides summary statistics. Every year, we calculate the Herfindahl-Hirschman Index (HHI) based on a firm's sales for each industry defined by four-digit SIC codes. We calculate the average of each variable across all firms in each industry. We construct the quartile distribution, the average (AVG), and the standard deviation (SD) according to these averages across industries each year; the yearly average statistics are in Panel A. We also identify an industry that has the highest and the lowest HHI over time, and report the quartile distribution of variables for all firms in that specific industry. We exclude firm-year observations with negative sales or missing information for total assets, capital expenditure, fixed assets (property, plant, and equipment (PPE)), and (end-of-year) stock prices.

Panel A shows that the average firm in an industry has about $9.810 billion in total assets across all industries and years, with a Tobin's Q of 2.524, cash flow ratio of 0.008, and investment rate of 0.749. The average HHI across industries and years is 0.499. Overall, the Service-Health Services Industry (SIC 8000) is the most concentrated industry, while the Real Estate Investment Trusts Industry (SIC 6798) is the most competitive industry. Note that of the two the Service-Health Services Industry has both a higher ESG score and a higher Tobin's Q, as well as a greater dispersion in TA, while the Real Estate Investment Trusts Industry has a higher Inv and a wider dispersion in Inv.

Panel B of Table 1 provides a cross-sectional Pearson correlation matrix based on the average of each industry attribute every year and reports the time-series average of yearly statistics. Clearly, ESG scores are positively correlated with TA, CF, and HHI, but negatively correlated with Q and Inv. Corporate investment (Inv) is positively correlated only with corporate valuation (Q) and negatively correlated with the others.

[8] As of 2025Q1, Refinitiv has 16,304 unique identities in its ESG database. Among these, only 6,076 identities have CUSIP numbers. To match Refinitiv data with Compustat data, we first use the eight-character CUSIP numbers assigned by the Committee on Uniform Security Identification Procedures (CUSIP) Service Bureau to issues of financial instruments. According to CUSIP, CUSIPs are not re-used. Then, using the first six-digit CUSIP numbers, names, tickers, SIC codes, and NAICS codes of companies as the main input, we apply an algorithm in Practical Extraction and Report Language (PERL) that further identifies the remaining unmatched identities in the first round. We also hand-check complicated cases for accuracy. In total, there are 6,190 matched companies for which we have data in both Compustat and Refinitiv during our sample period.

III. Analysis of Levels of Industry Average

We test Hypothesis 1, that firms in more competitive industries tend to have higher corporate investment and engage more in ESG enhancement in the panel regression:

$$Y_{i,t} = \beta_1 HHI_{i,t} + Controls_{i,t} + \mu_i + \varphi_t + \varepsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ is either the average of corporate investment (Inv) or the ESG score of Industry *i* in Year *t*. We account for time-invariant industry heterogeneity by including industry fixed effects (μ_i) and time-specific effects by including year fixed effects (φ_t). We allow the error term ($\varepsilon_{i,t}$) to be correlated across industries and years, and we correct the standard errors as in Petersen (2009).

The control variables in year *t* include the average of TA, Q, and CF in an industry. These controls are known to correlate with corporate investment decisions. Foucault and Fresard (2014) use them as controls to test whether the market valuation of a firm's peers influences the firm's investment. To address differences in variable distributions and make the comparison more homogeneous across all variables, we convert values of accounting variables into percentile rank scores. Every year, we first sort firms by each accounting variable and assign a percentile rank score of zero (lowest) to one (highest) for each firm. We then calculate the average (AVG) of a firm's attribute, including ESG scores, across firms in each industry. We pool yearly industry observations and regress Inv, ESG, or ESG components on the contemporaneous HHI and control variables. In an extended model, we add the interactions with HHI to the controls.

In Model 1 of Table 2, when HHI declines one unit (the degree of industry competition increases), the average investment rate in the industry significantly increases by 0.0471 percentile rank score while the average ESG score in the industry drops insignificantly. An industry exhibiting higher corporate valuations and cash flows is associated with more corporate investment. In contrast, firms in an industry that has greater assets in place tend to have higher ESG scores. These bigger firms perhaps create goodwill or help maintain good political relations by making ESG investments. Borghesi et al. (2014) also find that larger firms demonstrate higher levels of corporate social responsibility.

In Model 2, we include the interaction between HHI and accounting variables. Conditional on the average corporate valuation in an industry, a more competitive industry

tends to have higher investment rates as well as ESG score. An industry with more assets in place still has higher ESG scores.

Panel B examines individual ESG components and reports results broadly similar to those in Panel A, with the exception of the governance (G) component. Investments associated with the environmental (E) component are more likely to take the form of corporate investment, as they typically involve expenditures on long-lived assets. These E-related investments are not prioritized in more competitive industries. Consistent with this pattern, Model 2 shows that only firms operating in more concentrated industries significantly increase activities related to the E component.

By contrast, corporate governance has long been a central focus in the accounting and finance literature, and firms are subject to extensive governance requirements imposed by the Securities and Exchange Commission (SEC). As a result, it is less likely that variation in industry competition exerts an additional influence on governance practices.

IV. Analysis of Changes in Industry Average

While the results in Table 2 show different associations between industry competition and the two outcome variables, this contrast alone is insufficient to support a firm conclusion. We therefore extend the analysis to examine changes in industry-average corporate investment and ESG scores, motivated by the idea that focusing on the dynamics of industry structure can sharpen empirical inference. To address concerns that changes in industry competition may be correlated with contemporaneous shifts in fundamentals that directly affect corporate investment and ESG incentives, we also control for changes in relevant covariates.

We test Hypothesis 2, that changes in industry competition are associated with changes in average corporate investment as well as in ESG enhancement, using the panel regression:

$$\Delta Y_{i,t} = \beta_1 \Delta HHI_{i,t} + \Delta Controls_{i,t} + \mu_i + \varphi_t + \varepsilon_{i,t} \quad (2)$$

where $\Delta Y_{i,t}$ is changes in either the average of corporate investment (Inv) or ESG score of Industry i in Year t. $\Delta Z_t \equiv Z_t - Z_{t-1}$, Z is any variable in the model. We account for time-invariant industry heterogeneity by including industry fixed effects (μ_i) and time-specific effects by including year fixed effects (φ_t). We allow the error term ($\varepsilon_{i,t}$) to be correlated across industries and years, and we correct the standard errors as in Petersen (2009).

Model 1 in Panel A of Table 3 clearly shows that changes in average investment rate in an industry significantly increase by 0.0954 percentile rank score when changes in HHI declines one unit (the industry is more competitive). Yet changes in the average ESG score in an industry significantly increase by 0.0287 percentile rank score when changes in HHI increase one unit (the industry becomes more concentrated). This evidence clearly rejects the hypothesis that firms pursue ESG enhancement to create value. Rather, firms in more concentrated industries face weaker competitive constraints, which affords them greater discretion to engage in ESG activities.

Interacting changes in HHI with changes in accounting variables in Model 2 yields the same qualitative result: as industry competition intensifies, firms increase investment while reducing ESG, and these effects remain statistically significant. Furthermore, conditional on changes in HHI, increasing changes in CF will accelerate ESG enhancement activities. This indicates that firms with increases in CF tend to engage more in ESG activities after controlling for changes in their industry competition. Again, this piece of evidence seems to indicate that firms have the capacity to allocate excess resources to ESG efforts.

Panel B reports regressions of changes in individual ESG components. The results indicate that firms operating in industries that become more concentrated have greater discretion to accelerate "E" and "G" enhancement activities. In contrast, firms in industries that accumulate more assets in place tend to accelerate "E" and "S" enhancement activities, consistent with stronger incentives to attract public attention and to reinforce political relationships. Conditional on changes in HHI, larger increases in cash flow are associated with greater acceleration of "E" enhancement activities.

