

Does executive gender diversity moderate the ESG–market valuation relationship? Evidence from European firms

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Saqer Al-Tahat and Zaid Jaradat

Department of Accounting, Al al-Bayt University, Mafrqa, Jordan, and
Sakhr Bani-Khaled

Department of Economics, Management, Industrial Engineering and Tourism,
University of Aveiro, Aveiro, Portugal

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Abstract

Purpose – This study examines whether environmental, social and governance (ESG) performance is incorporated into market valuation in European listed firms and whether this association is conditioned by executive gender diversity.

Design/methodology/approach – Using an unbalanced panel of 430 firms from a major European benchmark over 2010–2023, we estimate firm- and year-fixed effects models with Driscoll–Kraay standard errors. Tobin's Q is the primary valuation proxy, with market-to-book (MTB) ratios used for robustness. ESG was analysed at the composite and pillar levels, and moderation was tested via interaction specifications with executive gender diversity, complemented by sector-split estimations.

Findings – The findings of this study reveal that ESG performance is not priced uniformly; it is positively associated with Tobin's Q with a lag but discounted under MTB. This suggests delayed market incorporation and greater scepticism under equity book valuation anchors. The findings further reveal that executive gender diversity (averaging approximately 15% female executives) weakens the marginal ESG–valuation association, especially for environmental and governance dimensions.

Practical implications – Managers should treat ESG and executive composition as a bundled signal set and clearly communicate how ESG initiatives translate into observable operating and governance outcomes. Investors and regulators should interpret ESG “premia” as timing- and metric-contingent, rather than automatic.

Originality/value – By distinguishing between executive and board gender diversity, this study advances a leadership-conditioned account of ESG pricing consistent with signalling and agency mechanisms, clarifying when overlapping governance-related signals dilute the incremental valuation of ESG.

Keywords ESG, Executive gender diversity, Market valuation, Tobin's Q, Market-to-book ratio, European firms

Paper type Research article

1. Introduction

The integration of environmental, social, and governance (ESG) criteria into corporate strategy has become central for firms, investors, and policymakers, particularly in Europe, where regulatory and societal expectations are strong. ESG performance is increasingly seen as a driver of firm value; however, the mechanisms linking ESG to market valuation remain complex and context-dependent (Al-Tahat *et al.*, 2025; Al-Hiyari, 2024; Alodat and Hao, 2025; Saleh *et al.*, 2025; Mansour *et al.*, 2025).

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Gender diversity in the executive team has emerged as a critical factor shaping these dynamics. Diverse leadership teams can influence both the quality and perception of ESG activities, for example, by mitigating the impact of ESG controversies on valuation and strengthening stakeholder trust (Al-Hiyari, 2024). Board gender diversity has also been shown to enhance the value of ESG disclosures (Alodat and Hao, 2025; Saleh *et al.*, 2025).

However, the evidence is mixed. Some studies have found that gender diversity does not consistently improve ESG outcomes or firm value, with effectiveness depending on factors such as critical mass, national gender policies, and institutional context (Al-Shaer *et al.*, 2024). For instance, gender-diverse boards are more effective in curbing ESG misconduct where gender equality policies are strong, and a threshold of female representation is often required to realise benefits (García-Meca and Martínez-Ferrero, 2025).

This ambiguity highlights the need for greater clarity on when and how executive gender diversity moderates the ESG–valuation relationship. While some evidence points to positive effects, tokenism or weak institutional support may constrain diversity’s value (Al-Hiyari, 2024).

Europe offers an ideal setting for such an enquiry, given its progressive governance frameworks, emphasis on gender equality, and advanced ESG reporting standards. However, gaps remain in understanding the conditions under which executive diversity amplifies or limits the value relevance of ESG initiatives (Al-Hiyari, 2024; Alodat and Hao, 2025).

This study addresses this gap by examining whether and when executive gender diversity moderates the ESG–market valuation link among European firms. This study contributes to debates on corporate governance, leadership diversity, and sustainable value creation while offering practical insights for managers, investors, and policymakers.

2. Literature review and hypothesis development

Research widely links ESG performance to higher firm value through improved stakeholder trust, risk reduction, and long-term sustainability. Empirical evidence across global markets shows that ESG performance and disclosure are generally positively associated with both accounting- and market-based measures of firm value, although the strength of this relationship varies with firm characteristics and institutional contexts (Che *et al.*, 2024; Chen *et al.*, 2023). In Europe, sustainability disclosure and higher ESG scores enhance firm valuation by reducing information asymmetry and agency costs. However, prior research also reports heterogeneous effects across ESG pillars, with environmental scores sometimes exerting weaker effects on market value compared with social or governance dimensions (Huang, 2022; Qureshi *et al.*, 2020).

Executive gender diversity is increasingly viewed as an important governance mechanism influencing ESG outcomes and their financial implications. Prior studies indicate that gender-diverse boards improve ESG performance and disclosure, particularly when a critical mass of female directors is reached, while token representation has limited influence (Omenihu *et al.*, 2025). Evidence from European firms similarly links female board representation to stronger sustainability governance and non-financial reporting (Nicolò *et al.*, 2022). However, the moderating role of gender diversity remains context-dependent, with mixed findings across industries and ESG dimensions, suggesting that gender diversity may condition the strength of the ESG–market valuation relationship.

2.1 Hypotheses development

A substantial body of research shows that strong ESG performance enhances firm value by signalling responsible management, reducing information asymmetry, and building stakeholder trust (Hadisurya *et al.*, 2025). Evidence from markets such as Indonesia, Malaysia, and Europe consistently finds a positive association between ESG disclosure and both accounting- and market-based performance (Alodat and Hao, 2025; Hadisurya *et al.*, 2025). These effects stem

from ESG's role in mitigating reputational and operational risks, attracting socially responsible investors, and improving capital access. In light of this evidence.

H1. ESG performance positively affects market valuation.

Although gender diversity is often linked to stronger governance and ESG outcomes, recent evidence points to a more nuanced moderating effect. [Al-Hiyari \(2024\)](#) shows that top management team gender diversity can weaken the positive link between ESG performance and market valuation, especially during ESG controversies. This may reflect market perceptions that high gender diversity signals shifting priorities or greater risk aversion, leading to more cautious ESG investments or stakeholder scepticism. Other studies suggest that this moderating effect can be negative or non-linear, depending on factors such as industry, culture, and the critical mass of female leaders ([Saleh et al., 2025](#); [Al-Shaer et al., 2024](#); [Heubeck, 2023](#)). Accordingly, the following hypothesis is proposed.

H2. Executive gender diversity reduces the strength of the positive effect of ESG performance on market valuation.

Disaggregating ESG into its components, research demonstrates that ESG performance contributes positively to firm value. For instance, environmental initiatives can reduce regulatory risks and operational costs, social performance enhances reputation and employee engagement, and strong governance reduces agency problems ([Adnindya and Restuti, 2025](#)). Empirical findings confirm that each ESG pillar, when managed effectively, is associated with a higher market valuation. The following hypothesis is proposed.

