# The Impact of ESG on The Financial, Operational, and Value Performance of Materials Sector Company in Asia Pacific from 2019 to 2023

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**Abstract.** This study analyzes the impact of Environmental, Social, and Governance (ESG) factors on the financial, operational, and market value performance of materials sector companies in the Asia Pacific region during 2019-2023. Using a quantitative approach with panel data from 128 purposively selected firms, a fixed effect model is applied to assess the influence of overall ESG scores and each pillar on Return on Assets (ROA), Return on Equity (ROE), Tobin's Q, and Price to Earnings (PE) ratio. The results show that overall ESG scores have a significant negative impact on ROA, ROE, and Tobin's Q, while the effect on PE is positive but not significant. The environmental pillar shows a consistent negative effect, whereas social and governance pillars have no significant influence. These findings suggest a short-term tradeoff between sustainability efforts and firm performance, and indicate that ESG is not yet fully valued by investors in this sector.

**Keywords:** ESG disclosure, Operational Performance, Financial Performance, Market Value, Asia Pacific

## 1 Introduction

The change in the business paradigm from a focus on profit alone to sustainability encourages companies to integrate Environmental, Social, and Governance (ESG) aspects into their corporate strategies ([1]; [2]). ESG is now seen as an important indicator by investors, regulators, and the public in assessing a company's competitiveness and prospects ([3]; [4]). However, the literature shows contradictory results, some studies support stakeholder theory, which sees ESG as having a positive impact on profitability and company value ([5]; [6]), while other studies support the value destroying view, which assesses that the cost of ESG compliance actually reduces financial performance [7].


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The controversy is increasingly relevant in the materials sector, which has a significant environmental impact, high energy consumption, and strong pressure from regulators and investors regarding sustainable practices [8]. In the Asia-Pacific context, the urgency of ESG implementation is increasing in line with high exposure to climate and social risks, the development of TCFD-based reporting regulations, and the surge in sustainable financial instruments [9]. However, empirical evidence on the impact of ESG on corporate performance in this region remains mixed ([4]; [10]).

Therefore, this study focuses on the influence of ESG on the operational, financial, and value performance of the materials sector in Asia Pacific for the period 2019–2023, to provide empirical contributions in explaining the controversy surrounding the relationship between ESG and corporate performance and to enrich the literature on sustainability strategies in this strategic region.

## 2 Literature Review and Development of Hypotheses

### 2.1 The Effect of Environmental, Social, and Governance (ESG) Disclosure on Operational Performance

Environmental, social, and governance (ESG) disclosure is considered important in assessing corporate transparency and sustainability. A number of studies have found a positive effect of ESG on operational efficiency and ROA ([11]; [12]; [13]). However, other studies show negative or mixed results ([12]; [19]; [2]; [14]). The environmental, social, and governance pillars are also reported to have varying impacts on operational performance ([15]; [2]).

Based on this, the research hypotheses are formulated as follows:

H1: ESG scores affect the operational performance (ROA) of material sector companies in the Asia Pacific.

H2: Environmental, social, and governance scores affect the operational performance (ROA) of material sector companies in the Asia Pacific.

### 2.2 The Effect of Environmental, Social, Governance (ESG) Disclosure on Financial Performance

Research on the relationship between environmental, social, and governance (ESG) disclosure and financial performance shows mixed results. Some studies find a positive effect, where companies with higher ESG scores have better profitability ([12]; [15]). However, other studies report negative or insignificant results, mainly due to the high costs of implementing sustainability ([16]; [17]; [2]; [18]). The environmental pillar often shows contradictory results, while governance is generally considered to increase efficiency and reduce agency costs [19].

Based on the literature, the research hypotheses are formulated as follows:

H3: ESG scores affect the financial performance (ROE) of material sector companies in Asia Pacific.

H4: Environmental, Social, and Governance scores affect the financial performance (ROE) of material sector companies in Asia Pacific.

### 2.3 The Effect of Environmental, Social, and Governance (ESG) Disclosure on Market Value

Research on the effect of environmental, social, and governance (ESG) disclosure on company market value, particularly Tobin's Q, shows varying results. Some studies find a positive impact, where sustainability reporting increases valuation and attracts investor interest, especially in carbon-intensive sectors ([12]; [20]; [13]). Other research supports that social disclosure, in particular, contributes positively to market performance because it is considered important to investors ([21]; [19]). However, there are also insignificant or negative results. [2] found that ESG scores had no effect on Tobin's Q, while the governance pillar had a significant negative impact. These differing results indicate that the influence of ESG on market value is greatly influenced by the industry context, specific ESG pillars, and investor preferences.

