INKUBIS: Jurnal Ekonomi dan Bisnis
Volume 8, Issue 4, 3632-3645
e_ISSN: 2775-3913
https://inkubis.politeksci.ac.id/index.php/ink/index
DOI: doi.org/10.59261/inkubis.v8i4.577

Environmental Performance, Investment Opportunities, and Consumer Firm Value under Independent Commissioner Oversight in Indonesia

Teguh Yanto
Universitas Trisakti, Indonesia

Etty Murwaningsari*
Universitas Trisakti, Indonesia

***Corresponding author:**
Etty Murwaningsari,
Universitas Trisakti, Indonesia.
✉etty.murwaningsari@trisakti.ac.id

Article Info:

Article history:
Received: October 06, 2026
Revised: October 31, 2026
Accepted: November 07, 2026
Available Online: November 24, 2026

Keywords:
Environmental Performance;
Firm Value;
Independent Commissioner;
Investment Opportunity Set;
Moderated Regression

This is an open access article under the CC BY-SA license.

Copyright © 2026 by Teguh Yanto. Published by Politeknik Siber Cerdika International

Abstract

Background: Indonesian consumer firms face environmental scrutiny, yet evidence on how environmental ratings and growth opportunities relate to valuation under different board structures remains mixed.
Objective: This study examines associations of environmental performance and the investment opportunity set (IOS) with firm value and their interactions with independent commissioners.
Methods: The reported balanced panel covers 295 Indonesia Stock Exchange consumer firms during 2023–2024 (590 firm-years). Environmental performance uses PROPER scores, IOS uses market-to-book equity, and firm value uses Tobin's Q. The original pooled regression includes liquidity, profitability, and interactions but omits the independent-commissioner main effect and year indicator; corrected estimation remains outstanding.
Results: In the original specification, environmental performance is positively associated with firm value ($\beta = 0.195$; $p < 0.001$). IOS is not significant at mean board independence ($\beta = 0.020$; $p = 0.104$). The environmental interaction is not significant ($\beta = -0.047$; $p = 0.832$), whereas the IOS interaction is positive ($\beta = 1.242$; $p < 0.001$). Liquidity and profitability have positive coefficients. These results remain provisional pending specification and sample-coverage verification.
Conclusion: The reported pattern motivates a distinction between externally assessed environmental information and discretionary growth signals; it does not establish their underlying mechanisms. Firm-year PROPER matching, inclusion of independent commissioners and year effects, panel-appropriate inference, and formal slope tests are required before definitive hypothesis decisions or governance recommendations can be made.

To cite this article: Yanto, T., & Murwaningsari, E. (2026). Environmental Performance, Investment Opportunities, and Consumer Firm Value under Independent Commissioner Oversight in Indonesia. *INKUBIS: Jurnal Ekonomi dan Bisnis, 8*(4), 3632–3645. https://doi.org/10.59261/inkubis.v8i4.577

INTRODUCTION

Capital markets increasingly treat environmental exposure as a component of firm risk, but the value relevance of environmental information depends on what is measured. Bolton and Kacperczyk (2021) document carbon risk pricing, while Raimo et al. (2021) associate ESG disclosure with debt-financing costs. These outcomes concern required returns and financing conditions rather than an identical valuation mechanism. Aydoğmuş et al. (2022) analyze 1,720 firms across 39 countries during 2013–2021, using 14,043 firm-year observations and fixed-effects models. Their combined ESG score is positively associated with firm value, whereas the environmental pillar is not significant. This large international sample demonstrates that

aggregate sustainability performance and environmental performance cannot be treated interchangeably. Munir and Pratama (2025) likewise distinguish emission performance from environmental disclosure in Southeast Asia. For Indonesian investors, the unresolved issue is whether an externally assessed environmental rating conveys valuation information beyond financial fundamentals and whether its association differs from a market-based growth indicator.

Indonesia provides a relevant setting because PROPER evaluates environmental management through gold, green, blue, red, and black categories under the framework applicable to the 2023–2024 study period (Kementerian Lingkungan Hidup dan Kehutanan, 2021). The official announcement for the 2023–2024 assessment lists 4,495 participants, including 1,313 red and 16 black ratings (Kementerian Lingkungan Hidup/Badan Pengendalian Lingkungan Hidup, 2025). These national figures demonstrate substantial variation in environmental compliance; they are not counts of listed consumer firms or evidence that every sampled issuer was rated. Consumer cyclical and non-cyclical businesses are relevant because environmental issues can affect production inputs, supply chains, and customer-facing reputations. Nevertheless, facility-level participation cannot automatically establish issuer-level coverage. The empirical problem therefore includes both valuation and measurement: researchers must identify which rated facilities belong to each listed firm and when their ratings became public before linking those ratings to equity-market outcomes.

Legitimacy theory explains why conformity with environmental expectations may support organizational acceptance (Suchman, 1995), while signaling theory emphasizes the conditions under which observable information conveys otherwise unobserved quality (Connelly et al., 2025; Spence, 1973). These perspectives motivate, but do not prove, a positive environmental association with valuation. Lestari and Khomsiyah (2023) and Renaldi and Anis (2023) examine Indonesian environmental performance and firm value, and Hanjani and Kusumadewi (2023) examine financial performance. Their outcomes should therefore be distinguished. Widarwati et al. (2024) study 34 PROPER-awarded firms from basic materials and both consumer sectors during 2017–2021, using a green-investment ratio, Tobin's Q, and board-size moderation. Garnadi and Garnasih (2026) instead analyze 30 PROPER firms during 2022–2024 with emission intensity, financial-performance mediation, and fixed-effects regression. PROPER participation in the latter study identifies the sample; emission intensity measures environmental performance. This study hypothesizes a positive association between its PROPER score and firm value (H1).