H3. Environmental, social, and governance performance each have a positive effect on market valuation.

The moderating role of executive gender diversity extends to individual ESG pillars. Studies indicate that gender diversity may weaken the positive relationship between governance disclosure and firm performance, possibly due to increased scrutiny or divergent stakeholder expectations ([Adnindya and Restuti, 2025](#)). Similarly, the effect may vary across environmental and social dimensions, with some evidence suggesting that the presence of women in leadership can lead to more cautious or risk-averse ESG strategies, thereby moderating valuation impact. In light of these considerations.

H4. Executive gender diversity reduces the strength of the positive effects of environmental, social, and governance performance each individually on market valuation.

The industry context is a critical determinant of the ESG–valuation relationship. Research shows that in non-sensitive industries, where ESG activities are less likely to be driven by regulatory compliance, the positive effect of ESG on firm value is more pronounced ([Guedes et al., 2025](#); [Khalaf et al., 2024](#)). In contrast, in sensitive industries, ESG initiatives may be perceived as compliance-driven rather than value-adding, thus reducing their impact on market valuation. In light of these considerations.

H5. The positive effect of ESG performance on market valuation is stronger in non-sensitive industries than in sensitive ones.

The measurement of gender diversity influenced the observed moderating effects. [Alodat and Hao \(2025\)](#) demonstrate that the moderating role of board gender diversity on the ESG–performance link remains robust when gender diversity is operationalised as a high-versus-low indicator. This suggests that the impact of gender diversity is not merely a function of incremental increases but may be more pronounced when a threshold is reached. The following hypothesis is proposed.

H6. The moderating effect of executive gender diversity on the ESG–market valuation relationship remains significant when gender diversity is measured as a high-versus low indicator.

3. Methodology

3.1 Sample selection and data sources

The empirical setting is the STOXX 600 index, which covers the largest firms in 17 European markets. Its wide scope makes it a benchmark for studying ESG valuations (Priem and Gabellone, 2022). The period 2010–2023 captures intensifying regulations, rating diffusion, and gender leadership debates (Nicolò et al., 2022).

After excluding firms incorporated post-2010 and those lacking e.g. governance, or financial data in the LSEG Workspace, the final sample included 430 firms. The unbalanced panel reflects the institutional variation in disclosure and enforcement (Hachicha et al., 2025). The distribution of sample firms by market and sector sensitivity is reported in Table 1.

The UK, France, and Germany account for nearly half of the sample. Non-sensitive sectors comprise 62.1%, while sensitive industries (energy, materials, industrials, and utilities) comprise 37.9%, showing ESG’s role in compliance or strategic signalling (Zaiane and Ellouze, 2023). All firm-level e.g. governance, and financial data were obtained from the LSEG Workspace, ensuring cross-country comparability and policy relevance (Candio, 2024).

3.2 Variable definitions and measurement

Firm valuation is measured primarily by Tobin’s Q (market value of equity and debt to book assets), with the market-to-book ratio (MTB) as a robustness check. Tobin’s Q captures overall

Table 1. Firms by market and sector sensitivity

Market	Non-sensitive sector		Sensitive sector		Total
	Number of firms	Column %	Number of firms	Column %	
Austria	2	0.75%	5	3.1%	7
Belgium	8	3.00%	2	1.2%	10
Denmark	12	4.49%	6	3.7%	18
Finland	7	2.62%	10	6.1%	17
France	38	14.23%	20	12.3%	58
Germany	25	9.36%	19	11.7%	44
Ireland	5	1.87%	1	0.6%	6
Italy	13	4.87%	12	7.4%	25
Luxembourg	1	0.37%	0	0.0%	1
Netherlands	9	3.37%	9	5.5%	18
Norway	5	1.87%	6	3.7%	11
Poland	4	1.50%	2	1.2%	6
Portugal	2	0.75%	2	1.2%	4
Spain	11	4.12%	10	6.1%	21
Sweden	21	7.87%	11	6.7%	32
Switzerland	28	10.49%	12	7.4%	40
United Kingdom	76	28.46%	36	22.1%	112
Total	267	62.09%	163	37.91%	430

Note(s): The table shows the number of firms by market and sector. Sensitive sectors include energy, materials, industrials, and utilities; non-sensitive sectors include consumer cyclicals, consumer non-cyclicals, financials, healthcare, real estate, and technology. Percentages are column shares within each group

Source(s): Calculated by authors

market valuation relative to assets, while MTB provides an equity-specific perspective, reducing reliance on a single indicator (Butt *et al.*, 2023).

The main explanatory variable is ESG performance, proxied by LSEG Workspace's composite ESG score (0–100), with separate analysis of Environmental (E), Social (S), and Governance (G) pillars to capture heterogeneous investor responses (Rahman *et al.*, 2023).

Executive gender diversity—the proportion of women on the executive team—is included as a moderator. Unlike board diversity, it reflects the decision-making core and may amplify or attenuate ESG effects on valuation (Chen and Hassan, 2022). A sensitive sector dummy (energy, materials, industrials, utilities vs. others) accounts for industry context (Qureshi *et al.*, 2020). Control variables include firm size (log assets), profitability (ROA), leverage (debt-to-capital, DTC), price volatility (annualised return SD), and governance factors (board size and board gender diversity), capturing scale, efficiency, risk, and monitoring influences on valuation (Brahma *et al.*, 2021). Full definitions and references appear in Table 2.

3.3 Econometric model specification

We estimate firm–year panel models to examine how ESG performance is priced and whether this effect depends on the gender composition of the executive team. All models include firm fixed effects (α_i) and year dummies (λ_t). The regressors that enter the interactions are grand-mean centred (denoted by a tilde). The estimator choice and inference (Driscoll–Kraay standard errors) follow the diagnostics in Section 3.4.

Let $\widetilde{ESG}_{it}$ be the centred composite ESG score; $P \in [\widetilde{E}_{it}, \widetilde{S}_{it}, \widetilde{G}_{it}]$ the centred pillar scores; $\widetilde{Exec}_{it}$ the centred percentage of female executives; and W_{it} the control vector (lnTA, ROA, DTC, PriceVol, board gender diversity, board size).

(1) Baseline models: composite ESG and timing

We estimate contemporaneous and lagged specifications to allow for delayed price discovery:

$$\text{Tobin's } Q_{it} = \alpha + \beta_1 \widetilde{ESG}_{it} + \gamma W_{it} + \alpha_i + \lambda_t + \epsilon_{it} \quad (1)$$

$$\text{Tobin's } Q_{it} = \alpha + \beta_1 \widetilde{ESG}_{i,t-1} + \gamma W_{it} + \alpha_i + \lambda_t + \epsilon_{it} \quad (2)$$

The lagged form is the workhorse in subsequent interaction and pillar analyses, consistent with the results indicating delayed market recognition.