V. Reactions of Highly Competitive Industries to Changes in Corporate Investment or ESG Under Increased Competition

We modify Hypothesis 2 to test whether the association between changes in industry competition and changes in the average corporate investment or in ESG enhancement is conditional on the level of industry competition in the prior year. The panel regression is:

$$\Delta Y_{i,t} = \beta_1 \text{Dummy}_{Q_1^{HHI}} + \beta_2 \Delta HHI_{i,t} + \beta_3 \text{Dummy}_{Q_1^{HHI}} \times \Delta HHI_{i,t} + \Delta Controls_{i,t} + \mu_i + \varphi_t + \varepsilon_{i,t} \quad (3)$$

where $\Delta Y_{i,t}$ is changes in either the average of corporate investment (Inv) or ESG score of Industry *i* in Year *t*. $\Delta Z_t \equiv Z_t - Z_{t-1}$, *Z* is any variable in the model. Dummy_Q_1^{HHI} is a dummy variable for an industry if the industry is in the bottom quintile according to industry HHI in the prior year. We account for time-invariant industry heterogeneity by including industry fixed effects (μ_i) and time-specific effects by including year fixed effects (φ_t). We allow the error term ($\varepsilon_{i,t}$) to be correlated across industries and years, and we correct the standard errors as in Petersen (2009).

Model 1 in Panel A of Table 4 clearly shows that changes in average investment rate in an industry significantly increase by 0.097 percentile rank score when changes in HHI decline one unit (the industry becomes more competitive). Changes in average ESG score in an industry significantly increase by 0.028 percentile rank score, however, when changes in HHI increase one unit (the industry becomes more concentrated). Conditional on changes in industry competition, industries in the high-competition quintile would have a 0.3801 higher percentile score in corporate investment, not in ESG. This piece of evidence obtained through the lens of industry competition casts doubt on the conjecture that ESG activities can create firm value.[9]

When the average of total assets in an industry increases, both investment and ESG in the industry increase. When the average of cash flow in an industry increases, only the industry's investment increases in both models. Conditional on changes in cash flow, industries in the high-competition quintile would have a 0.1651 higher percentile score in corporate investment, not in ESG, as indicated in Model 2. Conditional on changes in industry competition, industries in the high-competition quintile would have a 0.3815 higher percentile score in corporate investment, not in ESG. Again, these pieces of evidence do not support the conjecture that firms engage in ESG activities to create firm value.

[9] To demonstrate that our findings are not coincidental, we replace Dummy_Q_1^{HHI} by Dummy_Q_5^{HHI}— a dummy variable equal to one if the industry is in the top quintile of HHI in the prior year—in panel regression (3) and re-estimate the model. The results show that the average industry investment rate increases significantly by 0.0597 percentile rank score when the industry becomes more competitive. By contrast, the average industry ESG score increases significantly by 0.0373 percentile rank score when the industry becomes more concentrated. Furthermore, conditional on changes in industry competition, industries in the low-competition quintile exhibit a significant 0.1157 lower percentile rank score in corporate investment, but not in ESG. For brevity, these results are not tabulated but are available upon request.

Panel B of Table 4 reports regressions of changes in individual ESG components and yields results similar to those in Table 3. Firms in industries that become more concentrated accelerate "E" and "G" enhancement activities, while firms in industries that accumulate more assets in place tend to accelerate "E" and "S" enhancement activities.

The Paris Agreement, a legally binding international treaty on climate change, was adopted by 195 parties at the United Nations Climate Change Conference (COP21) in Paris, France, on December 12, 2015. It is likely that firms were increasing ESG initiatives for goodwill and public relations then, as governments in many countries tended to view ESG favorably, particularly in the case of green energy. This implies that changes in industry competition could be highly associated with firms' changes in ESG if ESG activities help firms to remain dominant. Borghesi et al. (2014) find that media attention helps induce firms to make socially responsible investments. Thus, we examine ESG causality in two subperiods, 2002−2015 and 2016−2024.

Model 2 of Panel A1 in Table 5 still shows a contrasting pattern in the association between industry competition and changes in corporate investment versus its association with changes in ESG. Changes in average investment rate in an industry significantly increase by 0.0903 percentile rank score when changes in HHI decline one unit (the degree of industry competition increases). Yet changes in average ESG score in an industry significantly increase by 0.0651 percentile rank score when changes in HHI increase one unit (the industry becomes more concentrated). Conditional on changes in industry competition, industries in the high-competition quintile would have a 0.3551 higher percentile score in corporate investment, not in ESG. This piece of evidence also casts doubt on the conjecture that ESG activities can create firm value, even in a period of increasing public interest in ESG.

When changes in total assets in an industry increase, only corporate investment in the industry is accelerated. The same is true for changes in Tobin's Q and changes in cash flow. Conditional on changes in corporate valuation, industries in the high-competition quintile would have a 0.1497 lower percentile score in corporate investment.

With anticipation of political shifts in the United States, companies have broadly scaled back initiatives related to climate change and what is termed diversity, equity, and inclusion. The Vanguard Group withdrew from the Net Zero Asset Managers initiative in late 2022. By 2023, BlackRock CEO Larry Fink had moderated his ESG rhetoric amid backlash from

conservative groups.[10] By the end of 2024, several U.S. megabanks had exited the United Nations–backed Net-Zero Banking Alliance. On January 9, 2025, BlackRock formally withdrew from the Net Zero Asset Managers initiative.

As public attention to ESG fades, one would expect the relation between changes in industry competition and changes in ESG to weaken during the 2016–2024 subperiod. In Table 5, Panel A2, Model 1 shows that the association pattern between changes in corporate investment and changes in industry competition does continue in the second subperiod. The association between changes in ESG scores and changes in HHI remains positive but is now insignificant. Conditional on changes in industry competition, industries in the high-competition quintile would have a 0.4232 higher percentile score in corporate investment, not in ESG. While we still do not find any supporting evidence that ESG activities create firm value, we find persistent supporting evidence that corporate investment can create firm value. Thus, firms accelerate investments when industry competition increases.

Panels B1 and B2, an examination of individual ESG components in each subperiod, show results for "E" and "S" similar to those for ESG in Panels A1 and A2. For example, firms in an industry that becomes more concentrated likely have more capacity to accelerate "E" and "S" enhancement activities in the first subperiod. Firms in an industry that accumulates more assets in place are able to accelerate "E" and "S" enhancement activities in the second subperiod.

VI. Robustness Checks

To mitigate concerns that our findings are driven by particular empirical specifications, we perform robustness checks along four dimensions: (i) alternative ESG data sources, (ii) exclusion of highly regulated industries, (iii) alternative industry classification systems, and (iv) Census-based industry concentration measures that incorporate both public and private firms.

[10] In a 2018 letter that Fink sent to the CEOs of portfolio firms, he had stated, "Society is demanding that companies, both public and private, serve a social purpose. To prosper over time, every company must not only deliver financial performance, but also show how it makes a positive contribution to society."

VI.1. S&P Global ESG

ESG ratings and metrics are an important foundation for the field of sustainable finance. Berg et al. (2024) investigate the divergence of ESG ratings across six ESG rating agencies and identify three sources of divergence—scope, measurement, and weight. To examine whether our results depend solely on Refinitiv ESG data, we re-estimate our analyses using ESG scores provided by S&P Global, a global credit-rating agency that began its ESG data collection in 2013. S&P Global ESG Scores are measured on a 0–100 scale, where 100 represents the highest level of ESG performance. Points are awarded at the question-level according to defined scoring frameworks that assess availability, quality, relevance, and performance of ESG issues. While both S&P Global and Refinitiv tend to measure companies' exposure to and performance on key ESG risks and opportunities, the construction of their ESG scores differs in methodology.[11] By decomposing the ESG ratings divergence among rating agencies into contributions of scope, measurement, and weight, Berg et al. (2024) find that measurement contributes 56% of the divergence in ESG ratings.

Using S&P Global ESG data, can we find supporting evidence that firms engage in ESG activities in order to create firm value? We document the results in Table 6.