Based on the literature, the research hypotheses are formulated as follows:

- H5: ESG scores affect the market value (Tobin's Q) of material sector companies in the Asia Pacific.
- H6: Environmental, Social, and Governance scores affect the market value (Tobin's Q) of material sector companies in the Asia Pacific.
- H7: ESG scores affect other market values (Price Earning Ratio) of material sector companies in Asia Pacific.
- H8: Environmental, Social, and Governance scores affect the Price Earning Ratio of material sector companies in Asia Pacific.

## 3 Data and Methodology

### 3.1 Data and Sample Selection

The research uses panel data analysis, a statistical approach that combines the characteristics of time series and cross-section data [22]. Cross-section data covers public companies in the materials sector in the Asia Pacific region, while the time series dimension covers the observation period of 2019–2023. The use of annual data is adjusted to the availability of ESG reports, which are generally published annually. The Asia Pacific region has shown a significant increase in the adoption of ESG reporting. [23] notes that more companies are implementing sustainability disclosures, while [9] reports an increase in companies obtaining assurance on ESG reporting, from 51% in 2019 to 64% in 2021. This reflects the growing market demand for transparency and accountability in ESG reporting.

The research sample was determined by using purposive sampling based on specific criteria tailored to the needs of the analysis. The sample selection criteria included: (1) material sector companies listed on stock exchanges in Asia-Pacific countries during the 2019–2023 period; (2) consistent ESG disclosure, both in the form of composite scores and individual scores for environmental, social, and governance pillars; and (3) having complete financial data for calculating variables such as return on assets (ROA), return on equity (ROE), Tobin's Q, and price earning ratio (PE), as well as control variables such as debt to equity ratio (DER), current ratio (CR), firm size, firm age, and assets turnover (ATO). Based on these criteria, 128 companies were obtained as samples with a total of 640 firm-year observations. All dependent and independent variables are described in Table 1 and 2.

**Table 1.** Description of dependent variables.

| Variables | Description | References |
|---|---|---|
| Dependent Variable | | |
| Retun on Assets (ROA) | ROA to measure a company's operational performance, calculated using the formula net income divided by total assets | Agarwala et al. (2024) |
| Return on Equity (ROE) | ROE is used to measure a company's financial performance and is calculated using the formula: net income divided by total equity. | Agarwala et al. (2024) |
| Tobin's Q (TBQ) | TBQ to measure a company's market value, calculated using the formula: total assets minus equity's book value plus equity's market value divided by total assets. | Agarwala et al. (2024) |
| Price Earning Ratio (PE) | PE to measure a company's market value, calculated using the formula price per share divided by earnings per share | Veeravel et al. (2024) |

Source: [1] & [4], processed

**Table 2.** Description of independent variables.

| Variables | Description | References |
|---|---|---|
| Independent Variable | | |
| ESG Score (ESG) | ESG developed solely from companies' ESG data disclosures | Thomson Reuters Refinitiv Eikon |
| Environmental Pillar Score (EDS) | Company disclosure regarding waste production, pollution, energy use, and so on | Thomson Reuters Refinitiv Eikon |
| Social Pillar Score (SDS) | Company disclosures regarding donations, volunteer work, employee health and safety, and more | Thomson Reuters Refinitiv Eikon |
| Governance pillar score (GDS) | Corporate disclosure on corporate governance corporate | Thomson Reuters Refinitiv Eikon |
| Control Variable | | |
| Debt equity ratio (DE) | DE indicates a company's financial leverage, calculated using the formula total debt divided by equity. | Agarwala et al. (2024) |
| Current ratio (CR) | CR indicates a company's liquidity, calculated using the formula: total current assets divided by current liabilities. | Agarwala et al. (2024) |
| Firm size (FS) | FS is measured by the natural logarithm of total assets | Agarwala et al. (2024) |
| Age | Age is measured by the year the company began operations | Agarwala et al. (2024) |
| ATO | ATO is measured by revenue divided by total assets. | Alareeni & Hamdan (2020) |

Source: [1] & [4], processed

### 3.2 Research Model

This research model refers to the journal by [1], which examines the relationship between overall and individual ESG (environmental, social, and governance) disclosure and company performance in manufacturing companies in India from 2014 to 2022 by adding a new proxy for the company's market value, namely the price earning ratio (P/E) to provide a comparison with Tobin's Q, which refers to the journal by [4].