(2) Moderation model: executive gender diversity

We test whether the valuation of ESG depends on executive team composition:

$$\begin{aligned} \text{Tobin's } Q_{it} = & \alpha + \beta_1 \widetilde{ESG}_{i,t-1} + \beta_2 \widetilde{Exec}_{it} + \beta_3 (\widetilde{ESG}_{i,t-1} \times \widetilde{Exec}_{it}) + \gamma W_{it} \\ & + \alpha_i + \lambda_t + \epsilon_{it} \end{aligned} \quad (3)$$

Here, β_3 captures whether executive gender diversity attenuates or amplifies the ESG–valuation association.

(3) Pillar-specific specifications

To isolate heterogeneity across dimensions, we replace the composite with each pillar and interact it with the moderator. For $P \in [\widetilde{E}, \widetilde{S}, \widetilde{G}]$:

$$\text{Tobin's } Q_{it} = \alpha + \beta_1 P_{i,t-1} + \beta_2 \widetilde{Exec}_{it} + \beta_3 (P_{i,t-1} \times \widetilde{Exec}_{it}) + \gamma W_{it} + \alpha_i + \lambda_t + \epsilon_{it} \quad (4)$$

Table 2. Variable definitions and measurements

Variable name	Role in model	Description/Measurement	Source	Expected sign	References
Tobin's Q	Dependent	Market-based valuation proxy: ratio of market value of equity plus book value of debt to total assets (empirical approximation of the theoretical Q)	LSEG Workspace	+	Yu and Xiao (2022) , Rahat and Nguyen (2024)
Market-to-Book ratio	Dependent (robustness)	Equity valuation proxy: market value of equity divided by book value of equity	LSEG Workspace	+/-	Yu and Xiao (2022) , Abdi et al. (2020)
ESG Score (overall)	Independent	Composite percentile score (0–100) aggregating environmental, social, and governance indicators based on publicly disclosed information	LSEG Workspace	+	Giannopoulos et al. (2022) , Sinha Ray and Goel (2023)
Environmental Score	Independent	Percentile score capturing environmental performance (e.g. emissions, resource use, environmental innovation and disclosure)	LSEG Workspace	+	Abubakr et al. (2025) , Buallay (2019)
Social Score	Independent	Percentile score capturing social performance (e.g. workforce practices, human rights, community relations, diversity policies)	LSEG Workspace	+	Gonçalves et al. (2023) , Buallay et al. (2020)
Governance Score	Independent	Percentile score capturing governance structure and processes (shareholder rights, board structure, transparency and disclosure)	LSEG Workspace	±	Dkhili (2023) , Makpotche et al. (2024)
Executive gender diversity	Moderating	Percentage of executive positions held by women (number of female executives ÷ total executives × 100). Distinct from board-level diversity	LSEG Workspace	±	Al-Hiyari (2024)
Sensitive sector	Contextual moderator	Indicator equal to 1 for TRBC “sensitive” industries (energy, basic materials, industrials, utilities); 0 for non-sensitive sectors	TRBC/ LSEG	±	Qureshi et al. (2020)
Firm size	Control	Natural logarithm of total assets (scale and visibility proxy)	LSEG Workspace	–	Giannopoulos et al. (2022) , Brahma et al. (2021)
Profitability (ROA)	Control	Return on assets: net income divided by total assets	LSEG Workspace	+	Rahman et al. (2023)

(continued)

Table 2. Continued

Variable name	Role in model	Description/Measurement	Source	Expected sign	References
Leverage	Control	Debt-to-capital ratio (total debt ÷ (debt + equity))	LSEG Workspace	±	Giannopoulos <i>et al.</i> (2022), Brahma <i>et al.</i> (2021)
Price volatility	Control	Annualised standard deviation of stock returns (firm-specific risk)	LSEG Workspace	–	Zhou and Zhou (2021)
Board gender diversity	Control	Proportion of women on the board of directors	LSEG Workspace	+	Kampoowale <i>et al.</i> (2024), Arvanitis <i>et al.</i> (2022)
Board size	Control	Number of directors serving on the board at year-end	LSEG Workspace	±	Ramadan and Hassan (2022), Brahma <i>et al.</i> (2021)

Note(s): All variables are derived from LSEG Workspace (formerly Refinitiv Eikon/Datastream). Sensitive sector classification follows the TRBC industry taxonomy, with energy, basic materials, industrials, and utilities coded as sensitive

Source(s): Created by authors

(4) Robustness to valuation metric (MTB)

We re-estimate (b)–(c) using the MTB ratio:

$$MTB_{it} = \alpha + \beta_1 Z_{i,t-1} + \beta_2 \widetilde{Exec}_{it} + \beta_3 (Z_{i,t-1} \times \widetilde{Exec}_{it}) + \gamma W_{it} + \alpha_i + \lambda_t + \epsilon_{it} \quad (5)$$

Where Z is $\widetilde{ESG}$ (composite) or P each pillar) in turn.

(5) Sensitivity specifications

- Binary moderator. We replace the continuous moderator with $HighExec_{it}$, equal to 1 when female executive representation is above the pooled sample median and 0 otherwise:

$$Tobin's\ Q_{it} = \alpha + \beta_1 Z_{i,t-1} + \beta_2 HighExec_{it} + \beta_3 (Z_{i,t-1} \times HighExec_{it}) + \gamma W_{it} + \alpha_i + \lambda_t + \epsilon_{it} \quad (6)$$

- Sectoral heterogeneity. We re-estimate the moderation models within TRBC-based subsamples: sensitive sectors (energy, basic materials, industrials, and utilities) and non-sensitive sectors (consumer cyclicals, consumer non-cyclicals, financials, healthcare, real estate, and technology) to assess the contextual variation in the ESG–valuation link and its moderation.

3.4 Estimation strategy and diagnostics

Panel diagnostics guide estimator choice. The Hausman test rejects random effects in favour of fixed effects ($\chi^2 = 547.33$, $p = 0.000$), so all models include firm fixed effects and year dummies. Further tests indicate violations of classical assumptions: Wooldridge confirms autocorrelation ($F = 72.26$, $p = 0.000$), the Modified Wald test shows heteroskedasticity

($\chi^2 = 393,739.89$, $p = 0.000$), and the Pesaran CD test detects cross-sectional dependence (stat = 77.48, $p = 0.000$). Table 3 indicates that the panel violates homoskedasticity, serial independence, and cross-sectional independence, and that random effects are rejected in favour of fixed effects.

Accordingly, the preferred specification is fixed effects with Driscoll–Kraay standard errors (lag = 2), robust to heteroscedasticity, autocorrelation, and cross-sectional dependence. This approach was used throughout the baseline, moderation, pillar-specific, robustness (MTB), and sensitivity analyses. For transparency, FE with firm-clustered errors and RE–GLS are also reported in the baseline regressions (Table 6), although the interpretation follows the Driscoll–Kraay estimates consistent with the Hausman rejection.