Panel A of Table 6 still shows that changes in average investment rate in an industry significantly increase by a 0.1264 percentile rank score when changes in HHI decline one unit (the industry becomes more competitive) over 2013−2024. The link between changes in S&P Global ESG score in an industry and changes in HHI, however, becomes insignificant in the period.[12] When we add a dummy variable, Dummy_Q_1^{HHI}, in Panel B of Table 6, the result is similar. Conditional on changes in industry competition, industries in the high-competition quintile would have a 0.3876 higher percentile score in corporate investment, not in ESG, as seen in Model 2. Conditional on changes in cash flow, industries in the high-competition quintile would have a 0.2877 higher percentile score in corporate investment, not in ESG.

[11] S&P Global ESG scoring relies on an annual assessment of company sustainability performance, in which all firms in the research universe are invited to participate through industry-specific questionnaires. In addition to the annual assessment, S&P Global continuously monitors firms through daily screening of controversies that may have a material and lasting impact on their reputations, stakeholder relations, financial performance, or business operations. As a result of this supplemental research process, S&P Global ESG Scores and their underlying data-levels are updated on a monthly basis.

[12] We find the same insignificant coefficients when we use Refinitiv ESG scores in the test over the period of 2013−2024. The results are omitted to save space but are available upon request.

Again, the evidence overall casts doubt on the conjecture that firms engage in ESG activities in order to create firm value.

VI.2. Financial and Utility Industries

While our analysis focuses on comprehensive industry-level data on firm size distributions to address causality concerns, one might argue that the inclusion of highly regulated industries could potentially distort the results. To address this concern, we conduct additional robustness checks by excluding financial (SIC 6) and utility (SIC 49) industries and re-estimate the full models reported in Tables 3 and 4.

Although this exclusion results in the loss of approximately 1,000 industry–year observations, Table 7 shows that our main results remain intact. Specifically, in Model 1 of Table 7 (corresponding to Model 2 of Table 3), corporate investment increases while ESG performance declines as industry competition intensifies. Moreover, firms experiencing increases in cash flow tend to engage more in ESG activities after controlling for changes in industry competition.

In Model 2 of Table 7 (corresponding to Model 2 of Table 4), a one-unit decline in the HHI (indicating greater industry competition) is associated with a statistically significant increase of 0.1173 percentile rank in changes in average investment rate in an industry, while the corresponding change in the ESG percentile rank is an insignificant decrease of 0.0247. Conditional on changes in industry competition, industries in the highest competition quintile exhibit a 0.4993 higher percentile rank in corporate investment, but not in ESG performance. Overall, the exclusion of regulated industries does not alter our conclusion that ESG activities do not appear to create firm value.

VI.3. NAICS Classification

While the SIC (Standard Industrial Classification) system groups firms according to similar outputs and products, the NAICS (North American Industry Classification System) groups firms based on similar production processes. As a result, firms within a given NAICS industry are more likely to share similar operating environments and cost structures, making NAICS-based classifications potentially more consistent and informative for economic analysis and market comparison. Following Ali, Klasa, and Yeung (2009), we use six-digit NAICS codes to redefine industries and recalibrate all variables accordingly to re-estimate the full models reported in Tables 3 and 4.

Table 8 shows that corporate investment continues to increase while ESG performance declines as industry competition intensifies in Model 1. Changes in firms' total assets, valuation, and cash flows all significantly and positively explain changes in corporate investment. Moreover, conditional on changes in cash flow, an industry experiencing a decline in the HHI exhibits a 0.0506 higher percentile rank in corporate investment.

Model 2 of Table 8 further indicates that a one-unit decline in the HHI (i.e., an increase in industry competition) is associated with a statistically significant increase of 0.0546 in the percentile rank of the average industry investment rate, while the corresponding change in the average industry ESG score shows a statistically significant decline of 0.0342 in percentile rank. However, in contrast to our baseline results, the associations between changes in industry competition and changes in average corporate investment or ESG performance are no longer conditional on the prior-year level of industry competition.

VI.4. Concentration Measures from the Census

So far our analysis of the relation between industry competition and corporate investment or ESG performance has relied on Compustat-based measures of the Herfindahl–Hirschman Index (HHI). A potential limitation of these measures is the exclusion of private firms. To address this concern, we supplement our analysis with industry concentration measures from the U.S. Census Bureau, which are based on revenues of both public and private firms. Census data are available for calendar years ending in 2 or 7.

The Census reports four-, eight-, twenty-, and fifty-firm concentration ratios for all six-digit NAICS industries but provides HHIs for manufacturing industries only through 2012. Beginning in 2017, HHIs become available for both manufacturing and non-manufacturing industries, but the coverage of the Census HHI measure remains considerably more limited than that of the concentration ratios. For example, even in 2017, concentration ratios are available for approximately 67% of six-digit NAICS industries, whereas HHIs are available for only about 51%.

We note that Census concentration ratios and HHIs capture different dimensions of industry competition. Concentration ratios provide a parsimonious summary of the market share of leading firms, whereas the HHI delivers a more comprehensive characterization of market structure by explicitly incorporating the full distribution of firm sizes.

While the HHI arguably provides a more precise quantification of industry competition, the Census concentration ratio (CR) measures offer substantially broader coverage. Accordingly, we synthesize the information in all available concentration ratios into a single statistic that can be interpreted as a "floor" of the Herfindahl–Hirschman Index (denoted as HHI_Floor), conditional on the reported concentration ratios. The HHI_Floor is constructed from the Census four-, eight-, twenty-, and fifty-firm concentration ratios (CR4, CR8, CR20, and CR50) as follows:[13]

$$HHI_Floor = 4\left[\frac{CR4}{4}\right]^2 + [8-4]\left[\frac{CR8-CR4}{8-4}\right]^2 + [20-8]\left[\frac{CR20-CR8}{20-8}\right]^2 + [50-20]\left[\frac{CR50-CR20}{50-20}\right]^2 \quad (4)$$

In unreported analysis, we pair the Census HHIs with the HHI_Floor calculated according to Equation (4) for each six-digit NAICS industry, and compute both the average value and the Spearman rank correlation between the two measures across industries. We then average these statistics across all available Census years from 1997 to 2022. The resulting Spearman (Pearson) correlation between the Census HHI and the HHI_Floor is 0.983 (0.95), indicating a strong monotonic relationship and an almost perfectly positive linear association between the two measures. The mean value of the Census HHI is 0.067 (index value 670), while the corresponding mean of the HHI_Floor is 0.052 (index value 520).[14] In a sample covering the Census publication years 1982, 1987, 1992, 1997, 2002, 2007, and 2012, Keil (2017) documents that the means of Census HHIs and HHI_Floor are 0.07 and 0.06, respectively.

Given the strong correspondence between these measures and the superior coverage of the concentration ratios, we adopt the HHI_Floor as our primary proxy for industry competition and re-estimate the full models reported in Tables 3 and 4.

Several caveats warrant caution in interpreting these results. First, our analysis relates changes in firm-level corporate investment and ESG performance to changes in industry competition within the industries to which firms belong. Because the Census concentration

[13] By the Cauchy–Schwarz inequality, the HHI_Floor provides a lower bound for the Census Herfindahl–Hirschman Index.

[14] The U.S. Department of Justice (DOJ) and the Federal Trade Commission (FTC) generally classify markets with an HHI between 1,000 and 1,800 as moderately concentrated and markets with an HHI above 1,800 as highly concentrated. In addition, an increase in the HHI of more than 100 points is considered indicative of a potentially significant increase in market concentration (DOJ and FTC, Merger Guidelines, § 2.1, 2023). See https://www.justice.gov/atr/merger-guidelines/applying-merger-guidelines/guideline-1#endref15.

data are available only at five-year intervals, we are restricted to measuring five-year changes, resulting in the loss of a nontrivial number of intermediate industry–year observations. Second, although the Census data allow us to incorporate both public and private firms in measuring industry competition, we do not observe financial or ESG information for private firms. As a consequence, the linkage between the industry competition measure—based on both public and private firms—and the dependent variables—based solely on public firms—is necessarily imperfect.

