

Profitability Determinants: Company Age and Company Size with Managerial Ownership as a Moderator

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ABSTRACT

Profitability indicates how efficiently companies convert resources into earnings. This study examines the associations of company age and size with profitability and the moderating role of managerial ownership. Using a quantitative approach, this study analyzes annual-report data from 12 Indonesian listed mining companies during 2018–2024, yielding 84 balanced firm-year observations. Panel-model selection and moderated regression were conducted using EViews, with a pooled common effect model reported provisionally. In the reported moderated model, company age ($b = -0.018681$; $p < 0.001$) and size ($b = -0.142184$; $p < 0.001$) have negative conditional associations with profitability. The size–ownership interaction is negative ($b = -0.046075$; $p = 0.0018$), whereas the age–ownership interaction is positive ($b = 0.030211$; $p = 0.0006$). Thus, higher managerial ownership is associated with a more negative size slope and a less negative age slope. These findings suggest that ownership structure matters when evaluating maturity and asset scale. However, the omitted standalone ownership term and possible residual dependence require further specification and robustness checks before stronger conclusions or governance recommendations are drawn.

Keywords: Company Age; Company Size; Managerial Ownership; Mining Companies; Panel Data; Profitability

JEL Classification: G32; L25; M41

INTRODUCTION

Profitability is a central indicator of a company's ability to sustain operations, remunerate investors, and finance future investment. In mining, asset-intensive production makes the efficient deployment of resources particularly relevant. Company age and company size are observable characteristics that may help explain differences in earnings generation, although neither characteristic is a direct measure of managerial quality. Age represents elapsed organizational experience, while size represents the scale of resources under managerial control. This study investigates whether their associations with profitability differ with managerial ownership, rather than assuming that maturity or scale necessarily produces superior financial outcomes.

The mining sector provides an important context for examining profitability because its business activities require substantial fixed assets, long-term investment, and strong managerial discipline. Companies in this sector usually face high operational risk, large capital requirements, and pressure to maintain efficiency. Therefore, the relationship between company age, company size, and profitability should not be understood only as a simple resource-capacity relationship. Older firms may have more experience, but they may also face rigid structures and higher maintenance costs. Larger firms may have broader assets and market access, but they may also experience complex coordination costs and inefficient asset utilization if managerial control is weak (Aliahmadi, 2024; Firmansyah & Kartiko, 2024).

Managerial ownership is relevant because it connects the financial interests of managers with the consequences of their decisions. Agency theory explains why the separation of ownership and control can generate monitoring costs and conflicting incentives (Jensen & Meckling, 1976). Share ownership may encourage managers to protect firm earnings, but greater control can also reduce the effectiveness of external discipline. Recent governance research examines related links among governance, corporate responsibility, and performance (Attarit et al., 2025). Such evidence motivates a conditional view of firm characteristics; it does not establish in advance which ownership interaction will be positive in Indonesian mining companies.

Prior studies address related but distinct outcomes. Firmansyah and Kartiko (2024) examine firm size and age in the association between green banking disclosure and sustainable growth, while Abidin et al. (2023) examine corporate responsibility disclosure and financial performance in Islamic banks. These studies establish the relevance of organizational characteristics and reporting context, but they are not direct tests of the present mining-sector hypotheses. Research on sustainability reporting quality also demonstrates the importance of distinguishing governance and disclosure measures from financial outcomes (Idawati et al., 2024). Accordingly, this study tests its own relationships rather than treating findings from other sectors or dependent variables as interchangeable.

The seven-year panel allows the analysis to organize repeated observations consistently, but it does not by itself distinguish a persistent company characteristic from an omitted common influence. Profitability may change with operating conditions shared by firms in the same year. Ownership and size may also respond to past earnings. These possibilities motivate the cautious use of association language throughout the paper. A repeated-observation design improves the structure of the evidence, yet causal identification depends on additional assumptions and appropriate treatment of unobserved heterogeneity.

The focus on profitability is distinct from a focus on market valuation. Share prices may reflect expected future earnings, financing choices, investor sentiment, and information beyond current accounting results. Aydoğmuş et al. (2022) examine environmental, social, and governance (ESG) performance in relation to both firm value and profitability, illustrating why the two outcomes warrant separate treatment. A governance mechanism associated with market valuation need not generate an immediate improvement in an annual accounting ratio. The present study therefore limits its empirical conclusions to the reported profitability outcome.

The ownership perspective also connects profitability research with the broader debate on responsible and sustainable corporate activity. Coelho et al. (2023) synthesize research on social responsibility and financial performance, while Singh and Chakraborty (2021) examine whether responsibility disclosure is associated with financial performance in an emerging economy. These contributions show that financial outcomes are often studied alongside institutional and organizational conditions. The present analysis narrows that broader agenda to managerial shareholding, while recognizing that sustainability practices and other omitted conditions may also matter.

This study examines the associations of company age and company size with profitability and tests whether managerial ownership moderates both relationships in 12 Indonesian listed mining companies during 2018–2024. Its contribution is a joint analysis of maturity, asset scale, and ownership interactions within a consistent firm-year panel. The contribution is contextual rather than a claim that ownership moderation has never been studied. The results may help managers and investors identify when age and size are insufficient indicators of earnings capacity. They also expose specification and diagnostic questions that must be resolved before these associations can support causal or prescriptive conclusions.