Firm value also reflects options for future investment. Myers (1977) conceptualizes growth options, and Smith and Watts (1992) relate the investment opportunity set to corporate policies. IOS is a latent construct; market-to-book equity is an indicator rather than a direct inventory of profitable projects. Indonesian findings vary: Sudiyatno et al. (2023) examine manufacturing firms and capital-structure moderation, Ishlah and Natsir (2023) investigate agricultural firms, and Wahyudi (2020) studies property firms. Such differences in sector, financial structure, and model specification can produce different coefficients without demonstrating a universal conflict in theory. The present study tests whether IOS is positively associated with firm value (H2), conditional on the moderator being at its mean in the centered interaction model. Because market-to-book equity and Tobin's Q both contain market equity value, their relationship also requires caution about shared measurement components rather than an automatic interpretation as productive investment opportunities.

Managerial discretion over investment and environmental expenditure creates potential agency conflicts (Jensen and Meckling, 1976), including inefficient expansion when managers control free cash flow (Jensen, 1986). Independent commissioners may constrain these decisions by separating monitoring from management (Fama & Jensen, 1983). Indonesia's two-tier governance framework requires at least one independent commissioner when the board has two members and at least 30 percent independent commissioners when it has more than two members (Otoritas Jasa Keuangan, 2014). Formal proportions nevertheless provide limited information about actual monitoring. Das et al. (2025), Puspitasari and Rahayu (2025), and Umam and Halimah (2021), report differing Indonesian valuation findings, while Khan et al. (2024) examine board independence in a South Asian setting. Bukari et al. (2024) analyze ESG performance as a moderator of governance–value relationships; that direction differs from treating board independence as a moderator of an environmental-performance association. These

designs should not be conflated.

The closest studies suggest a specific comparison rather than a claim that governance moderation has never been studied. Widarwati et al. (2024) examine green investment and board size within a sample already including consumer firms. Salehi et al. (2022) study 177 Tehran-listed firms during 2014–2021, relating investment efficiency to Tobin's Q and including board independence and institutional ownership as moderators. Chancharat et al. (2026) study 94 Thai firms during 2019–2023 using panel GMM and find negative board-independence moderation of the ESG–value association. These studies differ in environmental or investment proxies, governance attributes, markets, periods, and estimators. Biju et al. (2025) address the ESG–performance nexus, while Al-Jaifi et al. (2023) examine board diversity and environmental performance, and Ghitti et al. (2024) address greenwashing. None is an interchangeable test of the present two interactions. Agency reasoning motivates positive independent-commissioner moderation of the environmental-performance (H3) and IOS (H4) associations, subject to empirical verification.

The proposed contribution is to compare independent-commissioner interactions for two information types within the same consumer-sector valuation framework: an externally assessed PROPER score and a market-based indicator of discretionary growth prospects. It is not the first application of environmental valuation research to consumer firms. The objectives are to assess environmental performance and IOS in relation to firm value and to examine whether both associations vary with board independence. Differences in interaction coefficients can motivate an information-type explanation, but they cannot directly identify credibility, investor interpretation, or actual monitoring activity; these mechanisms are not separately measured. The practical benefit is a more cautious framework for jointly examining environmental assessments, growth indicators, and governance structure. Potential implications concern transparent rating-to-issuer matching and better disclosure of oversight activities. Such implications remain conditional on a correctly specified model, comparable interaction tests, and verification of the reported sample rather than a presumption that board independence necessarily creates market value.

METHOD

This study adopted a quantitative observational approach using secondary panel data from consumer cyclical and consumer non-cyclical companies listed on the Indonesia Stock Exchange (IDX) during 2023–2024. The original sample selection procedure identified 330 companies, excluded 10 companies that were not continuously listed, and excluded another 25 companies with incomplete reports or variable data, resulting in a reported sample of 295 companies and 590 firm-year observations. The data sources comprised annual reports, sustainability reports, financial statements, IDX disclosures, corporate websites, and official PROPER announcements. However, the reported sample size has not been independently verified against annual PROPER participation records. In particular, the available documentation does not establish whether every company received an eligible environmental rating in both observation years. Assigning facility-level or subsidiary-level ratings to listed companies requires verifiable ownership information and a consistent aggregation procedure. Accordingly, the reported sample size should be treated as provisional until the firm-year matching process has been documented and verified.

The timing of environmental performance measurement requires particular attention because the official PROPER results for the 2023–2024 assessment period were announced in March 2025. Accordingly, the assessment period and public disclosure date must be distinguished when relating environmental ratings to market-based firm value. If firm value was measured before the relevant rating became publicly available, the estimated association cannot be interpreted as a contemporaneous market response to the announced rating. The temporal alignment among environmental assessment, public information availability, and firm valuation must therefore be verified using the original observation records. These measurement choices cannot be reconstructed from summary statistics. Figure 1 retains the conceptual relationships, although the operational regression specification also requires the main effect of independent commissioners (IC) and a year indicator. For replication purposes, the extraction sheet should retain issuer-year identifiers, source URLs and page numbers, valuation dates, financial

numerator and denominator components, board counts, facility ownership information, rating decree and assessment/publication dates, and records of any missing-data decisions. Financial inputs should be checked against audited financial statements, and environmental ratings should be verified against official decrees. The original extraction sheets and cross-check log were not supplied.