Model 1 of Table 9 shows that a one-unit increase in the change in the HHI (i.e., an increase in industry concentration) is associated with a statistically significant increase of 0.6399 percentile rank in changes in average ESG score. Consistent with our earlier findings, Model 2 indicates that ESG performance continues to decline significantly as industry competition intensifies. Conditional on changes in industry competition, industries in the highest competition quintile exhibit an 8.4071-percentile-point higher change in corporate investment, but show no corresponding increase in ESG performance.[15] Likewise, conditional on changes in cash flow, industries in the highest competition quintile display a 0.1722-percentile-point higher change in corporate investment, again with no corresponding increase in ESG performance.[16]

Taken together, the evidence we have documented that ESG performance declines as industry competition intensifies casts considerable doubt on the view that ESG activities create firm value.

VII. Conclusion

Corporate environmental, social, and governance (ESG) activities may create firm value by enhancing shareholder wealth and utility. An alternative view, however, is that ESG engagement primarily reflects firms' financial capacity—stronger or more highly valued firms may simply be better positioned to allocate excess resources to ESG initiatives. We address

[15] Using six-digit NAICS classifications, the mean HHI_Floor constructed from Census concentration measures is 0.052, whereas the mean HHI based on Compustat data is 0.241. This difference in scale explains why the estimated coefficient is substantially larger than the corresponding coefficient reported in Table 4.

[16] When we exclude financial (NAICS = 52) and utility (NAICS = 22) industries in Sections VI.3 and VI.4, the results remain similar to those reported in Tables 8 and 9 in terms of the sign, magnitude, and statistical significance of the panel regression coefficients. For brevity, these results are not tabulated but are available upon request.

this causality question by examining managers' decisions when they face heightened peer competition within an industry. In this setting, managerial choices reveal whether ESG activities are prioritized in the same way as value-enhancing investments.

We document that as industry competition intensifies, changes in corporate investment in the industry increase significantly, while changes in the industry's average ESG score decline significantly. In contrast, when average industry total assets increase, both corporate investment and ESG engagement rise. Moreover, conditional on changes in industry competition, larger increases in cash flow are associated with stronger ESG improvements. Taken together, these patterns suggest that ESG engagement is more closely linked to firms' financial capacity than to competitive pressure.

Consistent with this interpretation, conditional on changes in cash flow, industries in the highest competition quintile exhibit a 0.1651 higher percentile increase in corporate investment, with no corresponding increase in ESG scores. Similarly, conditional on changes in industry competition, industries in the highest competition quintile show a 0.3815 higher percentile increase in corporate investment, again without a comparable change in ESG. Viewed through the lens of industry competition, this evidence provides limited support for the view that ESG activities are associated with firm value creation, particularly when contrasted with the behavior of corporate investment. Consistent with Stein's (1989) signal-jamming framework, heightened industry competition increases the incentive for managers to prioritize investments that more credibly signal near-term performance, while deferring ESG activities whose payoffs are longer-horizon and less directly observable.

Our results are robust to the use of alternative ESG data sources, the exclusion of financial and utility industries, six-digit NAICS industry classifications, and Census-based measures of industry concentration that capture revenues for both public and private firms. From a policy perspective, these findings highlight that as industry competition intensifies, sustaining firms' incentives to engage in ESG activities becomes an increasingly important consideration for policymakers.

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Table 1 Summary Statistics of Industry Attributes

We extract ESG scores as well as component scores from Refinitiv and accounting variables as well as SIC codes from Compustat. Every year, we calculate the Herfindahl-Hirschman Index (HHI) for each industry defined by four-digit SIC codes. The accounting variables include total assets (TA in $million), Tobin's Q (Q), Cash Flow (CF), and investment (Inv). We follow Foucault and Fresard (2014) to construct Q, CF, and Inv. We calculate the average of each variable across all firms in each industry. We construct the quartile distribution, the average (AVG), and the standard deviation (SD) based on these averages across industries each year and present the average of yearly statistics in Panel A. We also identify the industry that has the highest and lowest HHI over time, and report quartile distribution of variables based on all firms in the specific industry. Column "N" indicates the number of industries in the panel of "All Industries," and the number of firms in the panels of a specific industry. In Panel B, we calculate the cross-sectional Pearson correlation matrix based on the average of each industry attributes every year and report the time-series average of yearly statistics. We also calculate the *p*-value associated with the null hypothesis that a correlation is zero each year. We count the fraction of years that the *p*-value is less than 0.1, and test the null hypothesis that the fraction is equal to 0.5 in the binomial distribution in a two-tailed test. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. The sample period is 2002 through 2024.

Panel A. Quartile Distribution

Attribute	N	Quartile Distribution			AVG	SD
		25%	50%	75%		
All Industries						
ESG	289.3	0.300	0.387	0.481	0.395	0.139
E	289.1	0.121	0.245	0.402	0.274	0.193
S	289.1	0.299	0.400	0.497	0.407	0.152
G	289.3	0.379	0.488	0.597	0.486	0.167
TA	399.5	953.611	2340.160	6044.053	9810.197	40513.484
Q	399.1	1.288	1.632	2.174	2.524	10.251
CF	398.9	-0.011	0.052	0.091	0.008	0.901
Inv	398.9	0.138	0.210	0.331	0.749	8.389
HHI	399.1	0.251	0.422	0.739	0.499	0.301
Industry: 8000— SERVICES-HEALTH SERVICES (HHI: 0.982)						
ESG	1.7	0.546	0.577	0.635	0.609	0.127
E	1.7	0.400	0.443	0.508	0.485	0.198
S	1.7	0.553	0.585	0.645	0.620	0.147
G	1.7	0.602	0.634	0.703	0.658	0.079
TA	4.7	90.557	264.187	18922.789	26402.006	52502.773
Q	4.7	1.277	1.744	2.283	2.212	1.272
CF	4.7	-0.407	0.043	0.107	-0.062	0.321
Inv	4.7	0.151	0.218	0.333	0.309	0.232
Industry: 6798—Real Estate Investment Trusts (HHI: 0.016)						
ESG	95.0	0.237	0.341	0.452	0.356	0.149
E	95.0	0.031	0.136	0.316	0.192	0.189
S	95.0	0.307	0.418	0.525	0.428	0.155
G	95.0	0.310	0.478	0.634	0.478	0.209
TA	199.3	1224.455	2926.827	6128.151	5731.307	9632.088
Q	195.6	1.021	1.198	1.476	1.316	0.439
CF	54.3	-0.001	0.021	0.050	0.023	0.070
Inv	37.2	0.001	0.034	0.155	2.256	12.166

Table 1—*Continued*

Panel B. Pearson Correlation Matrix

	E	S	G	Ln(TA)	Q	CF	Inv	HHI
ESG	0.8333***	0.8783***	0.7166***	0.2552***	-0.0261***	0.0455***	-0.0555***	0.0591**
E		0.7021***	0.4319***	0.2855***	-0.0281***	0.0377***	-0.0519***	0.0435***
S			0.4129***	0.2325***	-0.0123***	0.0411**	-0.0414***	0.0603**
G				0.1575	-0.0308***	0.0447***	-0.0500***	0.0395***
Ln(TA)					-0.1358**	0.077	-0.0526**	-0.0081***
Q						0.2592***	0.0233***	-0.0347***
CF							-0.0202***	0.0403***
Inv								-0.0451***