LITERATURE REVIEW

Agency Theory and Profitability

Agency theory explains the relationship between principals and agents in a company. Shareholders as principals delegate decision-making authority to managers as agents, while managers control daily operations and strategic decisions. This separation may create information asymmetry and agency costs when managers pursue personal interests rather than shareholder wealth maximization (Jensen & Meckling, 1976). In this context, profitability becomes an important outcome because it reflects the ability of management to use company resources effectively and to produce financial returns for owners.

Managerial ownership can align incentives because a manager who holds shares participates in gains and losses accruing to shareholders. However, share ownership is not equivalent to effective monitoring. Decision-making authority, voting rights, board oversight, and the presence of other shareholders affect whether incentives translate into disciplined investment. Research on managerial ownership and income smoothing addresses a related reporting channel (Prasasti & Febyansyah, 2024), whereas Zafar et al. (2022) examine financial returns associated with corporate responsibility in Islamic banking. These distinct channels should not be collapsed into a single claim that ownership always increases profitability.

Profitability

Profitability represents earnings relative to a specified economic base, such as assets, equity, or sales. These ratios answer different questions and cannot be used interchangeably. Asset-based profitability concerns resource utilization; equity-based

profitability also depends on financial leverage; a sales margin reflects earnings per unit of revenue. This manuscript reports profitability as the dependent variable, but the underlying ratio and its numerator and denominator require confirmation from the original dataset. Consequently, the coefficients below are interpreted in reported profitability units, without assigning an unsupported return-on-assets or return-on-equity label.

For mining companies, profitability assessment must distinguish resource commitments from the earnings those commitments generate. [Husnah and Fahlevi \(2023\)](#) examine financial performance in Indonesia's mining industry in relation to corporate social responsibility and sustainable development goals. Their sector-specific focus supports considering organizational and institutional conditions alongside financial measures, although it does not test the ownership interactions examined here. Earlier cross-sector evidence, including [Sekhon and Kathuria \(2020\)](#), likewise concerns responsibility and financial performance rather than a universal profitability benefit from age or size.

Profitability should also be distinguished from environmental performance. [Panggabean et al. \(2025\)](#) examine company size, profitability, and age in an environmental-performance model with environmental costs as a moderator. Their framework includes several of the same constructs but assigns them different analytical roles. This distinction prevents circular reasoning in which a study that uses profitability as a predictor is cited as direct evidence about its determinants. In the present research, the dependent variable must be defined independently from the variables proposed to explain it.

Company Age and Company Size

Company age is the number of years between establishment and the observation year. It captures organizational history but does not directly measure learning, innovation, or the physical age of mining equipment. An older company may replace its assets regularly, while a younger company may acquire mature operations. Therefore, chronological age should be interpreted as a broad organizational characteristic. Differences associated with age can reflect both accumulated capabilities and persistent differences between firms established in different periods.

Company size is represented by the logarithm of total assets. A logarithmic measure compresses large monetary differences and expresses scale more comparably across firms. The underlying currency, monetary unit, consolidation basis, and logarithm base must nevertheless be consistent. Size captures the resources recognized on the balance sheet, not their productivity or utilization. A larger balance sheet may represent operating capacity, projects not yet generating revenue, or acquired assets. Distinguishing asset scale from productive efficiency is necessary when interpreting a negative size coefficient.

Managerial Ownership

Managerial ownership is the number of shares held by management divided by total outstanding shares. It is conceptually different from institutional ownership and from a general corporate governance index. The definition of management must match the original coding of directors, executives, or other included officeholders. A value of 0.10 represents a ten-percent shareholding when the variable is expressed as a proportion. Increasing ownership by one percentage point therefore changes the variable by 0.01, a distinction that matters when interpreting interaction coefficients.

Managerial ownership should be distinguished from managerial power and from broader governance measures. [Viandika and Tjahjono \(2025\)](#) examine managerial ownership as a moderator in a firm-value model, while [Rashid et al. \(2020\)](#) investigate executive power and responsibility disclosure. These designs address different outcomes and should not

be treated as direct tests of accounting profitability. Their relevance is conceptual: incentives and authority can affect different corporate decisions, and shareholding alone does not capture every mechanism through which managers influence performance.

Hypotheses Development

Company Age and Profitability

For the age–profitability relationship, accumulated experience and organizational rigidity yield competing predictions. Established firms may use operating knowledge and stakeholder relationships to manage uncertainty, while persistent routines may slow adaptation. [Firmansyah and Kartiko \(2024\)](#) place firm age within a conditional sustainable-growth framework. This evidence motivates examining the circumstances surrounding maturity rather than assuming a uniformly positive age association. [Aqabna et al. \(2023\)](#), who study performance, responsibility, and earnings management during COVID-19, further illustrate that performance research must attend to context, although their study does not isolate the age relationship tested here.