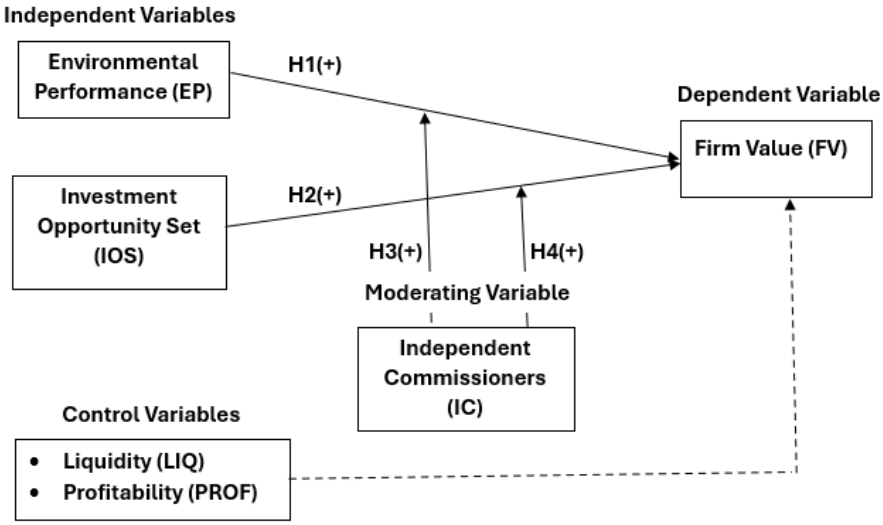

Figure 1. Research Model

The original analysis was conducted using EViews and involved descriptive statistics, correlation analysis, mean-centering, and moderated regression analysis. However, the original regression specification excluded the main effect of independent commissioners despite incorporating its interaction terms with environmental performance and the investment opportunity set. Furthermore, the panel model selection results indicated a statistically significant time component that was not represented in the original regression equation. Consequently, the original coefficient estimates are retained only as preliminary results. A fully specified hierarchical moderation model should incorporate the centered main effects of environmental performance, the investment opportunity set, and independent commissioners, their respective interaction terms, liquidity, profitability, and a year indicator. Model selection and statistical inference should subsequently be reassessed using the verified firm-year sample and panel-appropriate standard errors. Until these analyses have been completed, the original regression results cannot provide definitive evidence for the proposed hypotheses. The specification required for re-estimation, which has not yet been estimated using the supplied documents, is as follows:

$$FV_{it} = \beta_0 + \beta_1 EPc_{,it} + \beta_2 IOSc_{,it} + \beta_3 (EPc \times ICc)_{it} + \beta_4 (IOSc \times ICc)_{it} + \beta_5 LIQ_{it} + \beta_6 PROF_{it} + \beta_7 ICc_{,it} + \delta D_{2024,t} + \varepsilon_{it}$$

The subscript c denotes sample-mean centering, i indexes firms, and t indexes years; D_{2024} equals one for 2024 and zero for 2023. No coefficients for β_7 or δ can be recovered from the supplied aggregate results. Re-estimation should compare the restricted equation with an IC-main-effect model and an IC-plus-year model, using a common estimation sample and firm-clustered standard errors to account for within-firm dependence. With only two years of observations, a year indicator controls for the observed common shift, but inference based on clustering across only two time groups is unreliable. These constitute necessary analytical corrections rather than procedures claimed to have been completed. This secondary analysis of publicly available corporate documents did not involve human or animal participants; however, no institutional approval or exemption decision is asserted in the absence of supporting documentation.

RESULTS AND DISCUSSION

Result

Sample Characteristics and Study Context

Table 1 presents the sample selection process, which initially included 330 consumer-sector firms listed on the Indonesia Stock Exchange (IDX) during 2023–2024. Of these, 10 firms were excluded because they were not continuously listed throughout the observation period, while an additional 25 firms were excluded due to incomplete annual reports or insufficient variable data. Consequently, the reported final sample comprised 295 firms, representing 590 firm-year observations across the two-year study period. Although the sample selection figures are arithmetically consistent, the availability of PROPER ratings for each firm-year observation has not been independently verified. The available documentation does not provide detailed information on subsector distribution, annual environmental rating coverage, issuer identities, or the ownership relationships between rated facilities and listed companies. Therefore, the reported balanced panel remains subject to verification of firm-year data completeness and the consistency of PROPER rating assignments. Any discrepancies identified during this process may require adjustments to the sample composition and subsequent statistical analyses. Furthermore, the inclusion of firms with complete environmental ratings may introduce selection bias toward companies with greater environmental visibility, potentially limiting the generalizability of the findings.

Table 1
Sample Selection Procedure

No.	Criteria	Number
1.	Consumer cyclical and consumer non-cyclical firms listed on the IDX, 2023–2024	330
2.	Firms not continuously listed during the observation period	(10)
3.	Firms with incomplete annual reports or variable data	(25)
	Final sample (firms)	295
	Observation years	2
	Total firm-year observations (295 × 2)	590

Note. Compiled by the author from IDX data (2026)

Descriptive Statistics

Table 2 reports a mean Tobin's Q approximation of 1.578 and a median of 1.565, with values between 0.658 and 2.778. Because its denominator is book assets, this approximation does not directly measure replacement cost. The mean coded PROPER score is 3.046, close numerically to the code for blue; the reported range is 2–5. Category frequencies are not available, so the distribution of compliance categories is not reconstructed. IOS averages 1.755 (standard deviation 0.950), and its median of 1.563 is below its mean. IC averages 0.421, with a range of 0.333–0.600 and standard deviation 0.084; these proportions describe formal composition rather than monitoring quality. LIQ averages 1.672, and PROF averages 0.075, with a minimum of −0.078. These summaries describe the reported sample and do not resolve its PROPER coverage or the validity of equal-interval coding. Distributional conclusions about raw variables require test outputs beyond those displayed in Table 2. In particular, a mean near 3 does not establish a blue majority. The minimum of 2 indicates that no black code appears in the reported observations, subject to rating-mapping verification; it says nothing about unrated firms. Category frequencies and percentages require the individual ratings, and the equal-distance assumption should be checked using category indicators.