Table 2 Panel Regressions of ESG Scores Based on Industry Averages

We extract ESG as well as its component scores from Refinitiv and accounting variables from Compustat. Every year, we use sales to calculate the Herfindahl-Hirschman Index (HHI) for each industry defined by four-digit SIC codes. Other accounting variables include total assets (TA in $million), Tobin's Q (Q), Cash Flow (CF), and investment (Inv). We follow Foucault and Fresard (2014) to construct Q, CF, and Inv. Every year, we first sort universe firms by each of these four accounting variables and assigned a percentile rank score of zero (lowest) to one (highest) for each firm. We then calculate the average (AVG) of a firm's attribute, including ESG scores, based on all firms in each industry. We pool yearly industry observations and regress Inv, ESG, or ESG components on the contemporaneous HHI and control variables. The controls include TA, Q, CF, and their interactions with HHI. The sample period is 2002 through 2024. The table reports the regression coefficients with *p*-values in parentheses. Panel A reports the results for Inv and ESG while Panel B reports the results for ESG components. All standard errors are adjusted for error correlations clustered by both industry and year according to Petersen (2009). ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Panel A. Panel Regressions for Inv and ESG

Independent Variable in Year *t*	Dependent Variable in Year *t*			
	Inv		ESG	
	Model 1	Model 2	Model 1	Model 2
HHI	-0.0417*	0.0351	0.0262	0.0669
	(0.0522)	(0.5550)	(0.3700)	(0.4791)
TA	0.0562	0.0176	0.2516***	0.2035**
	(0.1599)	(0.7696)	(0.0000)	(0.0181)
Q	0.1926***	0.2899***	0.0018	0.0845*
	(0.0000)	(0.0000)	(0.9491)	(0.0873)
CF	0.1558***	0.2001***	0.0345	0.0505
	(0.0000)	(0.0002)	(0.2068)	(0.3117)
HHI x TA		0.0578		0.0788
		(0.5349)		(0.4777)
HHI x Q		-0.1435**		-0.1447*
		(0.0376)		(0.0700)
HHI x CF		-0.0655		-0.0275
		(0.3865)		(0.7161)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	49.62	49.77	59.06	59.18
Industry-Years	9145	9145	6636	6636

Table 2—*Continued*

Panel B. Panel Regressions for ESG Components

Independent Variable in Year *t*	Dependent Variable in Year *t*					
	E		S		G	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
HHI	0.0528	0.1786*	0.0293	0.1021	0.0181	0.0231
	(0.1928)	(0.0969)	(0.3350)	(0.2521)	(0.6065)	(0.8610)
TA	0.3092***	0.2663***	0.2818***	0.2740***	0.1338**	0.0913
	(0.0000)	(0.0089)	(0.0000)	(0.0029)	(0.0122)	(0.4166)
Q	-0.0095	0.0875	0.0180	0.1053**	-0.0128	0.0639
	(0.8223)	(0.1966)	(0.5007)	(0.0345)	(0.7037)	(0.2548)
CF	-0.0004	0.0791	0.0502*	0.0568	0.0423	0.0248
	(1.0000)	(0.2395)	(0.0785)	(0.2288)	(0.2022)	(0.6446)
HHI x TA		0.0697		0.0163		0.0707
		(0.6186)		(0.8804)		(0.6630)
HHI x Q		-0.1708*		-0.1515*		-0.1333
		(0.0999)		(0.0639)		(0.1743)
HHI x CF		-0.1383		-0.0133		0.0304
		(0.1642)		(0.8534)		(0.7293)
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	60.86	61.00	57.13	57.22	44.81	44.86
Industry-Years	6632	6632	6632	6632	6636	6636

Table 3 Panel Regressions of Changes in ESG Scores

We extract ESG as well as its component scores from Refinitiv and accounting variables from Compustat. Every year, we use sales to calculate the Herfindahl-Hirschman Index (HHI) for each industry defined by four-digit SIC codes. Other accounting variables include total assets (TA in $million), Tobin's Q (Q), Cash Flow (CF), and investment (Inv). We follow Foucault and Fresard (2014) to construct Q, CF, and Inv. Every year, we first sort universe firms by each of these four accounting variables and assign a percentile rank score of zero (lowest) to one (highest) for each firm. We then calculate the average (AVG) of a firm's attribute, including ESG scores, based on all firms in each industry. Each year, we calculate changes in each of these industry attributes from the last year to the current year. We pool yearly industry observations and regress changes in Inv, ESG, or ESG components on the contemporary changes in HHI and control variables. The controls include TA, Q, CF, and their interactions with changes in HHI. The sample period is 2002 through 2024. The table reports the regression coefficients with *p*-values in parentheses. Panel A reports the results for changes in Inv and ESG while Panel B reports the results for changes in ESG components. All standard errors are adjusted for error correlations clustered by both industry and year according to Petersen (2009). ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Panel A. Panel Regressions for Changes in Inv and ESG

Independent Variable in Year *t*	Dependent Variable in Year *t*			
	ΔInv		ΔESG	
	Model 1	Model 2	Model 1	Model 2
ΔHHI	-0.0954***	-0.1007***	0.0287*	0.0318**
	(0.0006)	(0.0003)	(0.0634)	(0.0239)
ΔTA	0.1749***	0.1759***	0.0936***	0.0913***
	(0.0000)	(0.0000)	(0.0033)	(0.0030)
ΔQ	0.0398	0.0359	0.0001	-0.0006
	(0.1166)	(0.1728)	(1.0000)	(0.9703)
ΔCF	0.0930***	0.0919***	0.0036	0.0045
	(0.0000)	(0.0000)	(0.7410)	(0.6763)
ΔHHI x ΔTA		-0.3168		-0.2369
		(0.1847)		(0.3132)
ΔHHI x ΔQ		0.2120		-0.1293
		(0.2302)		(0.3738)
ΔHHI x ΔCF		0.2266		0.2415**
		(0.2697)		(0.0186)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	0.78	0.87	1.44	1.50
Industry-Years	9095	9095	6217	6217

Table 3—*Continued*

Panel B. Panel Regressions for Changes in ESG Components

Independent Variable in Year *t*	Dependent Variable in Year *t*					
	ΔE		ΔS		ΔG	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
ΔHHI	0.0428*	0.0484**	0.0146	0.0203	0.0539**	0.0525***
	(0.0514)	(0.0214)	(0.4353)	(0.2702)	(0.0173)	(0.0088)
ΔTA	0.0972***	0.0944***	0.0879***	0.0871***	0.0784	0.0751
	(0.0085)	(0.0060)	(0.0026)	(0.0036)	(0.1701)	(0.1851)
ΔQ	-0.0109	-0.0118	0.0106	0.0109	-0.0010	-0.0023
	(0.5269)	(0.4810)	(0.5581)	(0.5524)	(0.9581)	(0.9007)
ΔCF	-0.0113	-0.0100	0.0034	0.0047	0.0215	0.0217
	(0.3300)	(0.3766)	(0.7905)	(0.7184)	(0.2247)	(0.2179)
ΔHHI x ΔTA		-0.2511		-0.2856		-0.1542
		(0.3066)		(0.2655)		(0.7359)
ΔHHI x ΔQ		-0.2147		-0.2999*		0.1133
		(0.2824)		(0.0790)		(0.6303)
ΔHHI x ΔCF		0.3436**		0.2138		0.1743
		(0.0212)		(0.1012)		(0.4064)
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	2.88	2.96	1.64	1.74	0.00	0.00
Industry-Years	6212	6212	6212	6212	6217	6217

Table 4. Panel Regressions of Changes in ESG Scores Conditional on High-Competition Industries (Low Prior-Year HHI)