The net association depends on whether accumulated capabilities outweigh adjustment costs. Because the present model does not separately measure learning and rigidity, H1 is nondirectional. The test asks whether the age coefficient differs from zero, with the sign determining its substantive interpretation. In the moderated specification, that coefficient is conditional on the ownership reference value; it is not an average association across all sampled companies. The theoretical rationale consequently allows either sign while requiring that the reference point and model restrictions remain explicit.

[Mansikkamäki \(2023\)](#) studies age and size in transitions between growth–profitability configurations. That perspective is relevant because maturity and scale can condition how performance evolves rather than simply exert a constant positive effect. It motivates examining age as part of a relationship that depends on other firm characteristics. The current study applies that conditional reasoning to managerial ownership, but does not reproduce the growth-transition design or claim equivalent findings. Its empirical question remains whether the age slope varies with ownership in the observed mining-company panel.

H1: Company age is significantly associated with profitability.

Company Size and Profitability

The size–profitability relationship also admits competing mechanisms. Resource scale can support operating capacity, financing access, and risk absorption, but additional assets may introduce coordination costs or remain unproductive during project development. [Abdi et al. \(2022\)](#) examine size and age as moderators of sustainability-related financial relationships in the airline industry. Although their sector and specification differ, the study provides a basis for considering the conditions under which organizational scale matters. It does not establish the sign of the mining-sector size coefficient.

For asset-intensive firms, additional assets may create costs before generating proportional earnings. A larger balance sheet therefore need not indicate more efficient resource use. Given the competing implications of scale economies and coordination costs, H2 is nondirectional. The empirical test concerns a conditional association within the sampled firms and observation period. Its sign cannot by itself establish whether a particular investment, acquisition, or asset sale would improve earnings, because such decisions may change several components of performance simultaneously.

Ahmed et al. (2023) examine the association between capital structure and profitability with firm size as a moderator. This provides a related example of size participating in a conditional financial relationship, although the present design treats size as a focal predictor and ownership as the moderator. Separating these roles is necessary when comparing studies. A significant size-related interaction elsewhere cannot determine the expected sign of the present size coefficient. It does, however, reinforce the usefulness of explicitly specifying which relationship is expected to vary and which variable creates that variation.

H2: Company size is significantly associated with profitability.

Managerial Ownership as Moderator

The moderation hypotheses follow from competing incentive-alignment and entrenchment mechanisms. Under agency theory, a financial stake can encourage managers to weigh the shareholder consequences of their decisions (Jensen & Meckling, 1976). Greater ownership may nevertheless coexist with discretion that weakens external discipline. Aliahmadi (2024) examines executive power as a moderator of the productivity–performance relationship, providing a related example of why managerial influence can condition resource outcomes. Executive power is not identical to managerial ownership; its relevance here is to the mechanism, not to predicting the interaction sign.

Managerial ownership may moderate the association between company size and profitability because asset scale requires managerial discipline (Viandika & Tjahjono, 2025). Efficient resource allocation may help larger companies translate asset capacity into earnings. Managerial ownership can strengthen managerial incentives to control costs, reduce waste, and increase asset productivity. However, managerial ownership can also strengthen managerial discretion if the ownership structure allows managers to dominate decisions. Therefore, the moderation relationship requires empirical testing.

Managerial ownership may also condition the age–profitability relationship. Shareholding could encourage managers to adapt established routines and preserve valuable organizational knowledge. Alternatively, entrenched owner-managers could protect existing practices even when change is needed. Both mechanisms are plausible; the current data do not directly measure either. Accordingly, H4 predicts moderation without prespecifying its direction. Likewise, H3 is two-sided because incentive alignment and managerial discretion may operate in opposite directions for the size–profitability relationship.

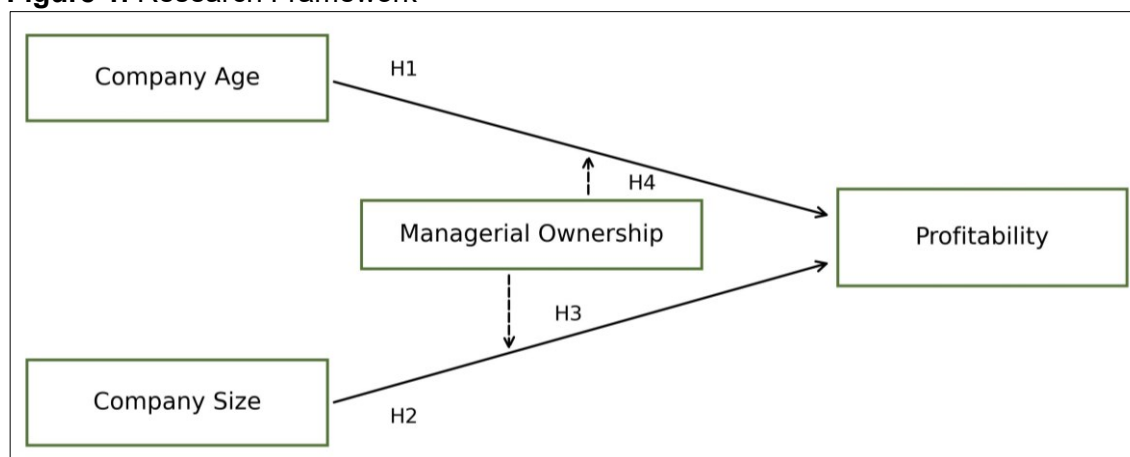
H3: Managerial ownership significantly moderates the association between company size and profitability.