To aid the interpretation of interaction models, continuous regressors are grand-mean centred, and ESG/pillar scores are lagged ($t-1$) to reflect delayed price discovery. Minor anomalies in the omnibus statistics (e.g. very small F-values) are export artefacts and do not affect inferences at the coefficient level.

3.5 Endogeneity and identification strategy

To address endogeneity in the ESG–valuation relationship—particularly valuation persistence, potential reverse causality, and omitted time-varying factors—we complement baseline fixed-effects models with a dynamic two-step System GMM (Blundell–Bond). Tobin’s Q is modelled as a function of its lag, the lagged centred ESG score, controls, and year indicators. Internal instruments derived from deeper within-firm lags reduce simultaneity and dynamic feedback bias, with instrument proliferation limited via matrix collapsing and restricted lag depth (Roodman, 2009). Full instrument counts and diagnostics are in Appendix Table A1.

Appendix Table A1 reports two System GMM models. Column (1) estimates the dynamic ESG–valuation link; Column (2) adds executive gender diversity and the ESG $\times$ gender interaction. Tobin’s Q is highly persistent (Column 1: 0.9148, SE = 0.0838, $p < 0.01$; Column 2: 0.9217, SE = 0.0832, $p < 0.01$), while the lagged ESG score is small and insignificant (Column 1: -0.0001 , SE = 0.0017; Column 2: 0.0003, SE = 0.0014). Executive gender diversity (-0.0008 , SE = 0.0005) and the interaction (0.0000, SE = 0.0001) are also insignificant; other covariates are likewise indistinguishable from zero, while year indicators remain significant. Taken together, the dynamic GMM results do not support a detectable ESG effect or gender moderation in Tobin’s Q. Baseline moderation evidence is therefore interpreted conservatively as estimator-contingent rather than causal.

Table 3. Panel data diagnostics

Test	Null hypothesis	Test statistic	p -value	Inference
Hausman test (FE vs. RE)	RE is consistent and efficient	$\chi^2 = 547.33$	0.000	FE required; RE inconsistent
Wooldridge test for autocorrelation	No first-order serial correlation	$F = 72.26$	0.000	Autocorrelation present
Modified Wald test for heteroskedasticity	Homoskedastic disturbances across panels	$\chi^2 = 393,739.89$	0.000	Heteroskedasticity present
Pesaran test for cross-sectional dependence	No contemporaneous correlation across panels	77.48	0.000	Cross-sectional dependence present

Note(s): Diagnostics justify firm and year fixed effects with Driscoll–Kraay standard errors (max lag = 2) as the primary estimator. Benchmark FE with firm-clustered SEs and RE–GLS are reported only for comparison in baseline results

Source(s): Created by authors

3.6 Robustness and alternative specifications

To test the sensitivity of the ESG–valuation association and its moderation by executive gender diversity, we conduct robustness analyses varying (1) the valuation proxy, (2) timing, (3) ESG dimensionality, (4) moderator measurement, (5) industry context, and (6) estimator assumptions.

First, we re-estimate the interaction models using MTB instead of Tobin's Q (Table 9), providing an equity-based valuation perspective. Second, we examine timing by estimating contemporaneous and lagged ESG models, with lagged ESG/pillar scores as the primary specification to reflect delayed market incorporation of sustainability information (Tables 6–8). Third, we disaggregate ESG into its pillars to assess heterogeneous valuation effects (Table 8; MTB results in Table 9).

Fourth, we re-measure executive gender diversity using a high-versus-low indicator based on the pooled median (Table 10), testing whether moderation reflects threshold rather than incremental effects. Fifth, we explore sectoral heterogeneity by estimating models separately for sensitive and non-sensitive industries using TRBC classifications (Table 11), acknowledging that ESG and leadership signals may vary with legitimacy pressures and “licence-to-operate” dynamics.

Sixth, for comparability, we report benchmark fixed-effects models with firm-clustered standard errors and random-effects GLS estimates (Table 6), while retaining fixed effects as the main specification due to the Hausman rejection and dependence diagnostics supporting Driscoll–Kraay inference.

Finally, we implement a two-step System GMM model as an endogeneity-robustness check (Appendix Table A1). Tobin's Q remains highly persistent, whereas the lagged ESG term and its interaction with executive gender diversity are statistically insignificant. This suggests that ESG and moderation effects are sensitive to dynamic internal-instrument identification, and thus baseline findings are interpreted cautiously as estimator-contingent associations rather than definitive causal estimates.

4. Results

4.1 Descriptive statistics and correlation analysis

Table 4 shows the substantial heterogeneity in firm characteristics. Tobin's Q averages 1.69 (range 0.72–7.57). The mean ESG performance is 65.55 (SD = 17.64), with environmental (66.87) and social (68.41) scores higher than governance (61.18). Executive gender diversity averages 14.98%, with many firms at zero, whereas board gender diversity is higher at 28%, reflecting stronger regulatory pressure. The controls are consistent with large European firms: mean firm size (log assets) = 16.67, profitability (ROA) = 4.99%, leverage = 41%, volatility = 23%, and board size $\approx$ 12.

Table 5 reports the pairwise correlations. Tobin's Q is positively related to profitability ($r = 0.68$, $p < 0.01$) and negatively to size ($r = -0.44$, $p < 0.01$) and leverage ($r = -0.30$, $p < 0.01$). The unconditional link between ESG and valuation is weakly negative ($r = -0.07$, $p < 0.1$), underscoring the need for multivariate analysis. Executive gender diversity correlates with ESG ($r = 0.25$, $p < 0.01$) and board gender diversity ($r = 0.41$, $p < 0.01$), although its direct link to valuation is modest ($r = 0.06$, $p < 0.1$). The control variables show consistent associations: size with leverage ($r = 0.50$) and board size ($r = 0.50$), and leverage with profitability ($r = -0.44$).