Therefore, the following formulas are the research models.

Model 1:

$$ROAit = \alpha + \gamma 1(ESG) + \gamma 2(DE) + \gamma 3(CR) + \gamma 4(FS) + \gamma 5(AGE) + \gamma 8(ATO) + \varepsilon it \quad (1)$$

Model 2:

$$ROAit = \alpha + \gamma 1(EDS) + \gamma 2(SDS) + \gamma 3(GDS) + \gamma 4(DE) + \gamma 5(CR) + \gamma 6(FS) + \gamma 7(AGE) + \gamma 8(ATO) + \varepsilon it \quad (2)$$

Model 3:

$$ROEit = \alpha + \gamma 1(ESG) + \gamma 2(DE) + \gamma 3(CR) + \gamma 4(FS) + \gamma 5(AGE) + \gamma 8(ATO) + \varepsilon it \quad (3)$$

Model 4:

$$ROEit = \alpha + \gamma 1(EDS) + \gamma 2(SDS) + \gamma 3(GDS) + \gamma 4(DE) + \gamma 5(CR) + \gamma 6(FS) + \gamma 7(AGE) + \gamma 8(ATO) + \varepsilon it \quad (4)$$

Model 5:

$$TBQit = \alpha + \gamma 1(ESG) + \gamma 2(DE) + \gamma 3(CR) + \gamma 4(FS) + \gamma 5(AGE) + \gamma 8(ATO) + \varepsilon it \quad (5)$$

Model 6:

$$TBQit = \alpha + \gamma 1(EDS) + \gamma 2(SDS) + \gamma 3(GDS) + \gamma 4(DE) + \gamma 5(CR) + \gamma 6(FS) + \gamma 7(AGE) + \gamma 8(ATO) + \varepsilon it \quad (6)$$

Model 7:

$$PEit = \alpha + \gamma 1(ESG) + \gamma 2(DE) + \gamma 3(CR) + \gamma 4(FS) + \gamma 5(AGE) + \gamma 8(ATO) + \varepsilon it \quad (7)$$

Model 8:

$$PEit = \alpha + \gamma 1(EDS) + \gamma 2(SDS) + \gamma 3(GDS) + \gamma 4(DE) + \gamma 5(CR) + \gamma 6(FS) + \gamma 7(AGE) + \gamma 8(ATO) + \varepsilon it \quad (8)$$

Explanation:
$ROAit$ = Return on assets (operational performance) of company i in period t
$ROEit$ = Return on equity (financial performance) of company i in period t
$TBQit$ = Tobin's Q (market value) of company i at time t
$PEit$ = Price earning ratio (market value) of company i at time t
$\alpha$ = Constant term
$\gamma 1{-}8$ = Coefficients of independent variables and control variables
ESG = Overall ESG disclosure assessment of the company
EDS = Individual Environmental disclosure assessment of the company SDS = Individual Social disclosure assessment of the company
GDS = Individual Governance disclosure assessment of the company DE = Debt equity ratio (financial leverage of the company)

CR = Current ratio (liquidity of the company) FS = Firm size
AGE = Firm age
ATO = Assets Turnover
$\varepsilon it$ = Error term

# 4 Analysis and Findings

## 4.1 Descriptive Statistics

Descriptive statistics in Table 3 show that the operational performance of material companies in the Asia Pacific region during 2019–2023 was relatively stable, with an average ROA of 0.0678 (6.78%), which illustrates the companies' ability to generate a profit of USD 0.0678 for every dollar of assets owned. The variation in ROA values was quite wide, ranging from 0.0006 at Wagners Holding Company Ltd Australia, which experienced a drastic decline in profits, to 0.3627 at Fortescue Ltd Australia, which benefited from a surge in demand and iron ore prices. In terms of equity-based profitability, the average ROE was recorded at 0.1475 (14.75%), with the lowest value again belonging to Wagners Holding Company Ltd, while the highest value reached 1.5228 at Yamato Kogyo Co Ltd Japan, which was supported by a financing structure with very low leverage. In terms of market valuation, the average Tobin's Q was 1.9106, indicating that the market value of companies was generally above their book value, with values ranging from 0.4331 for Weihai Guangwei Composites Co Ltd China to 25.5292 for Yamato Kogyo Co Ltd (2020). Another market indicator, the Price Earning Ratio (PER), also shows positive investor expectations with an average of 31.55, although there is high disparity, ranging from 0.4331 for Grange Resources Ltd Australia to 2421.44 for Mitsubishi Chemical Group Corp Japan.