H4: Managerial ownership significantly moderates the association between company age and profitability.

Conceptual Framework

The research framework shows company age and company size as independent variables, profitability as the dependent variable, and managerial ownership as the moderating variable. The framework is presented in Figure 1.

Figure 1. Research Framework



RESEARCH METHOD

Research Approach and Design

This study uses a quantitative approach with a descriptive and hypothesis-testing panel design. Descriptive analysis summarizes the research variables, while panel regression examines the proposed associations and ownership interactions. The unit of observation is a company-year. The balanced panel comprises 12 mining companies listed on the Indonesia Stock Exchange (IDX), observed annually from 2018 through 2024, yielding 84 firm-year observations. The design is observational and does not identify causal effects.

Population and Sampling

The population is mining companies listed on the Indonesia Stock Exchange during 2018–2024. Purposive sampling retained companies with complete and consistent annual information for profitability, establishment year, total assets, and managerial shareholding throughout the seven-year period. Table 1 summarizes the sample-selection criteria and data coverage: 12 companies and 84 firm-year observations. Completeness is the documented selection basis; no additional profit, currency, or listing-continuity filter is assumed.

Table 1. Sample Selection and Data Coverage

Item	Documented coverage
Population	IDX-listed mining companies, 2018–2024
Selection criteria	Complete and consistent information for all four variables across seven years
Selected firms	12 companies
Observation period	2018–2024; seven annual observations per company
Final observations	$12 \times 7 = 84$ balanced firm-year observations
Data sources	Published company annual reports

Data Collection and Sources

Secondary data were collected from published company annual reports. Establishment dates provide the basis for age, financial statements provide the accounting inputs and total assets, and ownership disclosures provide managerial shareholding. Data from the same company and financial year are the required inputs to each interaction term. The available documentation does not establish whether currency conversion, winsorization, missing-value imputation, or restatement adjustments were applied. These procedures

cannot be assumed; a complete extraction record is needed to establish comparability across firms and years.

Variable Measurement

Table 2. Operational Definition of Variables

Variable	Measurement	Scale
Profitability	Reported profitability ratio	Ratio
Company Age	AGE_it = observation year t – establishment year of company i	Ratio
Company Size	Logarithm of total assets	Ratio
Managerial Ownership	MO_it = management-held shares_it / total outstanding shares_it	Ratio

Table 2 distinguishes documented measurement rules from coding details that remain unverified. The exact profitability formula, asset currency and unit, logarithm base, and ownership coding must be checked against the original data. Ownership is interpreted provisionally as a proportion, consistent with the reported range; the source coding must confirm this. Coefficient magnitudes cannot yet be translated reliably into returns on assets, returns on equity, or profit margins.

Data Analysis

The analysis combines descriptive statistics, panel-model selection, baseline regression, and moderated regression analysis. The baseline specification is:

$$\text{PROF_it} = \alpha + \beta_1 \text{AGE_it} + \beta_2 \text{SIZE_it} + \varepsilon_it$$

where i identifies the company and t identifies the year. The reported moderated specification is:

$$\text{PROF_it} = \alpha + \beta_1 \text{AGE_it} + \beta_2 \text{SIZE_it} + \beta_3(\text{SIZE_it} \times \text{MO_it}) + \beta_4(\text{AGE_it} \times \text{MO_it}) + \varepsilon_it.$$

Here, PROF denotes profitability, AGE company age, SIZE company size, and MO managerial ownership. M1 is SIZE multiplied by MO for the same firm-year, and M2 is AGE multiplied by MO for that same observation. Greek β symbols denote model parameters; b denotes a reported, unstandardized coefficient estimate.

The interaction terms are interpreted as products of the reported variables. Centering or standardization is not documented and is not asserted. Under this specification, the conditional size slope equals $\beta_2 + \beta_3 \text{MO}$, and the conditional age slope equals $\beta_1 + \beta_4 \text{MO}$. The coefficients on AGE and SIZE are therefore slopes evaluated at zero managerial ownership, rather than average effects across all companies. Significance of an interaction tests whether the corresponding slope changes with ownership; it does not establish that the slope is significant at every ownership value.

The supplied moderated output omits the standalone MO coefficient. The unrestricted hierarchical model is:

$$\text{PROF_it} = \alpha + \beta_1 \text{AGE_it} + \beta_2 \text{SIZE_it} + \beta_3(\text{SIZE_it} \times \text{MO_it}) + \beta_4(\text{AGE_it} \times \text{MO_it}) + \beta_5 \text{MO_it} + \varepsilon_it.$$

Relative to the unrestricted model, the reported specification imposes $\beta_5 = 0$: ownership has no standalone association at AGE = SIZE = 0. Neither reference value occurs in the sample, and no theoretical or statistical justification for this restriction is documented. The numerical results are therefore retained only as restricted-model estimates. The full

model must be re-estimated on the same 84 observations before the restriction and the hypothesis decisions can be evaluated. Adding MO to the equation alone cannot correct the reported estimates.