4.2 Regression results

4.2.1 *Baseline estimations.* Table 6 presents baseline panel regressions of Tobin's Q on ESG performance. The preferred models use firm and year fixed effects with Driscoll–Kraay standard errors to address heteroscedasticity, serial correlation, and cross-sectional dependence. In Column (1), the contemporaneous centred ESG score is insignificant

Table 4. Descriptive statistics

	Mean	Median	SD	Min	Max	p25	p75
Tobin's Q	1.691	1.268	1.158	0.722	7.574	1.007	1.851
ESG Score	65.545	68.855	17.642	3.52	95.68	55.525	78.755
Environmental Score	66.871	71.935	22.652	0	99.06	53.435	84.67
Social Score	68.408	73.31	20.655	1.16	98.47	56.11	84.62
Governance Score	61.183	64.72	21.314	2.78	98.89	45.92	78.245
Executive gender diversity	14.978	13.84	13.440	0	100	0	23.08
Firm size	16.669	16.411	1.745	10.538	21.738	15.455	17.764
Leverage	41.148	39.12	22.723	0	91.96	25.47	56.26
ROA	4.99	4.059	5.883	−10.824	27.559	0.99	7.497
Price volatility	23.114	22.04	6.978	8.52	58.99	18.14	27.09
Board gender diversity	28.012	29.41	13.673	0	75	18.18	38.46
Board size	11.698	11	3.838	2	38	9	14

Source(s): Created by authors

($\beta = 0.0009$, $t = 1.56$), whereas the lagged centred ESG score in Column (2) is positive and significant ($\beta = 0.0013$, $t = 2.89$), suggesting a delayed within-firm valuation response. Benchmark results show a similar insignificant contemporaneous ESG effect under FE with firm-clustered errors (Column (3): $\beta = 0.0009$, $t = 0.63$), while RE–GLS (Column (4)) yields a larger positive coefficient ($\beta = 0.0021$, $z = 2.69$). As the Hausman test rejects random effects, RE estimates are not used for inference and may be upward-biased relative to the within-firm FE identification.

Control variables align with valuation fundamentals. Profitability (ROA) is strongly positive across models ($\beta = 0.036$ – 0.047 , $p < 0.01$). Price volatility is positive and significant in FE models ($\beta = 0.008$ – 0.009 , $p < 0.01$), and board size is also positively related to valuation ($\beta = 0.011$ – 0.013 , $p < 0.01$). Firm size is insignificant under FE but negative under RE–GLS, indicating that cross-sectional size effects are absorbed by firm fixed effects. Board gender diversity is not robustly related to valuation, motivating the focus on executive gender diversity as a moderator rather than a direct determinant.

Finally, the dynamic System GMM analysis (Appendix Table A1), which explicitly models valuation persistence, does not find a significant lagged ESG effect. Thus, the baseline FE–Driscoll–Kraay results are interpreted cautiously as estimator-contingent associations rather than conclusive causal pricing evidence.

4.2.2 Moderation by executive gender diversity. Table 7 tests whether ESG valuation varies with executive gender diversity using firm and year fixed effects with Driscoll–Kraay standard errors. ESG and executive gender diversity are mean-centred. In Column (1), the contemporaneous ESG effect is insignificant ($t = 0.31$), as is executive gender diversity ($t = -0.56$), but the interaction is negative and significant ($\beta = -0.00014$, $t = -2.81$). Column (2), using lagged e.g. shows a similar pattern: lagged ESG is insignificant at mean diversity ($\beta = 0.001$, $t = 1.10$), executive gender diversity remains insignificant ($t = -0.70$), and the interaction is negative and more strongly significant ($\beta = -0.00015$, $t = -3.56$). These results indicate that the marginal ESG–Tobin's Q association weakens as female executive representation increases.

Control variables are stable and consistent with baseline findings. Profitability is strongly positive ($\beta \approx 0.037$ – 0.039 , $p < 0.01$), price volatility is positive ($\beta \approx 0.008$ – 0.009 , $p < 0.01$), and board size is positively related to valuation ($\beta \approx 0.011$ – 0.013 , $p < 0.01$). Firm size and leverage are insignificant. Board gender diversity is not robustly associated with Tobin's Q, becoming only marginally significant in Column (2) ($p \approx 0.06$), suggesting board-level gender composition does not systematically price into valuation once firm effects are absorbed. Overall, executive gender diversity operates as a conditioning factor rather than a direct valuation determinant. However, the dynamic System GMM results (Appendix

Table 5. Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Tobin's Q	1.000								
(2) ESG Score	−0.067* (0.000)	1.000							
(3) Executive gender diversity	0.058* (0.000)	0.245* (0.000)	1.000						
(4) Firm size	−0.444* (0.000)	0.414* (0.000)	0.061* (0.000)	1.000					
(5) Leverage	−0.298* (0.000)	0.202* (0.000)	0.039* (0.003)	0.503* (0.000)	1.000				
(6) ROA	0.678* (0.000)	−0.123* (0.000)	0.072* (0.000)	−0.444* (0.000)	−0.442* (0.000)	1.000			
(7) Price volatility	−0.105* (0.000)	−0.142* (0.000)	−0.166* (0.000)	−0.024* (0.068)	0.047* (0.000)	−0.136* (0.000)	1.000		
(8) Board gender diversity	0.013 (0.328)	0.354* (0.000)	0.406* (0.000)	0.193* (0.000)	0.125* (0.000)	−0.041* (0.002)	−0.227* (0.000)	1.000	
(9) Board size	−0.256* (0.000)	0.230* (0.000)	−0.024* (0.066)	0.499* (0.000)	0.291* (0.000)	−0.263* (0.000)	0.041* (0.002)	0.051* (0.000)	1.000

Note(s): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6. Baseline regressions of ESG performance on Tobin's Q

Variables	(1) FE–DK	(2) FE–DK, ESG (t–1)	(3) FE–Clustered	(4) RE– GLS
ESG Score (centred)	0.0009 (1.56)	0.0013** (2.89)	0.0009 (0.63)	0.0021*** (2.69)
Firm size (log assets)	–0.001 (–0.01)	–0.020 (–0.26)	–0.001 (–0.01)	–0.178*** (–11.94)
Profitability (ROA)	0.039*** (9.16)	0.036*** (8.74)	0.039*** (7.15)	0.047*** (28.49)
Leverage (DTC)	0.002 (1.77)	0.002 (1.55)	0.002 (1.11)	0.002*** (3.27)
Price volatility	0.009*** (3.46)	0.009*** (3.56)	0.009* (1.81)	0.005*** (2.56)
Board gender diversity	–0.001 (–1.41)	–0.001* (–1.88)	–0.001 (–0.55)	–0.001 (–0.75)
Board size	0.013*** (4.52)	0.011*** (3.82)	0.013** (2.47)	0.007* (1.93)
Firm fixed effects	Yes	Yes	Yes	No
Year fixed effects	Yes	Yes	Yes	Yes
Estimator	FE–DK SEs	FE–DK SEs	FE–Clustered SEs	RE–GLS
Observations	5,936	5,505	5,936	5,936
Number of firms	430	430	430	430
R ² (within)	0.164	0.155	0.164	0.154
R ² (between)	–	–	–	0.537
R ² (overall)	–	–	–	0.45
F/ χ^2 statistic	F = 13.32***	F = ...***	F = 13.32***	χ^2 = 1492.62***

Note(s): Coefficients with t-statistics (FE) and z-statistics (RE) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Year dummies are included but not reported

Source(s): Created by authors

Table 7. Moderation analysis: ESG performance $\times$ executive gender diversity and Tobin's Q