**Table 3.** Descriptive statistics results.

| Variable | Obs | Mean | Std | Min | Max |
|---|---|---|---|---|---|
| | | Independent Variable | | | |
| ESG | 640 | 50.7908 | 19.0840 | 9.0982 | 89.6478 |
| EDS | 640 | 53.8338 | 23.1978 | 2.8844 | 94.9028 |
| SDS | 640 | 47.0910 | 24.2503 | 3.1914 | 93.3007 |
| GDS | 640 | 52.1089 | 2..0984 | 5.0260 | 98.1877 |
| | | Dependent Variable | | | |
| ROA | 640 | 0.0678 | 0.0470 | 0.0006 | 0.3627 |
| ROE | 640 | 0.1475 | 0.1406 | 0.0019 | 1.5228 |
| TBQ | 640 | 1.9106 | 2.6094 | 0.4331 | 25.5292 |
| PE | 640 | 31.5500 | 110.1975 | 1.4492 | 2421.44 |
| | | Control Variable | | | |
| DE | 640 | 0.5662 | 0.5582 | 0 | 5.8377 |
| CR | 640 | 1.9360 | 1.2430 | 0.1786 | 11.0821 |
| FS | 640 | 8.5935 | 1.2430 | 4.9486 | 11.5984 |
| AGE | 640 | 43.4218 | 28.3317 | 2 | 138 |
| ATO | 640 | 1.6490 | 0.2682 | 0.2682 | 7.5071 |

The average ESG score of material companies in Asia Pacific for the 2019–2023 period was 50.7908, indicating a moderate level of disclosure. The lowest score was recorded by Inner Mongolia Junzheng Energy & Chemical Group Co Ltd (9.0982; 2023), while the highest score was recorded by Siam Cement PCL (89.6478; 2020). Of the three pillars, the environmental score (EDS) had the highest average of 53.8338, followed by the governance pillar (GDS) at 52.1089, and the social pillar (SDS) at 47.0910. This indicates that companies are more consistent in disclosing environmental and governance aspects than social dimensions.

### 4.2 Pairwise Correlation Matrix

The correlation test results shown by Table 4 reveal that ESG variables have a very strong relationship with EDS (r = 0.889) and SDS (r = 0.923), as well as a moderate relationship with GDS (r = 0.516). The high correlation between these independent variables indicates the potential for multicollinearity. This condition is considered reasonable because the ESG score is an aggregation of the three pillars of environment, society, and governance [1]. Therefore, this study uses two estimation models, namely the first model that tests the effect of the composite ESG score as a whole, and the second model that analyzes the effect of each pillar of EDS, SDS, and GDS separately. This approach is consistent with previous studies ([1]; [19]; [2]).