Table 2
Descriptive Statistics (N = 590)

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
FV	1.578	1.565	2.778	0.658	0.330
EP	3.046	3.000	5.000	2.000	0.611
IOS	1.755	1.563	4.719	0.554	0.950
IC	0.421	0.400	0.600	0.333	0.084
LIQ	1.672	1.535	4.763	0.653	0.711
PROF	0.075	0.075	0.226	−0.078	0.054

Note. FV = firm value (Tobin's Q); EP = environmental performance (PROPER score); IOS = investment opportunity set (MVBVE); IC = independent commissioners (proportion); LIQ = liquidity (current ratio); PROF = profitability (return on equity).
Source: EViews output (2026)

Correlation among Explanatory Variables

Table 3 reports Pearson correlations for the original regressors. EPc and IOSc correlate at 0.403, and the two product terms correlate at 0.393. These associations do not identify causal relationships or validate the measurement of growth opportunities. All displayed pairwise correlations are below 0.80, but this is only a preliminary collinearity screen. The matrix excludes the separate IC main effect and year indicator; correlations and VIFs must therefore be recomputed for the corrected specification rather than carried forward as its diagnostics.

Table 3
Pearson Correlation Matrix

Variable	EP_c	IOS_c	$EP_c \times IC_c$	$IOS_c \times IC_c$	LIQ	PROF
EP_c	1.000					
IOS_c	0.403	1.000				
$EP_c \times IC_c$	0.015	0.023	1.000			
$IOS_c \times IC_c$	0.023	0.043	0.393	1.000		
LIQ	0.125	0.100	0.138	0.044	1.000	
PROF	0.222	0.307	−0.142	−0.027	0.025	1.000

Note. Subscript c denotes mean-centered variables.
Source: EViews output (2026)

Panel Model Selection

Table 4 summarizes the panel model selection tests conducted for the original regression specification. The cross-section F test yields a probability of 0.440, while the corresponding chi-square test reports a probability below 0.001. These conflicting results require further examination of the model structure, test assumptions, and estimation output. The Hausman test reports a probability of 0.400, and the cross-section Breusch–Pagan LM test is not statistically significant. However, both the time and joint LM components are significant at the 1% level, indicating that the original selection of a pooled model without time effects cannot be treated as conclusive. Therefore, the model selection procedure should be repeated after incorporating the independent commissioners' main effect and the year indicator. Until the corrected estimation results are available, the common effect model remains the original reported specification rather than a definitively validated final model.

Table 4
Panel Data Model Selection Tests

Test	Statistic	d.f.	Prob.	Indicated model
Chow: cross-section *F*	1.018	(294, 289)	0.440	CEM
Chow: cross-section chi-square	419.350	294	< 0.001	FEM
Hausman: cross-section random	6.211	6	0.400	REM
LM Breusch–Pagan: cross-section	0.000	–	0.990	CEM
LM Breusch–Pagan: time	61.648	–	< 0.001	–
LM Breusch–Pagan: both	61.648	–	< 0.001	–
Selected model				CEM

Note. CEM = pooled/common effects; FEM = fixed effects; REM = random effects; LM = Lagrange multiplier. Original selection only; corrected IC/year results unavailable.
Source: EViews output (2026)

Classical Assumption Tests

Table 5 preserves diagnostics for the original restricted pooled regression. The Jarque–Bera test does not reject residual normality (p = 0.382), and the reported VIF range is 1.039–1.278. Breusch–Pagan–Godfrey (p = 0.519), Glejser (p = 0.742), and White (p = 0.497) tests do not reject their respective homoskedasticity nulls; failure to reject is not proof of constant variance. The manuscript reports auxiliary regressions after built-in routines encountered a near-singular matrix, but their design matrices were not supplied for replication. The Breusch–Godfrey result (p = 0.086) does not reject at 5 percent and would reject at 10 percent. Its validity for a two-year panel depends on respecting firm boundaries when constructing lags. A Durbin–Watson value of 1.992 does not exclude within-firm dependence. No robustness result is claimed without re-estimation; the displayed p-values require reassessment with firm-clustered standard errors in the corrected specification. Because each firm contributes only two years, a lag-based test has at most one within-firm transition and depends critically on how the panel is ordered. Firm-clustered standard errors can address arbitrary within-firm error dependence across these two observations, but corrected estimates and their significance cannot be inferred from the existing diagnostic table.

Table 5
Classical Assumption Test Results

Test	Statistic	Prob.	Conclusion
Normality: Jarque–Bera	1.924	0.382	Not rejected
Skewness / kurtosis	−0.095 / 3.206	–	Near-normal
VIF: EP_c	1.221	–	No multicollinearity
VIF: IOS_c	1.278	–	No multicollinearity
VIF: $EP_c \times IC_c$	1.233	–	No multicollinearity
VIF: $IOS_c \times IC_c$	1.185	–	No multicollinearity
VIF: LIQ	1.039	–	No multicollinearity
VIF: PROF	1.148	–	No multicollinearity
Breusch–Pagan–Godfrey, Obs*R^2 (d.f. = 6)	5.195	0.519	Not rejected
Glejser, Obs*R^2 (d.f. = 6)	3.516	0.742	Not rejected
White without cross terms, Obs*R^2 (d.f. = 12)	11.380	0.497	Not rejected
Breusch–Godfrey, Obs*R^2 (d.f. = 1)	2.948	0.086	Not rejected (5%)
Durbin–Watson	1.992	–	Not conclusive

Note. VIF = centered variance inflation factor.
Source: EViews output (2026)

Regression Estimates and Hypothesis Testing

Table 6 presents the original pooled regression estimates, with an adjusted R^2 of 0.405 and an F-statistic of 67.823 ($p < 0.001$), indicating the overall explanatory performance and statistical significance of the restricted model. However, the specification does not include the independent commissioners' (IC) main effect or a year indicator, which may influence the estimated coefficients and their statistical significance. Accordingly, the reported results are interpreted as preliminary findings rather than definitive estimates from a fully specified moderation model. The original regression equation is expressed as follows:

$$FV_{it} = 1.351 + 0.195EP_{c,it} + 0.020IOS_{c,it} - 0.047(EP_c \times IC_c)_{it} + 1.242(IOS_c \times IC_c)_{it} + 0.050LIQ_{it} + 1.760PROF_{it} + \varepsilon_{it}$$