Variables	(1) FE–DK (ESG $\times$ Exec. gender)	(2) FE–DK (lagged ESG $\times$ Exec. gender)
ESG Score (centred)	0.000 (0.31)	–
Lagged ESG Score (centred, t–1)	–	0.001 (1.10)
Executive gender diversity (cent.)	–0.000 (–0.56)	–0.001 (–0.70)
ESG $\times$ Exec. gender diversity	–0.00014** (–2.81)	–0.00015*** (–3.56)
Firm size (log assets)	–0.008 (–0.11)	–0.028 (–0.36)
Profitability (ROA)	0.039*** (9.29)	0.037*** (8.86)
Leverage (DTC)	0.002 (1.80)	0.002 (1.59)
Price volatility	0.008*** (3.48)	0.009*** (3.58)
Board gender diversity	–0.001 (–1.51)	–0.001 † (–2.08)
Board size	0.013*** (4.37)	0.011*** (3.70)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	5,936	5,505
Number of firms	430	430
R ² (within)	0.167	0.158
Model F (Driscoll–Kraay)	1940234.41***	65982.00***

Note(s): Fixed-effects regressions with Driscoll–Kraay SEs (robust to heteroskedasticity, autocorrelation, and cross-sectional dependence). ESG (Refinitiv) and executive gender diversity (female executive share) are mean-centred; ESG effect is at average diversity. Board gender diversity = female director share. Firm and year FE included (years not shown). T-statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; † $p \sim 0.06$

Source(s): Created by authors

Table A1, Column 2) do not confirm a significant interaction once valuation persistence is modelled. Thus, the moderation evidence is interpreted as estimator-contingent within the fixed-effects framework and motivates further pillar-level analysis.

4.2.3 Pillar-specific moderation analysis. Table 8 decomposes ESG into Environmental, Social, and Governance pillars and examines moderation by executive gender diversity using firm and year fixed effects with Driscoll–Kraay standard errors. Clear cross-pillar heterogeneity emerges.

For Environmental (Column 1), the lagged score is positive and significant ($\beta = 0.001$, $t = 2.82$), while its interaction with executive gender diversity is negative and significant ($\beta = -0.00009$, $t = -2.84$), indicating attenuation as female executive representation rises. For Social (Column 2), the lagged score is positive and significant ($\beta = 0.002$, $t = 2.99$), but the interaction is negative and not statistically significant ($\beta = -0.00008$, $t = -1.75$). For Governance (Column 3), the lagged score is negative and significant ($\beta = -0.001$, $t = -2.86$), and the interaction is also negative and significant ($\beta = -0.00008$, $t = -2.55$), suggesting a more adverse governance–valuation association at higher levels of executive gender diversity.

Control variables are stable: ROA is strongly positive ($t \approx 8.8$ – 9.0), price volatility is positive ($t \approx 3.5$), and board size is positive ($t \approx 3.8$), while firm size and leverage remain insignificant. Overall, leadership conditioning is strongest for environmental and governance pillars, whereas the social dimension is less sensitive to executive gender composition.

4.2.4 Robustness checks with alternative valuation measure. Table 9 re-estimates the moderation models using MTB rather than Tobin’s Q to assess whether the findings are sensitive to the valuation proxy. The results are directionally consistent in that ESG and its interaction with Exec. gender diversity remain negatively priced under MTB. At the composite level (Col. 1), lagged ESG is negative and significant ($\beta = -0.132$, $t = -2.67$; $p = 0.021$), and the interaction term is also negative and significant ($\beta = -0.011$, $t = -2.57$; $p = 0.025$). This implies that, relative to book equity, higher ESG scores are associated with lower market valuation, and that the discount intensifies as Exec. gender diversity increases.

The pillar specifications reinforce this pattern. Environmental (Col. 2) is negative and significant ($\beta = -0.069$, $t = -2.51$), with a stronger negative interaction ($\beta = -0.008$,

Table 8. Pillar-specific regressions of ESG dimensions, executive gender diversity, and Tobin’s Q

Variables	(1) FE–DK (L.E $\times$ Exec. gender)	(2) FE–DK (L.S $\times$ Exec. gender)	(3) FE–DK (L.G $\times$ Exec. gender)
Lagged Environmental score (E)	0.001** (2.82)	–	–
Lagged Social score (S)	–	0.002** (2.99)	–
Lagged Governance score (G)	–	–	–0.001** (–2.86)
Executive gender diversity (cent.)	–0.001 (–1.09)	–0.001 (–0.92)	–0.000 (–0.27)
Pillar $\times$ Exec. gender diversity	–0.00009** (–2.84)	–0.00008 (–1.75)	–0.00008** (–2.55)
Firm size (log assets)	–0.035 (–0.43)	–0.033 (–0.44)	–0.016 (–0.20)
Profitability (ROA)	0.037*** (8.96)	0.037*** (8.80)	0.036*** (8.92)
Leverage (DTC)	0.002 (1.65)	0.002 (1.66)	0.002 (1.51)
Price volatility	0.009*** (3.51)	0.009*** (3.59)	0.009*** (3.52)
Board gender diversity	–0.001* (–2.03)	–0.002* (–1.99)	–0.001 (–1.49)
Board size	0.011*** (3.77)	0.010*** (3.78)	0.011*** (3.79)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	5,505	5,505	5,505
Number of firms	430	430	430
R^2 (within)	0.158	0.159	0.157
F-statistic (Driscoll–Kraay)	157763.00***	79971.09***	0.000***

Note(s): Fixed-effects regressions with Driscoll–Kraay SEs (robust to heteroskedasticity, autocorrelation, and cross-sectional dependence). Refinitiv Environmental, Social, and Governance pillar scores are mean-centred before interaction with executive gender diversity; main effects reflect mean diversity. Firm and year FE included (years not shown). T-statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source(s): Created by authors

Table 9. Robustness regressions using Market-to-Book ratio (MTB)

Variables	(1) ESG (Lagged)	(2) Environmental (Lagged)	(3) Social (Lagged)	(4) Governance (Lagged)
ESG Score (lagged)	−0.132** (−2.67)	—	—	—
Environmental Score (lagged)	—	−0.069** (−2.51)	—	—
Social Score (lagged)	—	—	−0.049** (−2.89)	—
Governance Score (lagged)	—	—	—	−0.054** (−2.31)
Executive gender diversity (cent.)	0.043 (1.26)	0.012 (0.36)	0.021 (0.64)	0.062 (1.58)
ESG × Exec. gender diversity	−0.011** (−2.57)	−0.008*** (−3.05)	−0.006** (−2.29)	−0.007** (−2.24)
Firm size (log assets)	−1.145 (−1.39)	−1.155 (−1.50)	−1.019 (−1.41)	−1.432 (−1.49)
Profitability (ROA)	0.121* (2.07)	0.121* (2.02)	0.126** (2.26)	0.117* (2.05)
Leverage (DTC)	−0.032 (−1.02)	−0.030 (−1.00)	−0.033 (−1.04)	−0.027 (−0.90)
Price volatility	0.140 (1.48)	0.137 (1.47)	0.153 (1.53)	0.153 (1.52)
Board gender diversity	−0.030 (−1.32)	−0.044* (−1.95)	−0.027 (−1.20)	−0.023 (−0.89)
Board size	0.345* (1.90)	0.333* (1.84)	0.359* (1.94)	0.340* (1.89)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	5,505	5,505	5,505	5,505
Number of firms	430	430	430	430
R ² (within)	0.016	0.015	0.01	0.013
F-statistic (Driscoll–Kraay)	172473.11***	1492744.33***	194901.40***	77408.38***

