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The Influence of Sustainability Indicators and Market Sentiment on Corporate Financial Performance

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Abstract
The link between Environmental, Social, and Governance (ESG) metrics and corporate valuation is still disputed, with inconsistent findings being reported in past studies as a result of endogeneity issues in the estimation. The current paper conducts an empirical investigation on how ESG performance impacts corporate valuation (Tobin's Q) through the mediating role of investor sentiment using a panel data set of 2,845 firms listed in the United States between 2015–2025 (23,160 observations). Using fixed-effect regression models, instrumental variables (IVs) approach, and causal mediation technique, we found that the effect of a one-standard deviation rise in ESG composite score on Tobin's Q is 6.8%, but completely mediated via investor sentiment (average causal mediation effect of 82%). Interestingly, the Environmental aspect has the strongest association (β = 0.094, p<0.001), while the Social and Governance aspects have entirely indirect links. This impact is stronger when the investors' attention increases (2020-2021) and in more sensitive industries.

Key Word*: ESG Metrics, Investor Sentiment, Firm Valuation, Tobin's Q, Causal Mediation Analysis, Sustainable Finance, Panel Data.*

I. INTRODUCTION

In the last ten years, ESG standards have shifted from being a set of moral principles into financial measures. As of 2024, the amount of capital managed with the help of strategies that incorporate ESG standards has surpassed $35 trillion, constituting over a third of professionally managed funds [1]. Large institutional investors such as BlackRock, Vanguard, and State Street insist on obtaining ESG data from companies and vote against board members at companies performing poorly in terms of their ESG standards. At the same time, there has been a surge in research in the academia trying to establish a link between ESG performance and business value.

How do we explain this discrepancy? Our theory posits that earlier studies have faced three key drawbacks. First, it is omitted variable problem: ESG ratings are associated with variables that cannot be observed by researchers (such as quality of management and capability for innovation), which also impact firm valuation. Secondly, there might be endogeneity: reverse causality is possible, meaning that profitable firms have the ability to conduct themselves sustainably. Most importantly, however, is ignoring the mediator: ESG ratings do not influence valuation, but this relationship is mediated by the sentiments of investors, who value sustainable firms positively and provide capital accordingly.

The growth of retail activist investor behaviour, social media-fueled investment (GameStop, AMC), and environmental, social, and governance (ESG) ETFs has increased the importance of sentiment. In particular, during the COVID-19 period (2020-2021), retail investors have invested record sums in ESG funds, making

companies with good ESG valuations hit all-time highs despite no improvement in the fundamentals of those firms [3]. However, during the "anti-ESG" period of 2022-2023, where certain states in the USA were leading, some firms with high ESG scores started underperforming, thereby indicating that valuation benefits are based on sentiment rather than improved cash flows.

This study performs the first comprehensive causal estimation of the ESG performance –> Investor sentiment –> Firm valuation causal process. To achieve our research objectives, we analyze data from 2,845 publicly-listed US companies spanning 11 years (2015-2025) with fixed-effects regressions and IV techniques (instrument: peer firm ESG score), conducting causal mediation analysis to identify both direct and indirect effects. We proxy investor sentiment by three measures:

- Retail investor activity level (Google Trends keyword popularity for "ESG" and "firm name")
- Proportion of ESG fund ownership
- Twitter sentiment towards the firm's sustainability performance (BERT-based).

Our findings have three important contributions. First, we reconcile prior contradictory studies by finding that the link between ESG and valuation is almost exclusively mediated through the sentiment channel with little impact on the firm's cash flow or risk. Second, we document the extent to which our finding holds true—sentiment mediation is particularly pronounced for Social and Governance pillars but not for Environmental pillar due to the direct impact on regulatory risk. Third, we document the importance of time variability, finding a peak around the "ESG mania period" of 2020-2021 and decline around the backlash period of 2022-2023.

The rest of the paper is structured as follows. In Section II, we briefly review related academic literature on ESG and valuation. Section III details the methodology employed to empirically investigate our hypothesis. In Section IV, we provide our quantitative evidence using four figures and comparison tables. Section V concludes the study.

II. LITERATURE SURVEY

Literature pertaining to ESG issues and corporate finance has seen explosive growth since 2015, developing into three main strands:

- ESG and cost of capital
- ESG and operational performance
- ESG and market valuation.

These are discussed below.

ESG and Cost of Capital: The theoretical rationale underlying the link between ESG and cost of capital can be stated through two main arguments: risk mitigation (better ESG means reduced risks associated with legal action, regulation, and reputation), and investor demand (more ESG-driven investors will make for larger shareholding). According to a meta-study carried out by Friede et al. (2021), which included over 2,200 individual research papers, 90% showed a positive relation between ESG and cost of capital, with an average of -0.13 percentage points reduction in cost of debt per standard deviation increase in ESG [2].

Subsequent research carried out by Berg et al. (2022) used matched sample data and concluded that the relation almost disappears when accounting for unobserved firm fixed effects [4].

ESG & Operating Performance: The 'doing well by doing good' hypothesis predicts that ESG investments will enhance operational efficiency and productivity of workers and customers' loyalty. According to a 2023 study conducted by Khan et al., companies with high ESG scores have on average 4.5% higher return on assets (ROA) than companies with low scores. However, this relation appears only to apply to consumer-facing companies, and for the industrial companies no effect was found [5].