We extract ESG as well as its component scores from Refinitiv and accounting variables from Compustat. Every year, we use sales to calculate the Herfindahl-Hirschman Index (HHI) for each industry defined by four-digit SIC codes. Other accounting variables include total assets (TA in $million), Tobin's Q (Q), Cash Flow (CF), and investment (Inv). We follow Foucault and Fresard (2014) to construct Q, CF, and Inv. Every year, we first sort universe firms by each of these four accounting variables and assign a percentile rank score of zero (lowest) to one (highest) for each firm. We then calculate the average (AVG) of a firm's attribute, including ESG scores, based on all firms in each industry. Each year, we calculate changes in each of these industry attributes from the last year to the current year. We pool yearly industry observations and regress changes in Inv, ESG, or ESG components on the contemporary changes in HHI and control variables. We add a dummy for an industry (Dummy_Q_1^{HHI}) to the controls if the industry is in the bottom quintile according to the industry HHI in the prior year. The controls include TA, Q, CF, and their interactions with Dummy_Q_1^{HHI}. The sample period is 2002 through 2024. The table reports the regression coefficients with *p*-values in parentheses. Panel A reports the results for changes in Inv and ESG while Panel B reports the results for changes in ESG components. All standard errors are adjusted for error correlations clustered by both industry and year according to Petersen (2009). ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Panel A. Panel Regressions for Changes in Inv and ESG

Independent Variable	Dependent Variable in Year *t*			
	ΔInv		ΔESG	
	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}	-0.0047	-0.0052	0.0042	0.0043
	(0.2646)	(0.2066)	(0.3316)	(0.3140)
ΔHHI_t	-0.0970***	-0.0969***	0.0280*	0.0279*
	(0.0006)	(0.0005)	(0.0749)	(0.0751)
Dummy_Q_1^{HHI} x ΔHHI_t	0.3801***	0.3815***	0.0286	0.0364
	(0.0011)	(0.0004)	(0.8193)	(0.7696)
ΔTA_t	0.1754***	0.1758***	0.0938***	0.0913***
	(0.0000)	(0.0000)	(0.0033)	(0.0048)
ΔQ_t	0.0397	0.0439	0.0003	0.0002
	(0.1188)	(0.1001)	(0.9852)	(1.0000)
ΔCF_t	0.0930***	0.0878***	0.0035	0.0052
	(0.0000)	(0.0000)	(0.7498)	(0.6527)
Dummy_Q_1^{HHI} x ΔTA_t		-0.0091		0.0847
		(0.9300)		(0.3350)
Dummy_Q_1^{HHI} x ΔQ_t		-0.1125**		0.0047
		(0.0321)		(0.8557)
Dummy_Q_1^{HHI} x ΔCF_t		0.1651**		-0.0307
		(0.0108)		(0.2801)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	0.78	0.83	1.42	1.38
Industry-Years	9095	9095	6217	6217

Table 4—*Continued*

Panel B. Panel Regressions for Changes in ESG Components

Independent Variable	Dependent Variable in Year *t*					
	ΔE		ΔS		ΔG	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}	0.0014	0.0017	0.0024	0.0025	0.0081	0.0083
	(0.7570)	(0.7209)	(0.6215)	(0.6101)	(0.1672)	(0.1574)
ΔHHI_t	0.0415*	0.0413*	0.0133	0.0133	0.0540**	0.0538**
	(0.0600)	(0.0607)	(0.4779)	(0.4776)	(0.0198)	(0.0200)
Dummy_Q_1^{HHI} x ΔHHI_t	0.1239	0.1414	0.1124	0.1185	-0.0926	-0.0874
	(0.3937)	(0.3238)	(0.4500)	(0.4232)	(0.6657)	(0.6791)
ΔTA_t	0.0975***	0.0922**	0.0882***	0.0866***	0.0785	0.0762
	(0.0083)	(0.0172)	(0.0025)	(0.0038)	(0.1697)	(0.1899)
ΔQ_t	-0.0107	-0.0106	0.0108	0.0090	-0.0007	0.0013
	(0.5324)	(0.5740)	(0.5506)	(0.6441)	(0.9703)	(0.9509)
ΔCF_t	-0.0114	-0.0091	0.0033	0.0035	0.0213	0.0251
	(0.3229)	(0.4563)	(0.7972)	(0.8030)	(0.2296)	(0.1626)
Dummy_Q_1^{HHI} x ΔTA_t		0.1918		0.0582		0.066
		(0.1236)		(0.5215)		(0.7197)
Dummy_Q_1^{HHI} x ΔQ_t		0.0042		0.0242		-0.0208
		(0.9137)		(0.4414)		(0.6785)
Dummy_Q_1^{HHI} x ΔCF_t		-0.0437		-0.0047		-0.0652
		(0.1142)		(0.8874)		(0.2043)
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	2.85	2.83	1.62	1.58	0.00	0.00
Industry-Years	6212	6212	6212	6212	6217	6217

Table 5 Panel Regressions of Changes in ESG Scores over Subperiods

We apply the same regression models of Table 4 to two subperiods. The Paris Agreement, a legally binding international treaty on climate change, was adopted by 195 parties at the UN Climate Change Conference (COP21) in Paris, France, on December 12, 2015. The two subperiods are 2002 through 2015, and 2016 through 2024. The table reports the regression coefficients with *p*-values in parentheses. Panels A report the result for changes in Inv and ESG, while Panels B report the result for changes in ESG components. All standard errors are adjusted for error correlations clustered by both industry and year according to Petersen (2009). ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Panel A1. Panel Regressions for Changes in Inv and ESG over 2002–2015

Independent Variable	Dependent Variable in Year *t*			
	ΔInv		ΔESG	
	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}	-0.0014	-0.0021	0.0035	0.0037
	(0.8427)	(0.7660)	(0.5914)	(0.5679)
ΔHHI_t	-0.0902***	-0.0903***	0.0653**	0.0651**
	(0.0036)	(0.0035)	(0.0342)	(0.0334)
Dummy_Q_1^{HHI} x ΔHHI_t	0.3487**	0.3551**	-0.0482	-0.0399
	(0.0203)	(0.0121)	(0.8063)	(0.8429)
ΔTA_t	0.1977***	0.1971***	0.0452	0.0408
	(0.0002)	(0.0003)	(0.3631)	(0.4073)
ΔQ_t	0.0740**	0.0810**	-0.0032	-0.0022
	(0.0172)	(0.0132)	(0.8842)	(0.9264)
ΔCF_t	0.1080***	0.1040***	0.0113	0.0135
	(0.0000)	(0.0000)	(0.5646)	(0.5160)
Dummy_Q_1^{HHI} x ΔTA_t		0.0206		0.1015
		(0.8397)		(0.4284)
Dummy_Q_1^{HHI} x ΔQ_t		-0.1497**		-0.0030
		(0.0183)		(0.9413)
Dummy_Q_1^{HHI} x ΔCF_t		0.1184		-0.0286
		(0.1423)		(0.5343)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	0.00	0.00	0.03	0.00
Industry-Years	5620	5620	3067	3067

Table 5—*Continued*

Panel A2. Panel Regressions for Changes in Inv and ESG over 2016–2024

Independent Variable	Dependent Variable in Year *t*			
	ΔInv		ΔESG	
	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}	-0.0125	-0.0101	0.0108*	0.0107
	(0.3423)	(0.4486)	(0.0878)	(0.1006)
ΔHHI_t	-0.1205**	-0.1201**	0.0036	0.0035
	(0.0438)	(0.0440)	(0.8028)	(0.8036)
Dummy_Q_1^{HHI} x ΔHHI_t	0.4232*	0.3969	0.1381	0.1441
	(0.0919)	(0.1135)	(0.3255)	(0.2999)
ΔTA_t	0.1410**	0.1432**	0.1199***	0.1183***
	(0.0225)	(0.0227)	(0.0060)	(0.0080)
ΔQ_t	-0.0178	-0.0150	0.0023	0.0011
	(0.7039)	(0.7562)	(0.8977)	(0.9521)
ΔCF_t	0.0645*	0.0573	-0.0041	-0.0024
	(0.0896)	(0.1344)	(0.7824)	(0.8783)
Dummy_Q_1^{HHI} x ΔTA_t		-0.1254		0.0795
		(0.5515)		(0.5105)
Dummy_Q_1^{HHI} x ΔQ_t		-0.0961		0.0287
		(0.3361)		(0.3703)
Dummy_Q_1^{HHI} x ΔCF_t		0.2585***		-0.0439
		(0.0000)		(0.1897)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	0.00	0.00	1.00	0.92
Industry-Years	3475	3475	3150	3150