A joint moderation test would assess $H_0: \beta_3 = \beta_4 = 0$ and requires the estimated coefficient covariance matrix. The reported model F-test is broader because it also includes the age and size coefficients; it cannot substitute for that joint interaction test. Mean-centering may improve the interpretability of reference values in a full hierarchical model. It should not be used to imply an equivalent reparameterization of the present restricted model, because omitting a constituent main effect can make the restriction depend on the chosen origin. All model comparisons should use the same observations and explicitly report the included terms.

The testing threshold is 5%. EViews probabilities rounded to 0.0000 are presented as $p < 0.001$. Chow, Hausman, and Lagrange multiplier tests compare different null hypotheses and must use the same sample, regressors, and effect dimension. Fit is summarized by R^2 , adjusted R^2 , and the F-statistic. Panel-specific checks for within-company serial correlation, heteroskedasticity, and cross-company dependence are required before final inference; the Durbin–Watson statistic alone is insufficient. No completed diagnostic tests or robust standard errors are documented in the supplied output.

[MacKinnon et al. \(2023\)](#) explain why cluster-robust inference requires attention to the number and structure of clusters. With only 12 companies, conventional cluster asymptotics may be unreliable. A robustness analysis should report the covariance estimator and small-sample treatment; a firm-level wild cluster bootstrap is one possible sensitivity procedure. Such inference requires original observations and residual information, not just coefficient tables. Firm clustering also does not by itself address dependence across companies. These are required follow-up analyses, not procedures already completed in this study.

RESULTS

Descriptive Statistics

Table 3. Descriptive Statistics

Statistic	Profitability	Company Age	Company Size	Managerial Ownership
Mean	0.280746	35.500000	29.158040	0.092298
Median	0.184490	38.000000	30.315840	0.003757
Maximum	2.653100	56.000000	32.354520	0.816808
Minimum	-0.373010	6.000000	20.533600	0.0000184
Std. Dev.	0.562261	14.116980	3.160858	0.218308
Skewness	2.128396	-0.433182	-1.634181	2.659155
Kurtosis	7.941314	2.154770	4.498204	8.774017
Jarque-Bera	148.8790	5.127503	45.24380	215.6829
Probability	< 0.001	0.077015	< 0.001	< 0.001
Observations	84	84	84	84

[Table 3](#) shows a mean profitability of 0.280746 and a standard deviation of 0.562261. The standard deviation exceeds the mean, while the median of 0.184490 is below it, indicating substantial dispersion and a right-skewed distribution. Observed profitability ranges from -0.373010 to 2.653100. These values should be checked against the original ratio definition before describing them as percentages or inferring extreme

economic returns. Company age averages 35.5 years and ranges from 6 to 56 years. Company size averages 29.158040 in its reported logarithmic units.

Managerial ownership averages 0.092298, approximately 9.23% when interpreted as a proportion, whereas its median is 0.003757, or approximately 0.38%. The much higher mean indicates an uneven ownership distribution, with some observations extending to 0.816808. This matters for moderation because a slope evaluated at average ownership may not represent the typical firm-year. The table summarizes the pooled observations; it does not establish how ownership varies within each company over time or how densely observations cover the upper end of the ownership range.

The Jarque–Bera statistics refer to the distributions of the variables, not to regression residuals. Their probabilities cannot establish whether the regression disturbances satisfy normality assumptions. Similarly, the descriptive ranges alone do not demonstrate data errors or justify deleting observations. Before any influential observation is removed, the underlying annual-report entry, coding rule, and substantive reason should be checked. These safeguards are especially relevant where the sample is small, and ownership is concentrated.

Panel Data Model Selection

Table 4. Panel Data Model Selection

Test	Compared Model	p-value	Decision	Pairwise result
Chow Test	Common Effect vs Fixed Effect	0.0023	Reject pooling	Fixed Effect
Hausman Test	Random Effect vs Fixed Effect	0.1407	Do not reject RE	Random Effect
Lagrange Multiplier Test	Common Effect vs Random Effect	0.0833	Do not reject pooling	Common Effect

Table 4 gives conflicting pairwise evidence. The Chow test ($p = 0.0023$) favors company fixed effects over a common intercept. The Hausman test ($p = 0.1407$) does not reject the random-effects consistency restriction, and the Lagrange multiplier test ($p = 0.0833$) does not reject zero random-intercept variance. The last two non-rejections do not override the significant Chow result or establish that pooling is valid. Tables 5–8 consistently retain the supplied pooled common effect estimates as provisional results, not as a validated final specification. Final selection requires comparable full-model estimates and sensitivity checks on the same sample, including assessment of the age-identification constraint discussed below.