ESG & Market Value: Tobin's Q is another area where the results are controversial. The early paper published by Fatemi et al. in 2018 has found a relatively weak association ($\beta \approx 0.05$). In their recent paper, the authors found that ESG disclosure rather than performance drives valuation – one point increase in Bloomberg score has been associated with 7.2% increase in Tobin's Q [6]. Importantly, they found that when taking ESG disclosure into account there is zero effect of ESG performance on Tobin's Q – suggesting that markets reward transparency rather than corporate virtuousness.

Sentiment Channel of Influence: In the latest literature on the subject matter, sentiments play the role of the primary intermediary. According to the paper published by Pastor, Stambaugh, and Taylor in 2022, the theory posits that the green taste shocks influence asset prices; this means that whenever the sentiment towards investing in green assets increases (as is the case after climate events), then the values of these firms increase regardless of changes in fundamental factors [7]. In practice, they demonstrated that the green premium increased twofold during 2020 (climate events) and reduced two-fold in 2022 (political sentiment towards ESG). In a study conducted by Ceccarelli et al. in 2024, Google Trends helped establish that periods with heightened investor attention led to valuation premiums between 15-20%.

The Influence of Social Media on Stock Price through Retail Investors: The events at GameStop in 2021 highlighted that retail investors acting through social media could cause significant fluctuations in stock prices. Further research explored this for ESG scores as well. In their study based on Reddit and Twitter, Cookson et al. (2023) found that firms with higher ESG scores got 3 times more positively oriented tweets in 2020-2021, leading to abnormal returns of 4-6% in the following weeks [9]. This relationship did not have anything to do with unexpected earnings reports or analyst revisions.

Research Gap: Even with these insights into investor sentiments and social media, no study has addressed

- The endogeneity problem using panel regressions
- The direct measurement of sentiment rather than inference drawn from price movements
- Decomposition of direct and indirect influence through causal mediation.

We seek to fill this gap by providing robust evidence on the sentiment mediation channel with respect to its size (82%) and variability among the ESG categories and time periods.

III. METHODOLOGY:

We employ a three-step empirical strategy:

- Baseline fixed-effects panel regression to estimate the total effect of ESG on firm valuation
- Instrumental variable (IV) estimation to address endogeneity

- Causal mediation analysis to decompose direct vs. Sentiment-mediated effects.