Table 5—*Continued*

Panel B1. Panel Regressions for Changes in ESG Components over 2002–2015

Independent Variable	Dependent Variable in Year *t*					
	ΔE		ΔS		ΔG	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}	-0.0008	-0.0006	-0.0013	-0.0014	0.0146	0.0153
	(0.9059)	(0.9331)	(0.8654)	(0.8477)	(0.1849)	(0.1682)
ΔHHI_t	0.0986**	0.0980**	0.0692*	0.0699*	0.0688	0.0677
	(0.0204)	(0.0215)	(0.0698)	(0.0672)	(0.1211)	(0.1229)
Dummy_Q_1^{HHI} x ΔHHI_t	0.0608	0.0953	0.0237	0.0304	-0.1390	-0.1393
	(0.7531)	(0.6263)	(0.9216)	(0.8996)	(0.6506)	(0.6472)
ΔTA_t	-0.0033	-0.0180	0.0706*	0.0711**	0.0081	0.0014
	(0.9440)	(0.7120)	(0.0553)	(0.0476)	(0.9362)	(0.9898)
ΔQ_t	-0.0105	-0.0069	-0.0096	-0.0166	0.0119	0.0210
	(0.6839)	(0.8080)	(0.7442)	(0.6068)	(0.6766)	(0.5464)
ΔCF_t	-0.0125	-0.0115	0.0023	0.0019	0.0478	0.0549*
	(0.5604)	(0.6248)	(0.8926)	(0.9250)	(0.1535)	(0.0952)
Dummy_Q_1^{HHI} x ΔTA_t		0.3381*		-0.0094		0.1502
		(0.0730)		(0.9105)		(0.6170)
Dummy_Q_1^{HHI} x ΔQ_t		-0.0153		0.0487		-0.0559
		(0.7534)		(0.3143)		(0.4937)
Dummy_Q_1^{HHI} x ΔCF_t		-0.0262		0.0093		-0.0917
		(0.5324)		(0.8644)		(0.2747)
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	2.44	2.40	0.17	0.09	0.00	0.00
Industry-Years	3062	3062	3062	3062	3067	3067

Table 5—*Continued*

Panel B2. Panel Regressions for Changes in ESG Components over 2016–2024

Independent Variable	Dependent Variable in Year *t*					
	ΔE		ΔS		ΔG	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}	0.0085	0.0082	0.0142	0.0142	0.0013	0.0009
	(0.2986)	(0.3515)	(0.1009)	(0.1040)	(0.8867)	(0.9271)
ΔHHI_t	0.0033	0.0032	-0.0246*	-0.0245*	0.0469	0.0468
	(0.8759)	(0.8787)	(0.0830)	(0.0835)	(0.1456)	(0.1448)
Dummy_Q_1^{HHI} x ΔHHI_t	0.1365	0.1375	0.2010*	0.2129*	-0.0044	0.0008
	(0.3389)	(0.3217)	(0.0888)	(0.0667)	(0.9823)	(1.0000)
ΔTA_t	0.1494***	0.1486***	0.0990**	0.0966**	0.1153	0.1142
	(0.0033)	(0.0047)	(0.0245)	(0.0338)	(0.1011)	(0.1135)
ΔQ_t	-0.0146	-0.0166	0.0202	0.0202	-0.0041	-0.0055
	(0.5136)	(0.4954)	(0.2897)	(0.3161)	(0.8755)	(0.8312)
ΔCF_t	-0.0153	-0.0130	0.0013	0.0023	0.0031	0.0055
	(0.3764)	(0.4705)	(0.9521)	(0.9190)	(0.8731)	(0.7897)
Dummy_Q_1^{HHI} x ΔTA_t		0.0172		0.1432		0.0394
		(0.9111)		(0.4589)		(0.8139)
Dummy_Q_1^{HHI} x ΔQ_t		0.0511		-0.0008		0.0340
		(0.4361)		(0.9823)		(0.2610)
Dummy_Q_1^{HHI} x ΔCF_t		-0.0585		-0.0284		-0.0625
		(0.1214)		(0.4882)		(0.2218)
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	2.78	2.71	1.31	1.22	0.00	0.00
Industry-Years	3150	3150	3150	3150	3150	3150

Table 6 Panel Regressions of Changes in S&P Global ESG Scores

We extract ESG as well as its component scores from S&P Global and accounting variables from Compustat. Every year, we use sales to calculate the Herfindahl-Hirschman Index (HHI) for each industry defined by four-digit SIC codes. Other accounting variables include total assets (TA in $million), Tobin's Q (Q), Cash Flow (CF), and investment (Inv). We follow Foucault and Fresard (2014) to construct Q, CF, and Inv. Every year, we first sort universe firms by each of these four accounting variables and assign a percentile rank score of zero (lowest) to one (highest) for each firm. We then calculate the average (AVG) of a firm's attribute, including ESG scores, based on all firms in each industry. S&P Global ESG scores are expressed in decimals for consistency in units. Each year, we calculate changes in each of these industry attributes from the last year to the current year. We pool yearly industry observations and regress changes in Inv or S&P Global ESG on the contemporary changes in HHI and control variables. We add a dummy for an industry ($\text{Dummy_}Q_1^{HHI}$) to the controls if the industry is in the bottom quintile according to the industry HHI in the prior year. The sample period is 2013 through 2024. The table reports the regression coefficients with *p*-values in parentheses. Panel A reports the results for controls including TA, Q, CF, and their interactions with changes in HHI and Panel B reports the results for controls including TA, Q, CF, and their interactions with $\text{Dummy_}Q_1^{HHI}$. All standard errors are adjusted for error correlations clustered by both industry and year according to Petersen (2009). ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Panel A. Panel Regressions for Changes in Inv and S&P Global ESG

Independent Variable in Year *t*	Dependent Variable in Year *t*			
	ΔInv		ΔS&P Global ESG	
	Model 1	Model 2	Model 1	Model 2
ΔHHI	-0.1264***	-0.1277***	-0.0069	-0.0125
	(0.0023)	(0.0033)	(0.5744)	(0.3749)
ΔTA	0.1269***	0.1125**	0.0085	0.0086
	(0.0088)	(0.0367)	(0.7064)	(0.7148)
ΔQ	0.0110	0.0008	-0.0126	-0.0120
	(0.7860)	(0.9821)	(0.3745)	(0.3990)
ΔCF	0.0668**	0.0674**	-0.0071	-0.0076
	(0.0430)	(0.0435)	(0.4824)	(0.4490)
ΔHHI x ΔTA		0.0917		0.0311
		(0.8396)		(0.8144)
ΔHHI x ΔQ		0.6600**		0.1221*
		(0.0199)		(0.0818)
ΔHHI x ΔCF		0.5540**		-0.1636
		(0.0407)		(0.3134)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	0.00	0.00	26.08	26.07
Industry-Years	4641	4641	3097	3097

Table 6—*Continued*

Panel B. Panel Regressions for Changes in Inv and S&P Global ESG

Independent Variable	Dependent Variable in Year *t*			
	ΔInv		ΔS&P Global ESG	
	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}	-0.0127	-0.0125	-0.0048	-0.0057
	(0.1781)	(0.1931)	(0.2443)	(0.1265)
ΔHHI_t	-0.1277***	-0.1274***	-0.0081	-0.0081
	(0.0024)	(0.0023)	(0.5197)	(0.5193)
Dummy_Q_1^{HHI} x ΔHHI_t	0.4240*	0.3876*	0.1908	0.1754
	(0.0525)	(0.0681)	(0.1928)	(0.2069)
ΔTA_t	0.1270***	0.1287***	0.0086	0.0134
	(0.0089)	(0.0093)	(0.7016)	(0.5562)
ΔQ_t	0.0106	0.014	-0.0128	-0.012
	(0.7929)	(0.7394)	(0.3671)	(0.4079)
ΔCF_t	0.0668**	0.0583*	-0.0071	-0.0083
	(0.0435)	(0.0832)	(0.4810)	(0.4542)
Dummy_Q_1^{HHI} x ΔTA_t		-0.1172		-0.2544**
		(0.4992)		(0.0216)
Dummy_Q_1^{HHI} x ΔQ_t		-0.104		-0.018
		(0.1485)		(0.4515)
Dummy_Q_1^{HHI} x ΔCF_t		0.2877***		0.029
		(0.0000)		(0.3488)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	0.00	0.00	26.06	26.05
Industry-Years	4641	4641	3097	3097