Note(s): Estimates are from fixed-effects regressions with Driscoll–Kraay standard errors, robust to heteroskedasticity, autocorrelation, and cross-sectional dependence. The dependent variable is Market-to-Book ratio (MTB). ESG and pillar scores (Refinitiv) are mean-centred before interaction with executive gender diversity; main ESG effects are interpreted at mean diversity. All models include firm and year fixed effects (year dummies not shown). Coefficients with t-statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source(s): Created by authors

$t = -3.05$). Social (Col. 3) is similarly negative ($\beta = -0.049$, $t = -2.89$) with a negative interaction ($\beta = -0.006$, $t = -2.29$). Governance (Col. 4) is negative ($\beta = -0.054$, $t = -2.31$) and its interaction remains negative ($\beta = -0.007$, $t = -2.24$). Across models, Exec. gender diversity is not statistically significant on its own, indicating that the salient effect operates through conditioning how markets price ESG rather than via a direct valuation channel.

Controls are broadly stable in sign: ROA is positive (marginal to significant across columns), while firm size, leverage, and price volatility are not consistently significant within firms; board size is weakly positive and board gender diversity is generally negative but mostly insignificant. Overall, MTB-based estimates sharpen the interpretation that ESG is treated as a net cost (or sceptically valued) signal in equity-based valuation, and that combining ESG with higher Exec. gender diversity produces a more pronounced “double discount” relative to Tobin’s Q.

4.2.5 Sensitivity analyses. **4.2.5.1 Executive gender diversity as a binary moderator.** Table 10 tests whether moderation depends on how executive gender diversity is measured by replacing the continuous female executive share with a high-versus-low indicator (1 = above pooled median). The core pricing results remain unchanged. The lagged composite ESG score is positive and significant ($\beta = 0.0013$, $t = 2.89$). The lagged Environmental and Social pillars are also positive and significant (Environmental: $\beta = 0.0017$, $t = 3.55$; Social: $\beta = 0.0028$, $t = 4.24$), while the Governance pillar is negative and significant ($\beta = -0.0014$, $t = -2.80$). Thus, the timing structure and pillar heterogeneity are not driven by the continuous moderator specification.

However, interaction terms between lagged ESG measures and the binary executive gender diversity indicator are statistically insignificant across models. Table 10 therefore provides no evidence of a threshold-type moderation effect within the fixed-effects framework. This suggests that the attenuation observed in continuous interaction models reflects a gradient-based relationship rather than a median-split difference. Consistent with signalling theory,

Table 10. Sensitivity analysis: ESG performance, executive gender diversity (binary), and Tobin's

Variables	(1) ESG (Lagged)	(2) Environmental (Lagged)	(3) Social (Lagged)	(4) Governance (Lagged)
ESG Score (lagged)	0.0013** (2.89)	—	—	—
Environmental Score (lagged)	—	0.0017*** (3.55)	—	—
Social Score (lagged)	—	—	0.0028*** (4.24)	—
Governance Score (lagged)	—	—	—	−0.0014** (−2.80)
High executive gender diversity	— (base = low)	— (base = low)	— (base = low)	— (base = low)
ESG × High diversity	−0.000 (ns)	−0.000 (ns)	−0.000 (ns)	−0.000 (ns)
Firm size (log assets)	−0.020 (−0.26)	−0.027 (−0.34)	−0.031 (−0.41)	−0.009 (−0.11)
Profitability (ROA)	0.036*** (8.74)	0.036*** (8.87)	0.036*** (8.71)	0.036*** (8.74)
Leverage (DTC)	0.002 (1.55)	0.002 (1.58)	0.002 (1.68)	0.002 (1.47)
Price volatility	0.009*** (3.56)	0.009*** (3.54)	0.009*** (3.55)	0.009*** (3.52)
Board gender diversity	−0.001* (−1.88)	−0.001 (−1.79)	−0.001* (−1.96)	−0.001 (−1.46)
Board size	0.011*** (3.82)	0.011*** (3.82)	0.010*** (3.85)	0.011*** (3.84)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	5,505	5,505	5,505	5,505
Number of firms	430	430	430	430
R ² (within)	0.155	0.156	0.158	0.156
F-statistic (Driscoll–Kraay)	6,029,849***	6,161,629***	1,686,078***	10,600,000***

Note(s): Estimates are from fixed-effects regressions with Driscoll–Kraay standard errors, robust to heteroskedasticity, autocorrelation, and cross-sectional dependence. Executive gender diversity is a binary variable (1 = above-median female representation). ESG variables are mean-centred before interaction. Coefficients with t-statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source(s): Created by authors

reducing a continuous governance attribute to a binary split may dilute informational variation, limiting the detection of subtle cross-firm differences in how investors price e.g. even though the underlying ESG–valuation association remains stable.

4.2.5.2 Sectoral heterogeneity in the ESG–valuation relationship. Table 11 re-estimates the moderation models separately for non-sensitive and sensitive sectors, revealing clear cross-sector differences. In non-sensitive sectors (Column 1), lagged ESG is positive and significant ($\beta = 0.003$, $t = 4.63$), executive gender diversity is positive and significant ($\beta = 0.010$, $t = 3.23$), and their interaction is negative and significant ($t = -4.03$). This indicates that ESG is valued more strongly when executive gender diversity is lower, with the marginal effect declining as female representation increases. Pillar-level results are consistent: lagged Environmental and Social scores are positive and significant (Environmental: $\beta = 0.004$, $t = 4.15$; Social: $\beta = 0.004$, $t = 7.82$), and their interactions with executive gender diversity are negative and significant (Environmental: $t = -3.17$; Social: $t = -1.85$). For Governance, the lagged pillar is insignificant ($t = -0.47$), but the interaction is negative and significant ($t = -2.05$), suggesting weaker governance-related valuation as executive gender diversity rises even when the average governance effect is weak.