The regression results indicate that environmental performance is positively and significantly associated with firm value at the mean level of independent commissioners ($\beta = 0.195$; $p < 0.001$), providing preliminary support for H1. In contrast, the investment opportunity set shows no statistically significant association at the same level of board independence ($\beta = 0.020$; $p = 0.104$), indicating that H2 is not supported in the original specification. The interaction between environmental performance and independent commissioners is also nonsignificant ($\beta = -0.047$; $p = 0.832$), providing no statistical support for H3. Conversely, the interaction between the investment opportunity set and independent commissioners is positive and significant ($\beta = 1.242$; $p < 0.001$), offering preliminary support for H4. Both liquidity ($\beta = 0.050$; $p = 0.001$) and profitability ($\beta = 1.760$; $p < 0.001$) exhibit positive and statistically significant associations with firm value.

The significant IOS interaction indicates that its estimated association with firm value varies with the proportion of independent commissioners. Based on the original centered model, the conditional IOS slope is expressed as $0.020 + 1.242ICc$. Using the reported mean IC of 0.421 and standard deviation of 0.084, the estimated slopes are approximately −0.084 at an IC proportion of 0.337, 0.020 at 0.421, and 0.124 at 0.505. These values represent conditional point estimates and do not independently establish statistical significance at the respective levels of

board independence. Formal inference requires the variance–covariance matrix of the estimated coefficients, which is unavailable in the reported output. Consequently, confidence intervals and significance tests for these conditional slopes cannot be established. Moreover, the regression intercept represents the predicted firm value when the centered variables equal zero and the uncentered liquidity and profitability variables equal zero, rather than the expected value of a typical sampled firm. Therefore, the preliminary hypothesis interpretations require reassessment after incorporating the IC main effect, year indicator, and panel-appropriate statistical inference.

Table 6
Original Moderated Regression Results (Restricted Common Effect Model; Dependent Variable: FV)

Variable	Expected sign	Coefficient	Std. error	*t*-statistic	Prob.	Decision
Constant		1.351	0.031	43.145	< 0.001***	
EP_c	+	0.195	0.019	10.280	< 0.001***	H1 supported (original)
IOS_c	+	0.020	0.012	1.626	0.104	H2 not supported (original)
$EP_c \times IC_c$	+	−0.047	0.223	−0.212	0.832	H3 not supported (original)
$IOS_c \times IC_c$	+	1.242	0.141	8.821	< 0.001***	H4 supported (original)
LIQ		0.050	0.015	3.330	0.001***	Significant
PROF		1.760	0.208	8.460	< 0.001***	Significant
R^2 = 0.411; adjusted R^2 = 0.405; F = 67.823 (p < 0.001); Durbin–Watson = 1.992; N = 590						

*Note. *** reported significance at the 1 percent level in the original specification. H1–H4 decisions shown in the original output are provisional; corrected estimates including ICc and a year indicator were not supplied.*
Source: original EViews output (2026)

Discussion

Environmental Performance and Firm Value

The original positive EP coefficient is compatible with a positive association between environmental assessment and valuation at mean IC, conditional on the reported controls. Legitimacy theory offers one interpretation: a favorable rating may align a firm with environmental expectations (Suchman, 1995). Lower perceived regulatory or reputational exposure could be relevant to valuation, consistent with carbon-risk pricing and ESG-related financing evidence (Bolton & Kacperczyk, 2021; Raimo et al., 2021). Nevertheless, the regression does not observe investor beliefs, sanctions avoided, or reputational change. Its observational design and incomplete specification do not establish that a rating improvement causes a valuation gain. The H1 interpretation remains contingent on issuer-level rating validation and corrected estimation.

Signaling theory suggests that externally assessed information may help investors interpret environmental quality (Connelly et al., 2025). Rating-provider divergence (Berg et al., 2022) and the distinction between emissions and disclosure (Munir & Pratama, 2025) make measurement relevant, but the present model does not compare alternative rating systems directly. Indonesian valuation evidence includes prior studies (Lestari & Khomsiyah, 2023; Renaldi & Anis, 2023). Widarwati et al. (2024) already include consumer firms, so the present study cannot claim the first extension to consumer-facing sectors. Garnadi and Garnasih (2026) select PROPER participants but use emission intensity as their environmental proxy; their fixed-effects mediation design differs from the present ordinal-score interaction model. These differences prevent an attribution of divergent findings solely to public verification or information simplicity.

The numerical EP coefficient assumes a constant change in expected Tobin's Q for each one-code increase, conditional on mean IC. PROPER categories are ordinal: the environmental difference between red and blue need not equal that between green and gold. A categorical specification with one category omitted as the reference, and corresponding IC interactions, is therefore required as a sensitivity analysis. Hanjani and Kusumadewi (2023) address environmental and financial performance, while Aydoğmuş et al. (2022) distinguish aggregate ESG from the environmental pillar in valuation models. These studies support careful construct separation rather than proof that a particular information channel explains the present coefficient. Operational efficiency, reputation, and regulatory-risk channels remain theoretical possibilities because they were not measured or tested as mediators.

Investment Opportunity Set and Firm Value

The nonsignificant IOS coefficient concerns the conditional association at mean IC; it does not demonstrate that growth opportunities have no association with firm value at every governance level. Myers (1977) distinguishes existing assets from future investment opportunities, while Connelly et al. (2025) emphasize the credibility conditions of signals. These ideas make governance a plausible conditioning factor without establishing investor discounting in this sample. Differences from Ishlah and Natsir (2023) and Sudiyatno et al. (2023), and similarity to Wahyudi (2020), may reflect sector, proxy, period, or specification differences. Sudiyatno et al. (2023) examine capital-structure moderation rather than the identical commissioner mechanism. The original H2 and H4 patterns must therefore be interpreted together and rechecked after including the IC main effect and year indicator.