Regression Equation and Moderated Regression Analysis

Table 5. Regression Estimation without Moderation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.208425	0.112302	46.37876	< 0.001
Company Age	-0.014996	0.000863	-17.36794	< 0.001
Company Size	-0.150742	0.003856	-39.09114	< 0.001

Table 5 reports the baseline regression without ownership interactions. Company age has a coefficient of -0.014996 ($t = -17.36794$; $p < 0.001$), and company size has a coefficient of -0.150742 ($t = -39.09114$; $p < 0.001$). Both associations are negative under the reported baseline specification. These estimates describe conditional associations within the model; they do not isolate causal effects of aging or expansion.

The estimated baseline equation is $PROF = 5.208425 - 0.014996 AGE - 0.150742 SIZE$. The intercept corresponds to zero values of both predictors and has limited substantive meaning because those values are outside the observed age and size ranges. A one-year difference in age is associated with -0.014996 profitability units, holding size constant. A one-unit difference in the logged size measure is associated with -0.150742 profitability units, holding age constant. Neither coefficient should be described as a percentage-point change without confirming the scale of the dependent variable.

Table 6. Moderated Regression Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.084272	0.106381	47.79293	< 0.001
Company Size	-0.142184	0.004114	-34.56158	< 0.001
Company Age	-0.018681	0.001175	-15.89643	< 0.001
M1: Company Size × Managerial Ownership	-0.046075	0.014240	-3.235641	0.0018
M2: Company Age × Managerial Ownership	0.030211	0.008396	3.598199	0.0006

Table 6 presents the restricted moderated regression: $PROF = 5.084272 - 0.142184 SIZE - 0.018681 AGE - 0.046075 M1 + 0.030211 M2$. The size interaction is negative ($p = 0.0018$), whereas the age interaction is positive ($p = 0.0006$). Thus, higher managerial ownership is associated with a more negative size slope and a less negative age slope. These statements concern changes in conditional slopes, not direct comparisons between interaction and main-effect coefficient magnitudes. The omitted standalone ownership term remains a specification limitation requiring re-estimation.

Hypothesis Testing and Model Fit

Table 7. Hypothesis Testing Results

	Hypothesis	Coefficient	t-statistic	p-value	Decision	Direction
H1	Age → profitability	-0.018681	-15.89643	< 0.001	Supported*	Negative at MO = 0
H2	Size → profitability	-0.142184	-34.56158	< 0.001	Supported*	Negative at MO = 0
H3	Size × ownership	-0.046075	-3.235641	0.0018	Supported*	Negative interaction
H4	Age × ownership	0.030211	3.598199	0.0006	Supported*	Positive interaction

Note: *Support refers only to the supplied specification and conventional reported inference; it remains subject to the ownership-main-effect and residual-dependence checks described above.

Table 7 summarizes H1–H4. H1 is provisionally supported in the reported restricted model because the age coefficient is negative and statistically significant ($b = -0.018681$; $p < 0.001$). H2 is likewise provisionally supported for size ($b = -0.142184$; $p < 0.001$). These two coefficients are conditional slopes at $MO = 0$. H3 is provisionally supported by the negative size–ownership interaction ($b = -0.046075$; $p = 0.0018$), and H4 is provisionally supported by the positive age–ownership interaction ($b = 0.030211$; $p = 0.0006$).

Table 8. F-Test and Coefficient of Determination

Indicator	Value
Root MSE	0.096189
R-squared	0.970380
Adjusted R-squared	0.968881

Indicator	Value
S.E. of regression	0.099186
F-statistic	647.0393
Prob(F-statistic)	< 0.001
Durbin-Watson stat	0.682776

Table 8 reports $F = 647.0393$ ($p < 0.001$), $R^2 = 0.970380$, and adjusted $R^2 = 0.968881$. The F-test rejects the joint null that all four reported slope coefficients equal zero under the fitted model and its inferential assumptions; it does not establish that each regressor is causal or that a standalone ownership effect has been tested. R^2 indicates that the model accounts for approximately 97.04% of the observed in-sample variation. Adjusted R^2 is approximately 96.89% after adjustment for model size. These measures do not demonstrate out-of-sample predictive accuracy or identify the causes of the unexplained variation.

The Durbin–Watson statistic is 0.682776, substantially below two. This value flags possible residual dependence, but it does not establish panel serial correlation. The supplied output contains no panel-specific serial-correlation, heteroskedasticity, cross-company dependence, or robustness-test results. Tables 5–8 therefore report conventional inference only. No evidence is available that the coefficient signs or hypothesis decisions remain stable under the unrestricted ownership model or a different panel specification. The high in-sample fit does not resolve these limitations.

DISCUSSION

Company Age and Its Association with Profitability

Company age is negatively associated with profitability at the zero-ownership reference point. Therefore, H1 is provisionally supported within the restricted moderated model. This finding describes a conditional age slope, not an unconditional association for every company. Zero ownership is slightly below the reported minimum, so it is a model reference point rather than an observed sample category. A negative association is compatible with established routines or operating commitments that do not support current earnings. Asset obsolescence, maintenance burdens, and managerial rigidity are not measured, however, and remain possible explanations rather than demonstrated mechanisms.