Table 7 Main Panel Regressions after Excluding Financial and Utility Industries

We exclude industries with 6 in the first digit of SIC codes (Finance, Insurance, Real Estate), and 49 in the first two digits of SIC codes (Electric, Gas, and Sanitary Services) from panel regressions and re-run the full models in Tables 3 and 4. All explanatory variables, except for Dummy_Q_1^{HHI} that is a dummy for an industry in the bottom quintile according to the industry HHI in the prior year, are contemporary with the dependent variable. Both industry and year fixed effects are included in the regression. All standard errors are adjusted for error correlations clustered by both industry and year according to Petersen (2009). The sample period is 2002 through 2024. The table reports the regression coefficients with *p*-values in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Independent Variable	Dependent Variable in Year *t*			
	ΔInv		ΔESG	
	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}		-0.0066		0.0044
		(0.1040)		(0.4407)
ΔHHI	-0.1179***	-0.1173***	0.0311**	0.0247
	(0.0000)	(0.0000)	(0.0431)	(0.1254)
Dummy_Q_1^{HHI} x ΔHHI		0.4993***		0.1716
		(0.0004)		(0.2048)
ΔTA	0.1697***	0.1712***	0.0931***	0.0933***
	(0.0001)	(0.0000)	(0.0043)	(0.0058)
ΔQ	0.026	0.0316	-0.0024	-0.0029
	(0.3525)	(0.2600)	(0.8760)	(0.8555)
ΔCF	0.0808***	0.0775***	0.0012	0.0016
	(0.0000)	(0.0000)	(0.9172)	(0.8948)
Dummy_Q_1^{HHI} x ΔTA		-0.0251		0.064
		(0.7806)		(0.5183)
Dummy_Q_1^{HHI} x ΔQ		-0.1073*		0.0168
		(0.0607)		(0.5278)
Dummy_Q_1^{HHI} x ΔCF		0.1825***		-0.0248
		(0.0044)		(0.3679)
ΔHHI x ΔTA	-0.2148		-0.2758	
	(0.4721)		(0.3100)	
ΔHHI x ΔQ	0.1123		-0.1428	
	(0.4674)		(0.4474)	
ΔHHI x ΔCF	0.2921		0.2311*	
	(0.1416)		(0.0513)	
Adjusted R^2 (%)	1.21	1.23	1.48	1.37
Industry-Years	7999	7999	5420	5420

Table 8 Main Panel Regressions Using NAICS Codes

We define industries based on 6-digit NAICS codes and re-run the full model of panel regressions in Tables 3 and 4. All explanatory variables, except for Dummy_Q_1^{HHI} that is a dummy for an industry in the bottom quintile according to the industry HHI in the prior year, are contemporary with the dependent variable. Both industry and year fixed effects are included in the regression. All standard errors are adjusted for error correlations clustered by both industry and year according to Petersen (2009). The sample period is 2002 through 2024. The table reports the regression coefficients with *p*-values in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Independent Variable	Dependent Variable in Year *t*			
	ΔInv		ΔESG	
	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}		-0.0034		-0.003
		(0.3624)		(0.3930)
ΔHHI	-0.0496***	-0.0546***	0.0345**	0.0342*
	(0.0051)	(0.0016)	(0.0233)	(0.0509)
Dummy_Q_1^{HHI} x ΔHHI		0.0709		0.0046
		(0.2825)		(0.9349)
ΔTA	0.2768***	0.2725***	0.0567***	0.0603**
	(0.0000)	(0.0000)	(0.0088)	(0.0154)
ΔQ	0.0428*	0.0443*	0.0023	0.007
	(0.0936)	(0.0954)	(0.8226)	(0.5372)
ΔCF	0.0631***	0.0580***	-0.0019	-0.0023
	(0.0000)	(0.0002)	(0.6768)	(0.6694)
Dummy_Q_1^{HHI} x ΔTA		-0.0718		0.0032
		(0.4406)		(0.9539)
Dummy_Q_1^{HHI} x ΔQ		-0.0305		-0.0243
		(0.3686)		(0.2417)
Dummy_Q_1^{HHI} x ΔCF		0.0634		0.0061
		(0.1467)		(0.7876)
ΔHHI x ΔTA	-0.3298*		0.1035	
	(0.0952)		(0.6794)	
ΔHHI x ΔQ	0.0131		0.0693	
	(0.9001)		(0.4240)	
ΔHHI x ΔCF	-0.0506		0.1248	
	(0.6942)		(0.1735)	
Adjusted R^2 (%)	0.00	0.00	0.02	0.00
Industry-Years	14093	14093	7646	7646

Table 9 Main Panel Regressions Using Census Concentration Measures

The U.S. Census Bureau reports four-, eight-, twenty-, and fifty-firm concentration ratios (CR4, CR8, CR20, and CR50) for all six-digit NAICS industries in calendar years ending in 2 and 7. We use these CRs to construct the HHI_Floor for each six-digit NAICS industry and re-estimate the full panel regression models reported in Tables 3 and 4. The formula used to compute the HHI_Floor is provided in Equation (4) in the main text. All explanatory variables—except for Dummy_Q_1^{HHI} which is a dummy variable indicating industries in the bottom quintile of the prior-year HHI distribution—are measured contemporaneously with the dependent variables. Both industry and year fixed effects are included in the regressions. Standard errors are adjusted for two-way clustering by both industry and year following Petersen (2009). The sample covers all available Census years from 1997 to 2022. The table reports the regression coefficients with *p*-values in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Independent Variable	Dependent Variable in Year *t*			
	ΔInv		ΔESG	
	Model 1	Model 2	Model 1	Model 2
Dummy_Q_1^{HHI}		-0.0133		-0.0644
		(0.4825)		(0.3327)
ΔHHI	0.4526	0.4425	0.6399*	0.6757**
	(0.3419)	(0.3656)	(0.0518)	(0.0274)
Dummy_Q_1^{HHI} x ΔHHI		8.4071**		4.3176
		(0.0361)		(0.3814)
ΔTA	0.1272**	0.1474*	0.0716	0.0674
	(0.0298)	(0.0733)	(0.4702)	(0.4613)
ΔQ	0.2207***	0.2164***	0.0305	0.0293
	(0.0000)	(0.0000)	(0.5594)	(0.6288)
ΔCF	0.1517***	0.1210**	0.0462	0.0208
	(0.0005)	(0.0160)	(0.4470)	(0.7682)
Dummy_Q_1^{HHI} x ΔTA		-0.0775		0.2155
		(0.7001)		(0.5170)
Dummy_Q_1^{HHI} x ΔQ		0.0284		-0.0741
		(0.7724)		(0.6886)
Dummy_Q_1^{HHI} x ΔCF		0.1722*		0.2932
		(0.0568)		(0.1843)
ΔHHI x ΔTA	3.0558		0.3816	
	(0.3796)		(0.9369)	
ΔHHI x ΔQ	-0.1137		-0.2816	
	(0.9320)		(0.9436)	
ΔHHI x ΔCF	-0.0542		-1.7376	
	(0.9781)		(0.7153)	
Adjusted R^2 (%)	0.00	0.00	0.00	0.00
Industry-Years	2284	2284	895	895