IOS and the Tobin's Q approximation share market equity value in their numerators. This overlap is a measurement concern that can generate mechanical association; the nonsignificance of one conditional coefficient does not eliminate it or demonstrate that investors discount unsupported growth expectations. Sensitivity analysis should replace market-to-book equity with an independently measured investment indicator, such as capital expenditure relative to assets, while recognizing that this captures a different dimension of IOS. The resulting estimates should be compared on the same sample. Nonpositive book equity also requires an explicit treatment because it can make market-to-book equity economically difficult to interpret. The supplied documents contain no alternative-proxy estimates or equity-screening record, so robustness to these choices is not claimed (Jensen, 1986; Smith Jr. & Watts, 1992).

Independent Commissioners and the Environmental Performance–Firm Value Relationship

The original EP × IC estimate provides no evidence of significant environmental moderation in the reported sample and restricted specification. This does not establish that board monitoring is ineffective or redundant. Substitution between external assessment and internal oversight is one theoretical possibility, but an imprecise coefficient, measurement limitations, low variation in IC, and omitted model terms are alternative explanations. Chancharat et al. (2026) find negative board-independence moderation using composite ESG information and panel GMM in Thailand; this is a different construct and design. Biju et al. (2025) examine the ESG–performance nexus in an emerging economy and should not be treated as an identical test of PROPER-score moderation. Whether external verification reduces the incremental valuation role of commissioners requires direct mechanism measures and a correctly specified interaction model.

Formal independence and actual monitoring quality are distinct. The sample mean IC proportion of 0.421 and standard deviation of 0.084 describe board composition; they do not show that firms appointed commissioners merely to satisfy regulation. Das et al. (2025) and Khan et al. (2024) provide contextual evidence on board characteristics and performance, while Tjahjadi et al. (2021) examine governance and corporate sustainability and Ghitti et al. (2024) discuss greenwashing. These studies motivate attention to expertise, affiliations, and oversight practices, but none verifies those attributes in the present sample. Agency theory offers a rationale for monitoring managerial discretion (Fama and Jensen, 1983; Jensen & Meckling, 1976), not evidence that government ratings remove all discretion over environmental investment, disclosure, or implementation.

Independent Commissioners and the Investment Opportunity Set–Firm Value Relationship

The original positive IOS × IC coefficient indicates that the conditional IOS slope increases as formal board independence rises in the restricted equation. This is consistent with H4 as an initial statistical pattern, subject to re-estimation. Agency theory provides a possible explanation through investment scrutiny and reduced inefficient expansion (Fama & Jensen, 1983), but investment screening and project quality were not observed. Salehi et al. (2022) examine investment efficiency and board-independence moderation in Tehran, whereas Sudiyatno et al. (2023) examine IOS and financing structure in Indonesia. Their findings motivate comparison without establishing an identical process here. The illustrative slopes at low and high IC are point estimates only: no claim that IOS is significantly negative at low IC, or significant only at high IC, is warranted until covariance-based slope tests and confidence intervals are available.

The contrasting interaction patterns suggest that board independence may condition the associations of environmental performance and investment opportunities with firm value differently. However, the statistical significance of one interaction and the nonsignificance of another do not establish a significant difference between their coefficients. A formal comparison requires the relevant coefficient covariance estimates and consideration of differences in measurement scales. Moreover, the proposed distinction between externally assessed environmental information and discretionary investment opportunities remains a theoretical interpretation rather than an empirically identified mechanism. Thus, the original findings provide a basis for further investigation but do not establish that independent commissioners enhance the credibility or valuation of investment opportunities through actual monitoring activities.

Control Variables

Liquidity and profitability have positive coefficients in the original specification. These associations are compared with the sector-specific evidence of Dotulong et al. (2023) and Saputri and Giovanni (2021), but their signs do not identify lower default risk or more credible earnings as observed mechanisms. Inclusion of two financial controls does not resolve omitted-variable bias, reverse causality, common year shocks, or the missing IC main effect. The stability of the control coefficients and the EP and interaction estimates must be assessed together in the corrected specification; it cannot be inferred from the reported significance of the original model.

Implications, International Relevance, and Limitations

The provisional findings support considering environmental assessments, growth indicators, and governance information jointly when evaluating consumer firms. For managers, transparent reporting of rating scope and board oversight may improve the information available to stakeholders; for investors, a PROPER score should be interpreted alongside its assessment unit, publication date, financial fundamentals, and investment context. These are cautious analytical implications rather than tested interventions or predicted valuation gains. The findings do not show that PROPER alone is sufficient for investment decisions or that increasing independent-commissioner proportions will improve firm value. Regulatory implications concern disclosure quality and substantive oversight, but any recommendation derived from H1–H4 requires first verifying the sample and re-estimating the hierarchical model with time controls and panel-appropriate inference.

International comparison is useful because formal board independence and environmental information differ across markets. Khan et al. (2024) examine a South Asian governance setting; Berg et al. (2022) document disagreement across ESG rating providers; and Chancharat et al. (2026) analyze Thai ESG and board interactions. Bukari et al. (2024) instead place ESG performance in the moderating role in governance–value relationships. Preserving these distinctions prevents an unsupported claim that all studies test the same monitoring mechanism. The present consumer-sector design offers a framework for comparative investigation, but it cannot establish that public ratings substitute for boards across emerging markets. Cross-country extensions would require comparable rating definitions, ownership information, monitoring measures, and estimation procedures.