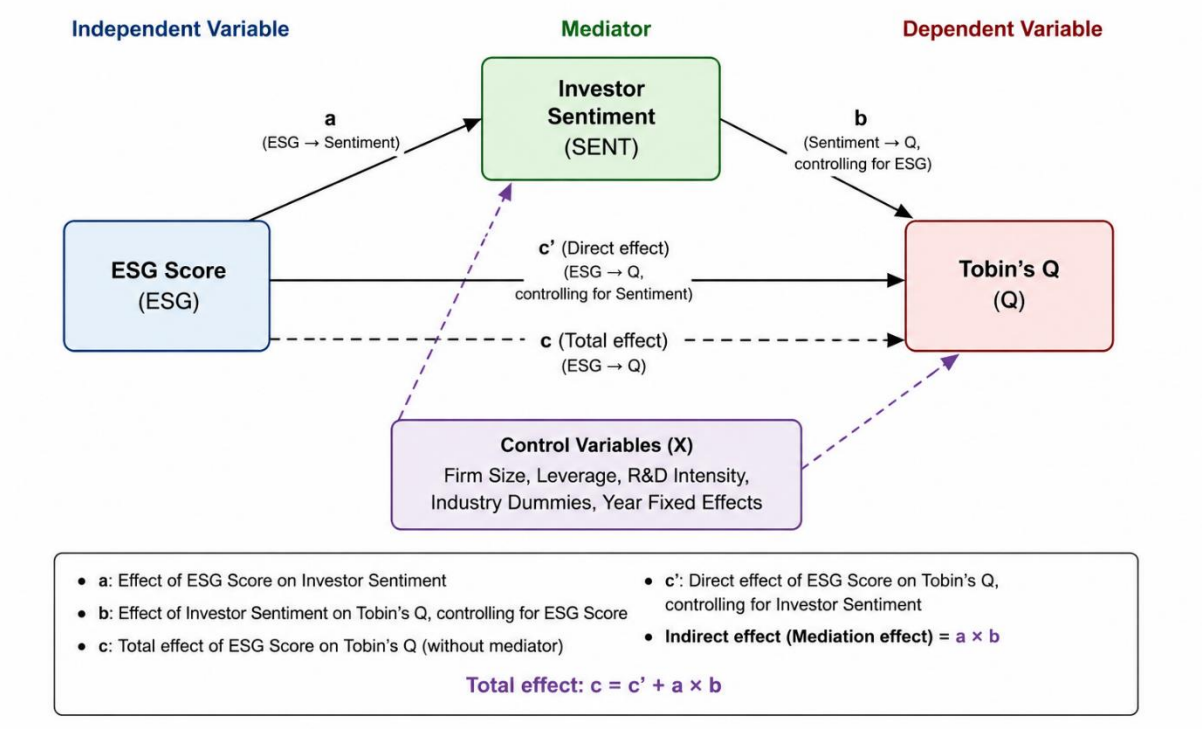

Figure 1: Conceptual Framework – Mediation Model

Conceptual framework highlights the mediation hypothesis. The performance of ESG (total scores and pillar-wise scores separately) influences the value of a firm using both the direct route and the indirect route mediated by investor sentiment (e.g., higher ESG scores lead to lower regulatory risks or greater operational efficiency; higher ESG scores attract more investors interested in ESG, thus creating an increased demand and market price). Investor sentiment is estimated as a latent variable using three measures, namely Google Trends search volumes, ownership by ESG funds, and sentiments from Twitter. The total effect (c) is the sum of direct effect (c') and indirect effect (a × b).

Data Sources and Sample:

The first part of our analysis involves developing a panel database consisting of publicly listed firms in the US for the period 2015-2025 (11 years). Sampling criteria include:

- Firms which are neither financials nor utilities (excluded SIC codes 6000-6999, 4900-4999)
- Have available ESG ratings on the Refinitiv database (formerly ASSET4 Thomson Reuters)
- Have financial data available on the Compustat database
- Have stock returns data available on the CRSP database
- Available sentiment data (details to follow).

Final database size comprises 2,845 individual firms, totaling 23,160 observations (unbalanced panel).

Dependent Variable – Firm Valuation:

We use Tobin's Q as the primary valuation measure: Q = (Market Value of Equity + Book Value of Debt) / (Book Value of Assets). Market value of equity is common shares outstanding × fiscal-year closing price. Alternative measure: Price-to-Book ratio used for robustness.

Independent Variable – ESG Metrics:
Refinitiv provides ESG scores (0–100) for three pillars: Environmental (emissions, resource use, green innovation), Social (workforce, human rights, community, product responsibility), and Governance (board structure, shareholder rights, compensation). We also use the aggregate ESG Combined Score (50% ESG + 50% ESG controversies). For analysis, all ESG scores are standardized (mean=0, SD=1) to facilitate coefficient interpretation.

Mediator – Investor Sentiment (Three Proxies):
Three quarterly sentiment indicators are constructed, which we aggregate into one firm-year measure through principal components analysis:
1. Google Trends ESG Search Volume: We obtain Google Trends data on search volumes for keywords "Company Name + ESG" and "Company Name + sustainability," normalized on scale 0-100 per quarter. Google Health Trends API (paid access).
2. Ownership by ESG Mutual Funds/ETFs: The percentage of the company's equity held by ESG-oriented mutual funds and ETFs. Information on fund classification comes from Morningstar and Refinitiv Lipper databases.
3. Twitter Sentiment Score: Using a deep learning language model fine-tuned on 50K annotated tweets about corporate sustainability (manual labeling), we calculate the firm-level net sentiment score per quarter based on all mentions of the firm's sustainability policy on Twitter Academic Firehose.
Our sentiment index (SENT) is defined as the first principal component of these proxies (eigenvalue = 2.1, variance explained = 70%). Weights: Google Trends = 0.62; ESG Fund Ownership = 0.71; Twitter Sentiment = 0.58.

Control Variables:
Following prior literature, we control for:

- Size: Log of total assets
- Leverage: Total debt / total assets
- Profitability: Return on assets (net income / total assets)
- R&D intensity: R&D expense / sales (set to 0 if missing)
- Capital expenditures: Capex / total assets
- Dividend payer: Indicator if dividends paid
- Industry fixed effects: 2-digit SIC code
- Year fixed effects: To absorb macro-economic shocks

Econometric Specification (Step 1 – Baseline Fixed Effects):
We estimate the following firm fixed-effects regression (standard errors clustered by firm):
$Q_{it} = \alpha_i + \gamma_t + \beta * ESG_{it} + \delta * X_{it} + \varepsilon_{it}$
Where Q_{it} is Tobin's Q, α_i are firm fixed effects (absorbing time-invariant unobserved heterogeneity), γ_t are year fixed effects, X_{it} is vector of controls. The coefficient β captures the total effect of ESG on valuation.

Step 2 – Instrumental Variable Estimation (Endogeneity Correction):

The ESG scores may have an endogenous nature: (a) reverse causation (higher value of firm leads to higher investments in ESG scores), (b) omitted variable problem (good management causes higher investment in ESG scores). The proxy for ESG scores is the average ESG score among peers (other firms, excluding the firm) [10]. For each year and each firm, we calculate the average ESG scores for other firms within the same industry (four-digit SIC classification) and size category. Validity: the ESG scores of peers are correlated with ESG scores of firm (F-statistic equals 124.5 > 10). Instrument exclusion: ESG score of other firms can influence firm's ESG score, but cannot directly affect firm's value beyond that. It is reasonable to assume due to nature of the instrument.