**Table 4.** Pairwise correlation matrix.

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) ESG | 1.000 | | | | | | | | | | | | |
| (2) EDS | 0.889 | 1.000 | | | | | | | | | | | |
| | (0.000) | | | | | | | | | | | | |
| (3) SDS | 0.923 | 0.757 | 1.000 | | | | | | | | | | |
| | (0.000) | (0.000) | | | | | | | | | | | |
| (4) GDS | 0.516 | 0.207 | 0.323 | 1.000 | | | | | | | | | |
| | (0.000) | (0.000) | (0.000) | | | | | | | | | | |
| (5) PE | -0.032 | -0.019 | -0.024 | -0.045 | 1.000 | | | | | | | | |
| | (0.419) | (0.634) | (0.542) | (0.254) | | | | | | | | | |
| (6) ROA | -0.059 | -0.115 | -0.024 | 0.018 | -0.145 | 1.000 | | | | | | | |
| | (0.133) | (0.004) | (0.541) | (0.647) | (0.000) | | | | | | | | |
| (7) ROE | -0.011 | -0.024 | -0.003 | 0.000 | -0.095 | 0.658 | 1.000 | | | | | | |
| | (0.786) | (0.544) | (0.941) | (0.997) | (0.017) | (0.000) | | | | | | | |
| (8) TBQ | -0.055 | -0.055 | -0.059 | -0.009 | 0.067 | 0.335 | 0.260 | 1.000 | | | | | |
| | (0.163) | (0.166) | (0.138) | (0.815) | (0.091) | (0.000) | (0.000) | | | | | | |
| (9) DE | -0.047 | -0.036 | -0.121 | 0.130 | 0.083 | -0.395 | -0.262 | -0.180 | 1.000 | | | | |
| | (0.239) | (0.363) | (0.002) | (0.001) | (0.037) | (0.000) | (0.000) | (0.000) | | | | | |
| (10) CR | -0.014 | -0.012 | 0.032 | -0.107 | 0.020 | 0.244 | 0.390 | 0.104 | -0.515 | 1.000 | | | |
| | (0.725) | (0.768) | (0.417) | (0.007) | (0.615) | (0.000) | (0.000) | (0.008) | (0.000) | | | | |
| (11) FS | 0.397 | 0.420 | 0.297 | 0.217 | -0.049 | -0.195 | -0.081 | -0.321 | 0.328 | -0.254 | 1.000 | | |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.214) | (0.000) | (0.041) | (0.000) | (0.000) | (0.000) | | | |
| (12) AGE | 0.309 | 0.307 | 0.338 | -0.013 | -0.055 | 0.016 | 0.242 | 0.044 | -0.178 | 0.242 | 0.124 | 1.000 | |
| | (0.000) | (0.000) | (0.000) | (0.743) | (0.169) | (0.690) | (0.000) | (0.271) | (0.000) | (0.000) | (0.002) | | |
| (13) ATO | 0.000 | -0.048 | 0.053 | -0.019 | 0.101 | -0.148 | -0.092 | -0.086 | -0.095 | 0.214 | 0.068 | 0.032 | 1.000 |
| | (0.999) | (0.222) | (0.178) | (0.638) | (0.011) | (0.000) | (0.020) | (0.030) | (0.016) | (0.000) | (0.085) | (0.416) | |

### 4.3 Selection of Panel Data Regression Estimation Methods

The Chow test results (Table 5) show that all models in this study have p-values below the 5% significance level, so the Fixed Effect Model (FEM) is considered more appropriate than the Common Effect Model. This result is reinforced by the Hausman test (Table 6), which also shows a probability value < 0.05 for all models (Models 1–8), thus reconfirming the FEM as the most appropriate estimation method. Thus, all regression tests in this study use the Fixed Effect Model approach, in line with the findings of previous studies ([24]; [4]; [17]).

**Table 5.** Chow test results.

| Model | F-Value | P-Value | Results |
|---|---|---|---|
| Model 1 | 6,26 | 0,0000 | Fixed Effect Model |
| Model 2 | 6,03 | 0,0000 | Fixed Effect Model |
| Model 3 | 8,32 | 0,0000 | Fixed Effect Model |
| Model 4 | 8,17 | 0,0000 | Fixed Effect Model |
| Model 5 | 21,67 | 0,0000 | Fixed Effect Model |
| Model 6 | 21,62 | 0,0000 | Fixed Effect Model |
| Model 7 | 7,27 | 0,0000 | Fixed Effect Model |
| Model 8 | 7,23 | 0,0000 | Fixed Effect Model |

**Table 6.** Hausman test result.

| Model | Chi-square test value | P-Value | Results |
|---|---|---|---|
| Model 1 | 48,09 | 0,0000 | Fixed Effect Model |
| Model 2 | 53,84 | 0,0000 | Fixed Effect Model |
| Model 3 | 47,20 | 0,0000 | Fixed Effect Model |
| Model 4 | 50,38 | 0,0000 | Fixed Effect Model |
| Model 5 | 18,39 | 0,0053 | Fixed Effect Model |
| Model 6 | 19,84 | 0,0225 | Fixed Effect Model |
| Model 7 | 28,80 | 0,0001 | Fixed Effect Model |
| Model 8 | 13,62 | 0,0001 | Fixed Effect Model |

## 5 Results

The first model tests the effect of composite ESG scores on operational performance (ROA) by including DER, current ratio, firm size, age, and asset turnover as control variables. The estimation results using the Fixed Effect Model (Table 7) show that ESG scores have a negative and significant effect on ROA (coefficient -0.000267; $p<0.05$), indicating a trade-off between sustainability and short-term operational efficiency. The DER variable also has a significant negative effect (coefficient -0.0770; $p<0.01$), while the current ratio does not show a significant effect. Firm size has a significant positive effect (coefficient 0.02310; $p<0.01$), while age and asset turnover have a significant negative effect on ROA ($p<0.01$), reflecting that older and more aggressive companies in terms of asset turnover do not necessarily generate higher profit margins, especially in commodity-based industries.