The two-year observation window limits temporal interpretation, and the original model omits both the IC main effect and the year indicator despite evidence of a common time

component. These are outstanding specification corrections in the present study, not issues resolved by listing them as future research. Firm-year rating coverage, subsector composition, facility-to-issuer mapping, and information-release timing cannot be audited from the supplied documents. Numerical PROPER coding assumes equal intervals, IOS overlaps mechanically with Tobin's Q, and board composition does not measure substantive monitoring. Firm-clustered inference, corrected model selection, category-based and alternative-proxy sensitivity checks, and formal simple-slope tests remain unavailable. The pooled observational design also leaves potential endogeneity unaddressed. Consequently, the retained coefficients cannot serve as definitive evidence for causal effects, mechanism substitution, or final H1–H4 decisions.

CONCLUSION

This study examines the associations of environmental performance and the investment opportunity set with firm value, including the moderating role of independent commissioners, using a reported sample of 295 Indonesian consumer-sector firms during 2023–2024. The original regression indicates a positive association between environmental performance and firm value ($\beta = 0.195$; $p < 0.001$), while the investment opportunity set exhibits no statistically significant association at the mean level of board independence ($\beta = 0.020$; $p = 0.104$). The environmental performance interaction is not statistically significant ($\beta = -0.047$; $p = 0.832$), whereas the investment opportunity set interaction is positive and significant ($\beta = 1.242$; $p < 0.001$). Nevertheless, these findings remain provisional because the original model excludes the independent commissioners' main effect and year indicator, and the completeness of firm-year PROPER observations has not been independently verified. Therefore, the reported results cannot establish causal relationships or definitive conclusions concerning the proposed moderating effects.

The study's conceptual contribution lies in comparing the interactions of independent commissioners with two distinct indicators within a common firm valuation framework: externally assessed environmental performance and market-based investment opportunities. This comparison offers a basis for integrating legitimacy, signaling, and agency perspectives, although the mechanisms underlying the reported associations have not been directly tested. Before definitive empirical conclusions can be drawn, further analysis must verify PROPER-to-issuer matching, estimate the corrected hierarchical model, apply panel-appropriate statistical inference, and evaluate alternative measurement specifications and conditional slopes. Future research should consider longer observation periods, alternative investment opportunity indicators, and measures of substantive board oversight. The practical implications emphasize transparent environmental reporting and governance disclosure rather than assuming that improvements in environmental ratings or board composition necessarily increase firm value.

ACKNOWLEDGEMENT

The authors thank the Doctoral Program in Economics, Faculty of Economics and Business, Universitas Trisakti, for the academic guidance provided during this research.

AUTHOR CONTRIBUTION STATEMENT

Teguh Yanto and Etty Murwaningsari were responsible for conceptualization, data curation, formal analysis, methodology, and writing (original draft and editing).

REFERENCES

Al-Jaifi, H. A., Al-Qadasi, A. A., & Al-Rassas, A. H. (2023). Board diversity effects on environmental performance and the moderating effect of board independence: Evidence from the Asia-Pacific region. *Cogent Business & Management*, *10*(2). https://doi.org/10.1080/23311975.2023.2210349

Aydoğmuş, M., Gülay, G., & Ergun, K. (2022). Impact of ESG performance on firm value and profitability. *Borsa Istanbul Review*, *22*, S119–S127. https://doi.org/10.1016/j.bir.2022.11.006

Berg, F., Kölbel, J. F., & Rigobon, R. (2022). Aggregate confusion: The divergence of ESG ratings. *Review of Finance*, *26*(6), 1315–1344. https://doi.org/10.1093/rof/rfac033

Biju, A. V. N., Geetha, S., Prasad, S., Sasidharan, A., & Jayachandran, A. (2025). ESG–firm

performance nexus: Evidence from an emerging economy. *Business Strategy and the Environment*, *34*(3), 3469–3496. https://doi.org/10.1002/bse.4152

Bolton, P., & Kacperczyk, M. (2021). Do investors care about carbon risk? *Journal of Financial Economics*, *142*(2), 517–549. https://doi.org/10.1016/j.jfineco.2021.05.008

Bukari, A., Agyemang, A. O., & Bawuah, B. (2024). Assessing the moderating role of ESG performance on corporate governance and firm value in developing countries. *Cogent Business & Management*, *11*(1). https://doi.org/10.1080/23311975.2024.2333941

Chancharat, N., Vetchagool, W., & Chancharat, S. (2026). ESG performance and corporate value in an emerging market: The moderating role of board structures in sustainability. *Journal of Risk and Financial Management*, *19*(1). https://doi.org/10.3390/jrfm19010087

Connelly, B. L., Certo, S. T., Reutzel, C. R., DesJardine, M. R., & Zhou, Y. S. (2025). Signaling theory: State of the theory and its future. *Journal of Management*, *51*(1), 24–61. https://doi.org/10.1177/01492063241268459

Das, N. A., Lukviarman, N., Rahim, R., & Alfarisi, M. F. (2025). The effect of two-tier board characteristics on firm value: The mediating role of corporate reputation in Indonesia. *Investment Management and Financial Innovations*, *22*(4), 449–461. https://doi.org/10.21511/imfi.22(4).2025.33

Dotulong, F., Murni, S., & Ogi, I. W. J. (2023). Analisis pengaruh likuiditas, profitabilitas dan ukuran perusahaan terhadap nilai perusahaan sub sektor transportasi di Bursa Efek Indonesia. *Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi*, *11*(1), 953–963. https://doi.org/10.35794/emba.v11i1.46655

Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *The Journal of Law and Economics*, *26*(2), 301–325. https://doi.org/10.1086/467037

Garnadi, M. I., & Garnasih, R. L. (2026). Does environmental performance drive firm value through financial performance? Evidence from Indonesian PROPER firms. *Current: Jurnal Kajian Akuntansi Dan Bisnis Terkini*, *7*(2), 523–534. https://doi.org/10.31258/current.7.2.523-534

Ghitti, M., Gianfrate, G., & Palma, L. (2024). The agency of greenwashing. *Journal of Management and Governance*, *28*(3), 905–941. https://doi.org/10.1007/s10997-023-09683-8

Hanjani, A., & Kusumadewi, R. K. A. (2023). Environmental performance and financial performance: Empirical evidence from Indonesian companies. *Corporate Social Responsibility and Environmental Management*, *30*(3), 1508–1513. https://doi.org/10.1002/csr.2433

Ishlah, R. N., & Natsir, K. (2023). The effect of financial performance, tax avoidance, and investment opportunity set on firm value in the agricultural sector. *International Journal of Application on Economics and Business*, *1*(1), 673–683. https://doi.org/10.24912/ijaeb.v1i1.673-683

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review*, *76*(2), 323–329.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360.