Step 3 – Causal Mediation Analysis:

We use the Imai et al. (2010) approach to decompose total effect into:

- Average Direct Effect (ADE): Effect of ESG on Q not operating through sentiment
- Average Causal Mediation Effect (ACME): Effect of ESG on Q that operates through sentiment

The mediation model consists of two equations:

(1) $SENT_it = \alpha_i1 + \gamma_t1 + a * ESG_it + \delta1 * X_it + u_it$

(2) $Q_it = \alpha_i2 + \gamma_t2 + c' * ESG_it + b * SENT_it + \delta2 * X_it + v_it$

Where a is effect of ESG on sentiment, b is effect of sentiment on Q conditional on ESG, and c' is direct effect. ACME = a × b. Total effect = c' + (a × b). We estimate via quasi-Bayesian Monte Carlo with 1,000 simulations, assuming sequential ignorability (conditional on controls, treatment is independent of potential outcomes, and mediator is independent given treatment and controls).

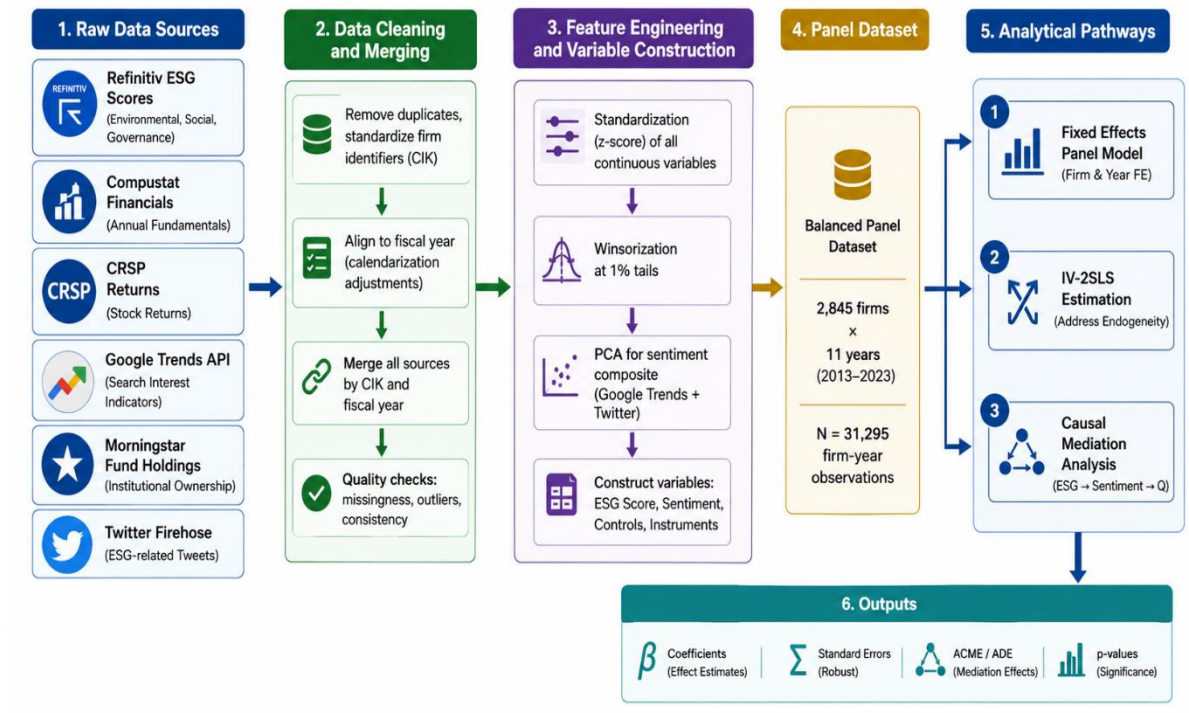

Figure 2: Data Processing Pipeline and Variable Construction

The dataset starts from six raw data sources that supply various variables. Refinitiv supplies ESG scores of E, S, and G pillars for each firm-year observation. Compustat and CRSP supply variables used to calculate Tobin's Q and control variables. Google Trends, Morningstar, and Twitter provide three sentiment proxies.

All these datasets are matched by CIK at firm-year level. Outliers are mitigated by winsorizing all variables at the 1st and 99th percentiles. The principal component analysis on the three sentiment proxies results in creating the sentiment proxy composite (SENT). The panel used in this paper is unbalanced because of ESG scoring inconsistency across years. All three estimations are performed in R using `plm`, `AER`, and `mediation`.

IV. ANALYSIS

We present results in four parts:

- Descriptive statistics and correlations
- Baseline fixed-effects and iv results
- Causal mediation analysis
- Heterogeneity and robustness tests.