The finding suggests that organizational history and current operating capability should be distinguished. Firmansyah and Kartiko (2024) consider age and size in a sustainable-growth setting; their work is relevant to conditional firm-characteristic arguments but should not be represented as a direct replication of this profitability result. For the present sample, a useful implication is to examine whether long-standing routines support resource efficiency. Such an examination requires operational evidence, because chronological age alone cannot identify which routines should be retained or changed.

The age measure also creates an identification constraint. Within a company, age increases by one each calendar year. With both firm and year fixed effects, this linear measure is exactly absorbed by those effects when establishment year is fixed. The pooled age coefficient may therefore combine differences between older and younger companies with time-related influences. Adding fixed effects is not a mechanical solution that guarantees a separately identifiable age effect. A future design must state clearly whether it seeks to explain between-firm maturity differences, nonlinear life-cycle patterns, or changes over calendar time.

Company Size and Its Association with Profitability

Company size is negatively associated with profitability at the zero-ownership reference point. Therefore, H2 is provisionally supported within the reported restricted model at MO = 0. One possible interpretation is that the earnings generated by additional resources do not offset their associated costs. Asset utilization is not observed directly, however, and the analysis cannot establish whether depreciation, financing expenses, inactive projects, or other conditions explain the negative coefficient. The result should consequently motivate investigation of resource productivity rather than a presumption that large firms are inherently inefficient.

The practical issue is whether expansion produces adequate earnings relative to the resources committed. Evidence from other performance settings should be compared cautiously: [Avinda et al. \(2025\)](#) use moderated regression for firm value among Indonesian coal companies, with size as a moderator of financial relationships. Their study supports examining conditional relationships in an adjacent sector, but it addresses a different outcome and a different moderator. The present negative size association therefore complements rather than duplicates that research question.

An operational response would be to review investment performance at project level rather than infer that reducing the balance sheet must increase profitability. Asset sales can change both earnings and the denominator of an accounting ratio, while deferred investment can temporarily improve a ratio at the expense of future capacity. The regression does not compare those strategies. Managers would need information on utilization, project maturity, financing, and expected cash flows before making an investment decision. The study is useful as a signal for further evaluation, not as a rule to contract or avoid growth.

[Ali \(2025\)](#) reports a positive association between digital banking implementation and business performance in Indonesian Sharia banks. Although that evidence cannot be transferred directly to mining, it illustrates the distinction between possessing resources and developing capabilities that put resources to use. In the present setting, monitoring systems and timely operating information are plausible areas for investigation. Whether they improve mining profitability must be tested with appropriate sector-specific measures rather than assumed from the banking findings.

Managerial Ownership and the Size–Profitability Association

Higher managerial ownership is associated with a more negative size–profitability slope. Therefore, H3 is provisionally supported within the restricted model. The conditional size slope is $-0.142184 - 0.046075 \text{ MO}$. If ownership is coded as a proportion, a one-percentage-point increase in ownership changes that slope by -0.00046075 profitability units per size unit. The negative interaction means that the size association becomes more negative as ownership increases; it does not show that ownership reduces profitability by a fixed amount for every company.

At the reported mean ownership of 0.092298, the fitted size slope is approximately -0.146437 . This value is an algebraic evaluation of the reported equation, not a new regression estimate or a marginal-effect significance test. Its standard error requires the covariance between the size and interaction coefficients, which the supplied tables do not contain. Claims that the slope is statistically significant at a particular ownership level would therefore require additional EViews output.

An agency interpretation is that ownership incentives and managerial discretion can coexist. A manager may be financially exposed to firm outcomes while retaining discretion over asset accumulation and investment timing. Entrenchment is one possible

explanation for a negative interaction, but this study does not measure voting control, board independence, related-party transactions, or managerial tenure. It therefore cannot establish entrenchment as the cause. Alternative explanations include persistent firm characteristics, project mix, or correlation between ownership and omitted financial conditions.

Simon et al. (2025) examine managerial ownership alongside tangibility and business risk in a capital-structure setting. That work places ownership within financing decisions and provides a useful comparison of governance-related variables, but its dependent variable is not profitability. In the present model, financing is not separately controlled. Accordingly, a plausible next step is to test whether the size interaction survives controls for financing and operating conditions. This would help distinguish an ownership-related association from one that proxies for different balance-sheet structures.

Managerial Ownership and the Age–Profitability Association

Higher managerial ownership is associated with a less negative age–profitability slope. Therefore, H4 is provisionally supported within the restricted model. The conditional age slope is $-0.018681 + 0.030211 \text{ MO}$. If ownership is coded as a proportion, a one-percentage-point increase in ownership changes this slope by $+0.00030211$ profitability units per year of age. The positive interaction attenuates the negative age association and eventually permits a positive fitted slope at sufficiently high ownership. It does not mean that the age association is positive throughout the sample.

At mean ownership of 0.092298, the fitted age slope is approximately -0.015893 , which remains negative. The point-estimate slope crosses zero at $\text{MO} \approx 0.618346$, or approximately 61.84% if ownership is coded as a proportion. Although this lies within the reported minimum–maximum range, the number of observations near that value is unknown. It is not an optimal ownership threshold, a policy recommendation, or a statistically established turning point. A confidence interval or region-of-significance analysis requires the coefficient covariance matrix and the ownership distribution.