Kementerian Lingkungan Hidup dan Kehutanan. (2021). Peraturan Menteri Lingkungan Hidup dan Kehutanan tentang Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan Hidup (PROPER). Kementerian Lingkungan Hidup dan Kehutanan.

Kementerian Lingkungan Hidup/Badan Pengendalian Lingkungan Hidup. (2025). Pengumuman Hasil Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan Hidup (PROPER) Periode 2023–2024. Kementerian Lingkungan Hidup/Badan Pengendalian Lingkungan Hidup.

Khan, M. J., Saleem, F., Din, S. U., & Khan, M. Y. (2024). Nexus between boardroom independence and firm financial performance: Evidence from South Asian emerging market. *Humanities and Social Sciences Communications*, *11*. https://doi.org/10.1057/s41599-024-02952-3

Lestari, A. D., & Khomsiyah. (2023). Pengaruh kinerja lingkungan, penerapan green accounting, dan pengungkapan sustainability report terhadap nilai perusahaan. *Jurnal Ekonomi Bisnis, Manajemen Dan Akuntansi (JEBMA)*, *3*(3), 514–526. https://doi.org/10.47709/jebma.v3i3.2799

Munir, A. R., & Pratama, A. (2025). Emission performance, environmental disclosure, and firm value: Evidence from Southeast Asia. *Risks*, *13*(12).

https://doi.org/10.3390/risks13120235
Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, *5*(2), 147–175. https://doi.org/10.1016/0304-405X(77)90015-0
Otoritas Jasa Keuangan. (2014). *Peraturan Otoritas Jasa Keuangan Nomor 33/POJK.04/2014 tentang Direksi dan Dewan Komisaris Emiten atau Perusahaan Publik*. Otoritas Jasa Keuangan. https://ojk.go.id/id/kanal/pasar-modal/regulasi/peraturan-ojk/Pages/pojk-direksi-dewan-komisaris-emiten.aspx
Puspitasari, I. D., & Rahayu, S. I. (2025). Enhancing firm value: The role of managerial ownership, independent commissioners, audit quality, and corporate social responsibility. *Taxation and Public Finance*, *2*(2), 56–67. https://doi.org/10.58777/tpf.v2i2.367
Raimo, N., Caragnano, A., Zito, M., Vitolla, F., & Mariani, M. (2021). Extending the benefits of ESG disclosure: The effect on the cost of debt financing. *Corporate Social Responsibility and Environmental Management*, *28*(4), 1412–1421. https://doi.org/10.1002/csr.2134
Renaldi, A., & Anis, I. (2023). Pengaruh pengungkapan biaya dan kinerja lingkungan terhadap nilai perusahaan: Studi empiris pada perusahaan industri manufaktur di Indonesia. *Jurnal Ekonomi Trisakti*, *3*(2), 3853–3862. https://doi.org/10.25105/jet.v3i2.18216
Salehi, M., Zimon, G., Arianpoor, A., & Gholezoo, F. E. (2022). The impact of investment efficiency on firm value and moderating role of institutional ownership and board independence. *Journal of Risk and Financial Management*, *15*(4). https://doi.org/10.3390/jrfm15040170
Saputri, C. K., & Giovanni, A. (2021). Pengaruh profitabilitas, pertumbuhan perusahaan dan likuiditas terhadap nilai perusahaan. *Competence: Journal of Management Studies*, *15*(1), 90–108. https://doi.org/10.21107/kompetensi.v15i1.10563
Smith Jr., C. W., & Watts, R. L. (1992). The investment opportunity set and corporate financing, dividend, and compensation policies. *Journal of Financial Economics*, *32*(3), 263–292. https://doi.org/10.1016/0304-405X(92)90029-W
Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics*, *87*(3), 355–374. https://doi.org/10.2307/1882010
Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review*, *20*(3), 571–610. https://doi.org/10.5465/amr.1995.9508080331
Sudiyatno, B., Sudarsi, S., Hartoto, W. E., & Fitriati, I. R. (2023). Does capital structure moderate the impact of the investment opportunity set and institutional ownership on firm value? *Investment Management and Financial Innovations*, *20*(2), 79–88. https://doi.org/10.21511/imfi.20(2).2023.07
Tjahjadi, B., Soewarno, N., & Mustikaningtiyas, F. (2021). Good corporate governance and corporate sustainability performance in Indonesia: A triple bottom line approach. *Heliyon*, *7*(3). https://doi.org/10.1016/j.heliyon.2021.e06453
Umam, D. C., & Halimah, I. (2021). The influence of institutional ownership, independent commissioners, dividend policy, debt policy, and firm size on firm value. *Priviet Social Sciences Journal*, *1*(2), 20–28. https://doi.org/10.55942/pssj.v1i2.98
Wahyudi, S. M. (2020). The effect of corporate social responsibility, investment opportunity set, leverage, and size of companies on corporate value. *European Journal of Business and Management Research*, *5*(4). https://doi.org/10.24018/ejbmr.2020.5.4.455
Widarwati, E., Rohmah, N. N., Wityasminingsih, E., Nurmalasari, N., Apriandi, D. W., & Sopiawadi, M. (2024). Green investment and firm value: Does corporate governance matter? *Journal of Accounting and Investment*, *25*(3), 1156–1174. https://doi.org/10.18196/jai.v25i3.22159