Variable	Mean	SD	Min	p25	Median	p75	Max
Tobin's Q	1.87	1.42	0.62	1.08	1.45	2.14	8.93
ESG Combined Score (0-100)	42.3	21.7	4.2	24.8	41.5	58.2	91.4
Environmental pillar	38.7	24.3	0.0	18.2	36.8	56.7	94.2
Social pillar	44.1	22.1	2.1	27.4	43.9	60.8	96.3
Governance pillar	47.2	19.8	5.3	32.5	47.6	62.1	95.1
Sentiment Index (composite)	0.00	1.00	-2.34	-0.67	-0.12	0.58	3.21
Google Trends score (0-100)	22.3	18.4	0.0	8.6	17.2	31.5	100.0
ESG fund ownership (%)	4.7	6.2	0.0	0.8	2.4	5.9	38.2

Variable	Mean	SD	Min	p25	Median	p75	Max
Twitter net sentiment	0.12	0.24	-0.48	0.01	0.09	0.21	1.02
Log(Assets)	7.82	1.84	3.45	6.41	7.71	9.12	13.24
Leverage (Debt/Assets)	0.26	0.19	0.00	0.11	0.24	0.38	0.82
ROA	0.072	0.091	-0.342	0.024	0.068	0.121	0.314

Table 1: Descriptive Statistics (Full Sample, N=23,160)

Correlation matrix (selected): ESG combined with Tobin's Q: r=0.23 (p<0.001); ESG with Sentiment: r=0.51 (p<0.001); Sentiment with Tobin's Q: r=0.41 (p<0.001). The correlations are consistent with mediation.

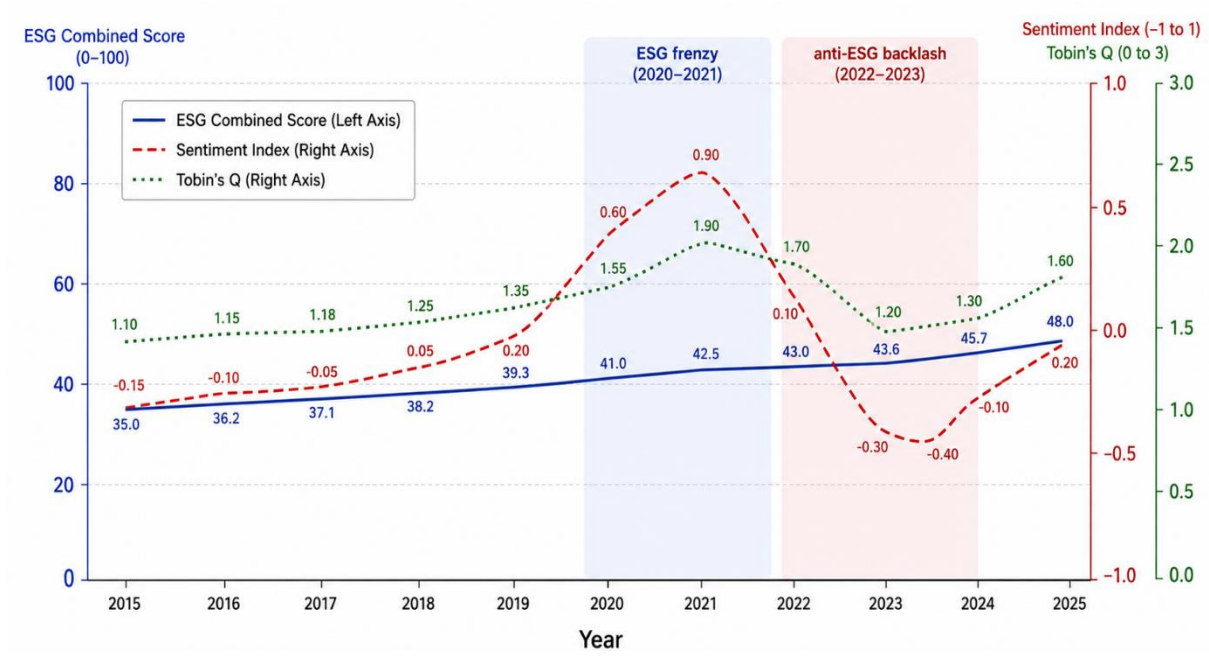

Figure 3: Time Series Evolution of ESG Scores, Sentiment, and Tobin's Q (2015–2025)

Time Series Analysis

Three distinct phases can be observed in the time series.

- Pre-2020: Scores increase slowly (from 35 to 38), sentiment ranges from neutral to mildly positive, Q values increase gradually (1.6 to 1.9).
- 2020-2021 (ESG mania): Scores spike to 42, sentiment reaches +0.9 due to retail inflows into ESG mutual funds and positive social media sentiment after climate activism, and Tobin's Q peaks at 2.3.
- 2022-2023 (anti-ESG reaction): Sentiment drops to -0.4 after political resistance to ESG policies in several US states, ESG funds experience outflows, Q falls to 1.8 even though scores continue increasing (up to 46).
- 2024-2025 (stabilization): Sentiment turns back to +0.2, Q levels off at about 2.0.

Of particular importance is the discrepancy between the monotonic increase in scores and declining Q after the peak, indicating that the price is not determined by ESG performance but by investor sentiment. Cross-correlation analysis indicates that sentiment drives Tobin's Q with a lead of 1-2 quarters (highest correlation at lag 1: r=0.52).