The ownership distribution is essential for interpreting both relationships. Because the median is far below the mean, evaluations at the mean alone may obscure the experience of typical firm-years. Conditional slopes should be reported at observed ownership quantiles with confidence intervals and the distribution of supporting observations. Such a presentation would distinguish well-supported regions from sparse portions of the ownership range. Summary statistics cannot establish that coverage, and no confidence bands or distributional patterns are inferred beyond what Table 3 reports.

The findings also distinguish statistical support from practical importance. A small p-value does not reveal whether a coefficient represents a material change in annual earnings, and the two interaction coefficients use different predictor units. Their numerical magnitudes therefore cannot rank the economic importance of size moderation against age moderation. That comparison would require clearly defined changes in age and size, a confirmed profitability scale, and estimates of uncertainty for the resulting predicted differences. Presenting those quantities would make the implications more useful to readers while keeping them tied to the data rather than to the apparent size of regression coefficients.

The positive interaction is compatible with an incentive-alignment explanation: managers who share financial outcomes may have stronger reasons to adapt accumulated knowledge to current operational needs. Yet the data do not directly observe learning, adaptation, or knowledge transfer. The interpretation should therefore remain

conditional. Ownership may be associated with these capabilities, but the regression alone does not prove that changing managerial shareholding would create them.

The two interactions also should not be merged into a single statement that ownership is either beneficial or harmful. In the fitted restricted equation, the ownership slope depends jointly on company size and age: $-0.046075 \text{ SIZE} + 0.030211 \text{ AGE}$. A complete hierarchical specification would additionally include the standalone ownership coefficient. Because that coefficient is not reported, the current equation constrains the ownership relationship. This is why re-estimating the full model is necessary before drawing conclusions about the overall financial consequences of increasing managerial ownership.

CONCLUSION

Company age and company size have negative conditional associations with profitability in the reported model for 12 Indonesian listed mining companies during 2018–2024. Both associations are evaluated at the zero-ownership reference point and must be interpreted within the restricted pooled specification. Maturity and asset scale alone are therefore insufficient indicators of earnings capacity. The observational design does not establish that aging or expansion causes profitability to decline.

Managerial ownership conditions the two associations differently. The negative size–ownership interaction corresponds to a more negative size slope, whereas the positive age–ownership interaction corresponds to a less negative age slope. The latter does not imply a positive age association at every ownership level. These patterns remain provisional pending inclusion of the ownership main effect, resolution of panel-model selection, and robust inference. Managers and investors should consider ownership alongside operating conditions and governance arrangements rather than infer a universally beneficial ownership level.

The contribution is a contextual account of how ownership conditions associations between firm characteristics and profitability. For practice, the results motivate reviews of asset efficiency, investment discipline, and the incentives supporting organizational adaptation. They do not establish an optimal size, age, or shareholding policy. Comparisons with other studies must preserve differences between accounting profitability, market value, sustainability reporting, and capital structure, because those outcomes represent distinct dimensions of corporate performance.

LIMITATION

The principal limitations are the small purposive sample, incomplete documentation of the profitability measure and sampling register, omission of the standalone ownership term, mixed model-selection evidence, and possible residual dependence indicated by the low Durbin–Watson statistic. The conventional hypothesis decisions should be reassessed after completing the model and appropriate panel diagnostics. Future work should document company-level data sources, test sensitivity to financing and time conditions, and report conditional slopes with confidence intervals. These steps are needed before stronger causal, predictive, or governance conclusions are justified.

A further robustness analysis should distinguish coefficient stability from statistical significance. Estimates should first be compared after adding the ownership main effect and theoretically justified covariates. Conditional slopes should then be evaluated at ownership values represented in the sample, with uncertainty calculated from the full coefficient covariance matrix. Company-level influence checks would help assess whether a high-ownership firm drives the age interaction. These are proposed analyses

rather than tests already completed. They should be documented even if the revised model does not retain the original significance decisions.

Reproducibility requires recording how annual observations were matched when companies changed names, ownership structures, or reporting presentation. Company identity must remain stable across years, and a disclosure-format change must not be mistaken for a change in the variable itself. A supplementary data dictionary should document each input, annual-report page, transformation, and missing-data decision. The available materials do not contain these records. Table 1 therefore distinguishes the known panel dimensions from the screening and company-identification information still needed to reproduce sample construction.

These limitations restrict the scope of the contribution. Cenci and Kealhofer (2022) address causal reasoning in empirical capital-structure research, underscoring the distinction between fitted financial regularities and intervention claims. Here, repeated firm-year observations support description and conditional modeling, but do not identify the consequences of changing ownership or expanding assets. Greater documentation and robust inference would strengthen confidence in the associations; causal conclusions would additionally require a design that addresses the sources of endogeneity.

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DECLARATION OF CONFLICTING INTERESTS

The authors declare that there is no conflict of interest related to the research process, manuscript preparation, or publication of this article. All results and discussions are presented objectively based on the data and analysis conducted by the authors.

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