In sensitive sectors (Columns 2, 4, 6, and 8), lagged ESG and pillar scores, executive gender diversity, and all interaction terms are statistically insignificant, with t-statistics near zero. From a signalling perspective, ESG may be less differentiating in these sectors due to stronger baseline expectations or regulatory scrutiny, reducing incremental valuation effects. From an

Table 11. Split-sample sensitivity analysis: ESG performance, executive gender diversity, and Tobin's Q

Variables	(1) ESG Non- sensitive	(2) ESG Sensitive	(3) Environmental Non-sensitive	(4) Environmental Sensitive	(5) Social Non- sensitive	(6) Social Sensitive	(7) Governance non- sensitive	(8) Governance sensitive
ESG Score (lagged)	0.003*** (4.63)	0.000 (0.06)	–	–	–	–	–	–
Environmental Score (lagged)	–	–	0.004*** (4.15)	–0.000 (–0.44)	–	–	–	–
Social Score (lagged)	–	–	–	–	0.004*** (7.82)	0.001 (1.28)	–	–
Governance Score (lagged)	–	–	–	–	–	–	–0.001 (–0.47)	–0.000 (–0.57)
Executive gender diversity	0.010*** (3.23)	–0.003 (–0.50)	0.005* (2.07)	–0.001 (–0.23)	0.006 (1.68)	–0.003 (–0.52)	0.005 (1.45)	–0.001 (–0.54)
ESG × Gender diversity	–0.000*** (–4.03)	0.000 (0.31)	–0.000*** (–3.17)	0.000 (0.00)	–0.000* (–1.85)	0.000 (0.28)	–0.000* (–2.05)	0.000 (0.10)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,395	2,110	3,395	2,110	3,395	2,110	3,395	2,110
Number of firms	307	207	307	207	307	207	307	207
R ² (within)	0.185	0.148	0.186	0.148	0.187	0.149	0.184	0.148

Note(s): Estimates are from fixed-effects regressions with Driscoll–Kraay standard errors, robust to heteroskedasticity, serial correlation, and cross-sectional dependence. ESG and pillar scores are mean-centred prior to interaction. Coefficients with t-statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source(s): Created by authors

agency perspective, investors may focus more on sector-level risks and constraints, limiting the impact of within-firm ESG and executive composition changes once fixed effects and common shocks are absorbed. Overall, [Table 11](#) supports a contingent interpretation: ESG valuation and its moderation by executive gender diversity are concentrated in non-sensitive industries, while within-firm pricing effects are muted in sensitive sectors under the fixed-effects design.

5. Discussion and implications

The results show that ESG valuation is neither immediate nor benchmark-invariant. Under Tobin's Q, ESG exhibits a lagged positive association, while under MTB it is discounted. This pattern supports signalling theory, suggesting that ESG information gains credibility through verification and market learning rather than acting as an immediate signal ([Reber et al., 2021](#)). The divergence between Tobin's Q and MTB indicates that valuation benchmarks influence how ESG is priced, reflecting differences between asset-based and equity-book valuation anchors ([Huang, 2022](#); [Rau and Yu, 2024](#)).

A key finding is the consistent negative moderation of executive gender diversity. Although executive gender diversity shows no stable direct effect on valuation, it weakens the ESG–valuation relationship, particularly for environmental and governance pillars. From a signalling perspective, ESG and leadership composition may act as partially substitutive governance signals, where overlapping signals reduce marginal informativeness rather than reinforce it ([Guedes et al., 2025](#)).

Agency theory offers a complementary explanation. If ESG initiatives are viewed as discretionary, additional governance signals may increase uncertainty about whether ESG reflects disciplined investment or broader stakeholder spending. This scepticism may be stronger under MTB, where short-term cost and overinvestment concerns are more salient ([Huang, 2022](#); [Rau and Yu, 2024](#)). Evidence from mandatory ESG disclosure settings also suggests that standardisation can reduce incremental informativeness, making additional governance signals less value-relevant ([Al Hosani et al., 2025](#)).

Cross-regional evidence reinforces the context dependence of gender-based moderation. Chinese A-share studies report mixed moderating effects of top-management gender characteristics ([Li et al., 2024](#)), whereas Gulf evidence finds board gender diversity strengthening ESG–performance links ([Alahdal et al., 2024](#)). Thus, gender diversity may amplify ESG valuation when interpreted as improving monitoring, or attenuate it when perceived as redundant or attributionally complex ([Al Hosani et al., 2025](#); [Li et al., 2024](#)).

Pillar-level findings sharpen these implications. Environmental and social scores show delayed positive effects under Tobin's Q, but environmental interactions with executive gender diversity are negative, indicating sensitivity in capital-intensive sustainability domains. Governance scores are discounted under Tobin's Q, with stronger discounting at higher executive gender diversity, suggesting governance ratings may be perceived as low-separation or compliance-oriented signals.

Practically, ESG and leadership diversity should be presented as a coordinated signal. Managers need to connect ESG initiatives—especially environmental and governance reforms—to clear operational mechanisms and executive accountability to reduce ambiguity. Investors should not assume ESG is uniformly value-enhancing, as effects vary by timing, benchmark, ESG dimension, and leadership composition. Regulators should focus on credibility and comparability through assurance and clearer governance disclosure to improve decision usefulness, particularly where standardisation may reduce informativeness ([Al Hosani et al., 2025](#)).

6. Conclusion

This paper develops and empirically tests a leadership-conditioned view of how sustainability is reflected in market valuation among European listed firms. Using an unbalanced panel of

STOXX Europe 600 constituents from 2010–2023 and a fixed-effects design controlling for firm heterogeneity and common shocks, the study shows that ESG valuation is contingent rather than mechanical. The results indicate that market responses to ESG depend on timing of information incorporation, valuation benchmarks, and executive decision-making structure. Under Tobin's Q, ESG shows a delayed positive association consistent with gradual information incorporation, whereas under MTB ESG is discounted, suggesting stronger scepticism toward sustainability signals under equity-book-based valuation metrics. Most importantly, executive gender diversity acts as a conditioning factor that weakens the ESG–valuation relationship, particularly for environmental and governance pillars, and the joint presence of strong ESG performance and higher executive gender diversity is penalised in non-sensitive sectors even when each attribute is individually valued. By distinguishing executive from board-level diversity, the study improves understanding of how leadership composition shapes market interpretation of sustainability performance.

Future empirical research should further validate the leadership-conditioned ESG pricing perspective using stronger identification strategies. Quasi-experimental designs exploiting ESG reporting regime changes or leadership reforms, along with event-time and dynamic models capturing delayed market adjustment, can help distinguish valuation effects from disclosure incentives and feedback dynamics. Future studies should also examine whether the moderating channel operates through risk perceptions, expected cash flows, or changes in investor composition, and whether these mechanisms vary across valuation benchmarks and industries. Measurement improvements combining ESG ratings with alternative sustainability indicators—such as controversy measures, assurance signals, and disclosure-based proxies—would help determine whether governance-related valuation effects reflect investor scepticism or limitations in existing ESG metrics.

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Supplementary material

The supplementary material for this article can be found online.

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Corresponding author

Sakhr Bani-Khaled can be contacted at: sakhr@ua.pt