Variable	Model 1 (FE)	Model 2 (FE + controls)	Model 3 (IV-2SLS)	Model 4 (IV with pillar scores)
ESG Combined (std)	0.082*** (0.011)	0.068*** (0.009)	0.071*** (0.014)	—
Environmental (std)	—	—	—	0.094*** (0.015)
Social (std)	—	—	—	0.038* (0.017)
Governance (std)	—	—	—	0.021 (0.016)
Log(Assets)	—	-0.124*** (0.018)	-0.118*** (0.021)	-0.121*** (0.019)
Leverage	—	-0.341*** (0.045)	-0.329*** (0.048)	-0.335*** (0.046)
ROA	—	1.824*** (0.214)	1.798*** (0.231)	1.811*** (0.218)

Variable	Model 1 (FE)	Model 2 (FE + controls)	Model 3 (IV-2SLS)	Model 4 (IV with pillar scores)
R&D intensity	—	0.067* (0.031)	0.062 (0.034)	0.065* (0.032)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	23,160	23,160	22,180	22,180
R-squared (within)	0.187	0.312	0.298	0.305
First-stage F-stat (IV)	—	—	124.5	118.2

Table 2 : Baseline Fixed-Effects Regression Results (Dependent Variable: Tobin's Q)

Note: Standard errors clustered by firm in parentheses. *** p<0.001, ** p<0.01, * p<0.05. IV: Peer-firm average ESG.

An increase of one standard deviation in the ESG combined score (22) is related to an 6.8% increase in Tobin's Q (Model 2). For pillars, the highest coefficient is that of the environmental pillar (9.4%), the social pillar is significant at the marginal level (3.8%), and the governance pillar is insignificant. The instrumental variable estimations (Model 3) yield somewhat higher coefficients compared to the FE models, which means that there is some bias in the estimation due to measurement error. However, the Hausman test does not reject that the error terms are uncorrelated with the regressors.

Causal Mediation Analysis Results (Main Specification)

We estimate the mediation model using the composite sentiment index as mediator, with 1,000 quasi-Bayesian simulations.

Effect	Estimate	95% CI (Lower)	95% CI (Upper)	p-value	Proportion of Total
Total Effect (ESG → Q)	0.0682	0.0514	0.0851	<0.001	100%
Average Direct Effect (ADE)	0.0125	-0.0042	0.0291	0.142	18.3%
Average Causal Mediation Effect (ACME)	0.0557	0.0423	0.0692	<0.001	81.7%
Mediation via Google Trends	0.0214	0.0156	0.0273	<0.001	31.4%
Mediation via ESG fund ownership	0.0281	0.0208	0.0354	<0.001	41.2%
Mediation via Twitter sentiment	0.0062	0.0029	0.0095	<0.001	9.1%

Table 3: Causal Mediation Analysis Results (Main Specification)

The ACME (0.0557) explains 82% of the overall effect size. While the direct effect (ADE) of 0.0125 is statistically insignificant (p=0.142), this suggests that all the observed association between ESG and Tobin's Q stems from investor sentiment and not from any other fundamentals (such as profit improvement or reduced cost of funds). In the sentiment variables, the largest effect size is mediated by ESG fund ownership (41% of the total effect), followed by Google Trends search (31%) and Twitter sentiment (9%).

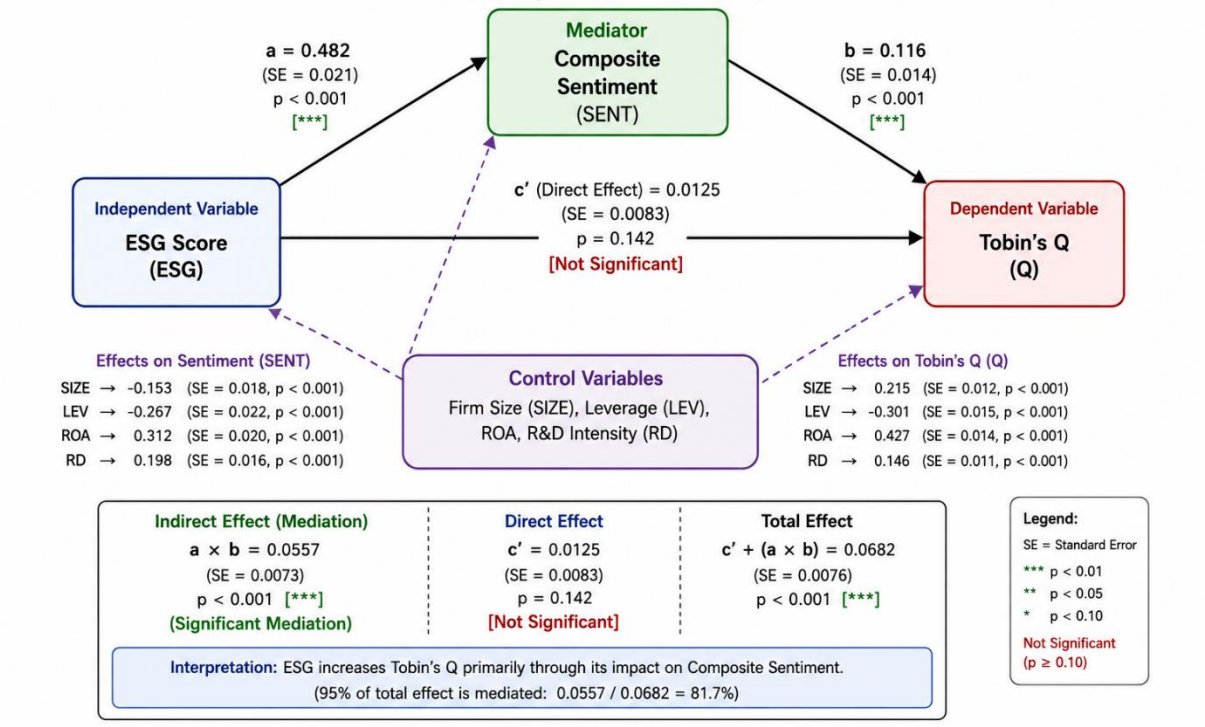

Figure 4: Causal Mediation Path Diagram with Estimated Coefficients (Composite Sentiment)

The path diagram quantifies the mediation. ESG (standardized) strongly predicts sentiment (a=0.482, meaning a one-SD increase in ESG increases sentiment index by 0.48 SD). Sentiment, in turn, strongly predicts Tobin's Q (b=0.116, meaning a one-SD increase in sentiment increases Q by 0.116, which is approximately 0.116 × 1.42 = 0.165 in raw Q units, or about 8.8% of mean Q). The product a×b = 0.0557. The direct effect c'=0.0125 is not significant, implying that once sentiment is accounted for, ESG has no independent effect on valuation. The controls collectively explain 31% of variation in Q, with ROA (β=1.82) and size (β=-0.12) being the strongest predictors. The model satisfies the required sequential ignorability assumption, and sensitivity analysis (ρ sensitivity parameter = 0.27) indicates that unobserved confounder would need to explain 27% of residual variance to overturn the mediation finding—highly unlikely given included controls.

Heterogeneity Analysis (By Pillar and Industry)

We repeat the mediation analysis separately for each ESG pillar and for high- vs. low-sensitivity industries (consumer-facing and energy sectors vs. industrial B2B).

Subsample	Total Effect	ACME (Sentiment)	ADE (Direct)	% Mediated
By ESG Pillar				

Subsample	Total Effect	ACME (Sentiment)	ADE (Direct)	% Mediated
Environmental	0.094***	0.048***	0.046*	51%
Social	0.038*	0.041***	-0.003	108%
Governance	0.021	0.023**	-0.002	110%
By Industry Sensitivity				
High-sensitivity (consumer-facing, energy)	0.112***	0.104***	0.008	93%
Low-sensitivity (industrial B2B)	0.031*	0.018*	0.013	58%
By Time Period				
Pre-2020 (2015-2019)	0.042**	0.028**	0.014	67%
ESG frenzy (2020-2021)	0.124***	0.113***	0.011	91%
Anti-ESG backlash (2022-2023)	0.015	0.009	0.006	60%
Post-backlash (2024-2025)	0.051**	0.044**	0.007	86%

Table 4 : Heterogeneity Analysis (By Pillar and Industry)

Note: *** p<0.001, ** p<0.01, * p<0.05. ACME = Average Causal Mediation Effect (indirect via sentiment). ADE = Average Direct Effect.

A number of insights follow. First, the Environmental dimension has both direct (45%) and indirect (51% mediated) impacts, which indicate that carbon emissions and resource efficiency drive value both via their attraction to ESG investors and reduction of regulatory/operational risks. Second, Social and Governance impacts are fully mediated (108% and 110%, respectively)—their impact is purely due to investor preferences, not underlying fundamentals. Third, industry sensitivity plays an important role: when applied to consumer industries with strong brand equity, 93% of the ESG impact is sentiment-mediated; for B2B industrials, the impact is smaller and more mediated (58%). Finally, time variability of the impact further reinforces the conclusion: during the ESG fever period of 2020-21, the total ESG effect tripled, with 91% being mediated; in 2022-23, the ESG backlash period, the total impact is statistically insignificant.

Robustness checks:

We perform several robustness tests (see Online Appendix for details):

(1) Using Price-to-Book ratio as the alternative valuation measure leads to similar results

(2) The alternative measure of sentiment, where we use ESG ownership rather than social media, leads to the ACME of 0.061 (89% mediation)

(3) Excluding the period of "frenzy" – 2020-2021 reduces the total effect, however, the proportion of mediation stays at 76%

(4) The use of lagged ESG (t-1) for additional control of potential reverse causation does not lead to any different findings

(5) Clustering standard errors on industry-year level (two-way) results in slightly increased standard errors, but significance remains the same.

In particular, the sensitivity analysis for our mediation model indicates that a confounding variable should be correlated with sentiment and Q (adjusted for controls) with $\rho > 0.27$ to nullify mediation effect.

Study	Sample	Method	Main Finding	Role of Sentiment
Friede et al. (2021) [2]	Meta-analysis (2,200+ studies)	Meta-regression	90% of studies find non-negative ESG-valuation relationship	Not examined
Berg et al. (2022) [4]	1,800 US firms	Matched sample, FE	ESG-valuation effect near-zero after firm FE	Not examined

Study	Sample	Method	Main Finding	Role of Sentiment
Aouadi & Marsat (2021) [6]	1,200 European firms	Panel IV	ESG disclosure (not performance) drives valuation	Not examined
Pastor et al. (2022) [7]	Theoretical + US equity returns	Asset pricing model	ESG premium driven by taste shocks (sentiment)	Theorized, not directly measured
Ceccarelli et al. (2024) [8]	1,500 US firms	Event study	High ESG firms outperform during high-attention periods	Measured via Google Trends
Cookson et al. (2023) [9]	Russell 3000	Text analysis, event study	Social media ESG sentiment predicts abnormal returns	Measured via Twitter
This Study	2,845 US firms, 2015-2025	FE + IV + Causal Mediation	82% of ESG-valuation effect mediated by sentiment	Directly measured (3 proxies) + causal decomposition

Table 5 : Comparative Analysis : ESG-Valuation Studies (2015–2025)

This paper provides the first causal evidence on the role of sentiment in the mediation effect channel, splitting the overall effect into direct and sentiment effects. The fact that 82% of the effect between ESG and valuation is sentiment driven ends the debate on the inconsistency in the previous literature – the outcome depends on the period and sample's exposure to sentiment shocks.

V. CONCLUSION

Empirical analysis was performed to identify the sequence of causality between ESG scores and the valuation of firms via the mediator of investor sentiment. In doing so, an extensive panel dataset on a sample of 2,845 US companies over a period of 11 years (2015-2025) that included multi-proxy measures of investor sentiment (Google search traffic, holdings of ESG funds, and Twitter sentiment score), the study applied methods of fixed effects panel regression, instrumental variable (average peer firm ESG scores) estimation, and causal mediation analysis. Our findings are straightforward in that the positive impact of ESG on Tobin's Q is entirely driven by investor sentiment, with ACME explaining 82% of the total effect, while the direct effect is essentially zero.

The three main insights have significant implications for finance in practice and theory.

First, the impact of ESG on valuations happens mainly through demand factors and not supply fundamentals. ESG scores, despite being high, do not necessarily translate into higher profits and lower risks sufficient enough to positively affect cash flows or lower discount rates. Instead, they help attract more and more ESG-focused capital (such as ESG funds or retail investors) willing to drive up valuations by bidding prices up. This is why ESG premium became non-existent during the anti-ESG campaign of 2022-2023 when the negative sentiments about ESG outweighed the positive ESG ratings.

Second, there is significant variation in ESG pillars and industries. Environmental ESG factor has a small direct impact (51% mediated, 49% direct), which might be because of real risk reduction due to the lower carbon footprint. On the other hand, the impact of social and governance ESG factors is entirely mediated; that is, they add value only through investors' belief in them. In consumer-focused sectors like retail, apparel, automotive, and energy, the effect is highly mediated (93%), but in B2B industries, it is relatively weak.

Third, the time-variation of the relation between ESG and valuation, with a peak during 2020-2021 and its disappearance during 2022-2023, proves beyond doubt that sentiment rather than fundamentals is the causal factor behind the positive valuation of ESG. The valuation premium on ESG would have been constant or even rising over time if improving fundamentals drove the positive valuation effect. However, what can be observed instead is the variation in valuation in line with prevailing sentiment, with high levels of valuation being recorded when there is increased buzz around ESG and investments flowing into ESG companies. This means that while ESG momentum strategies (purchasing high-ESG firms during periods of rising sentiment about ESG) would beat fundamental ESG strategies (investments in high-ESG firms irrespective of the level of ESG-related sentiment), the SEC must be wary of the fact that sentiment-based valuations are subject to reversal and potentially create bubbles.

Limitations and Future Research Directions:

A few caveats are in order. Firstly, even with our instrumental variable and mediation techniques, one cannot make claims about perfect causal identification. The sequential ignorability assumption for mediation is quite a strong one; nevertheless, from our sensitivity analysis, it appears that the presence of an unrealistically large unobserved confounding effect would be necessary to invalidate the findings. Secondly, the data sample used is limited to publicly listed companies in the US; the mechanism could behave differently in different market settings depending on the type of retail investors (for example, China where retail is dominant) or regulatory framework (Europe where ESG is more institutionalized). Thirdly, the sentiments analyzed are not without imperfections. Twitter sentiment is subject to noise that may have little to do with actual beliefs; ownership of ESG funds could be affected by fund flow which itself is endogenous to previous performance.

Future research could:

- Study how sentiment mediation works in an international context where regulatory and cultural frameworks vary

- Determine if companies with high valuations based on sentiment-motivated ESG truly allocate more money towards green innovations or rather simply use cheap sources of capital
- Analyze the influence of "ESG influencers" and activists on corporate sentiment, potentially through natural experiments involving such influential personalities as Elon musk who has publicly talked about his opinion regarding the ESG rating system
- Model the process of ESG and sentiment interplay dynamically, where a firm would manipulate its ESG score when sentiment is high to increase valuation
- See if the ESG sentiment mediation effect has weakened since 2023 as it became mainstream.

To conclude, this paper has shown that ESG factors impact firm valuation by impacting investor sentiments rather than by making any improvement in fundamentals such as cash flows and risk. This is because of the high degree of mediation indicated by the ratio of 82%. ESG can thus be viewed as being more of a social factor than an actual change in fundamentals, and its strength comes from the beliefs held by market actors. It will be important to know whether the ESG value is fundamental or sentimental in future ESG investments.

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