**Table 7.** Fixed effect model test results.

| | (1) ROA | (2) ROA | (3) ROE | (4) ROE | (5) TBQ | (6) TBQ | (7) PE | (8) PE |
|---|---|---|---|---|---|---|---|---|
| ESG | -0.000268$^{*}$ | | -0.000668$^{**}$ | | -0.00190$^{**}$ | | 0.000759 | |
| | (0.039) | | (0.009) | | (0.003) | | (0.721) | |
| EDS | | -0.000259$^{*}$ | | -0.000479 | | -0.00142$^{*}$ | | 0.00227 |
| | | (0.033) | | (0.057) | | (0.026) | | (0.275) |
| SDS | | -0.0000384 | | -0.000194 | | -0.000399 | | -0.000231 |
| | | (0.767) | | (0.423) | | (0.511) | | (0.918) |
| GDS | | 0.0000706 | | 0.0000794 | | 0.0000824 | | -0.00184 |
| | | (0.537) | | (0.641) | | (0.847) | | (0.282) |
| DE | -0.0770$^{***}$ | -0.0782$^{***}$ | -0.137$^{***}$ | -0.139$^{***}$ | -0.0671 | -0.0921 | 1.176$^{***}$ | 1.194$^{***}$ |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.113) | (0.099) | (0.000) | (0.000) |
| CR | 0.000858 | 0.00204 | -0.0227 | -0.0206 | -0.0227 | -0.0179 | 0.0633 | 0.0455 |
| | (0.935) | (0.853) | (0.162) | (0.228) | (0.677) | (0.749) | (0.580) | (0.706) |
| FS | 0.0231$^{**}$ | 0.0251$^{***}$ | 0.0543$^{***}$ | 0.0572$^{***}$ | -0.0404 | -0.0322 | -0.441$^{**}$ | -0.469$^{**}$ |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.365) | (0.497) | (0.003) | (0.002) |
| AGE | -0.0357$^{**}$ | -0.0332$^{**}$ | -0.0842$^{**}$ | -0.0799$^{**}$ | -0.0783 | -0.0685 | 0.227 | 0.187 |
| | (0.004) | (0.004) | (0.003) | (0.003) | (0.314) | (0.378) | (0.312) | (0.398) |
| ATO | -0.0924$^{***}$ | -0.0966$^{***}$ | -0.178$^{***}$ | -0.184$^{***}$ | -0.245$^{***}$ | -0.263$^{***}$ | 0.928$^{***}$ | 0.987$^{***}$ |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) |
| CONS | 0.119 | 0.0953 | 0.229 | 0.190 | 1.867$^{***}$ | 1.770$^{***}$ | 4.457$^{***}$ | 4.819$^{***}$ |
| | (0.056) | (0.135) | (0.072) | (0.144) | (0.000) | (0.000) | (0.000) | (0.000) |

Source: Stata Output Results (2025), reprocessed

The second model analyzes the effect of each ESG pillar on ROA by using the Fixed Effect Model approach. The regression results show that the environmental pillar (EDS) has a negative and significant effect on ROA (coefficient -0.000259; $p<0.05$), indicating that increased environmental compliance or disclosure has not provided short-term operational benefits in capital-intensive material sectors. Conversely, the social (SDS) and governance (GDS) pillars do not show a significant effect on ROA, suggesting that the benefits of both are likely to be long-term and are not yet reflected in current profitability. Consistent with the previous model, the debt to equity ratio (DER) has a significant negative effect ($p<0.01$), while the current ratio remains insignificant. Firm size shows a significant positive effect on ROA, while age and asset turnover again show a significant negative effect, reflecting that larger companies have higher efficiency, while older and more aggressive companies in asset turnover do not necessarily generate better profitability.

The third model tests the effect of composite ESG scores on financial performance as measured by ROE by using the Fixed Effect Model approach. The regression results show that ESG scores have a negative and significant effect on ROE (coefficient -0.000668), indicating that improvements in sustainability practices tend to suppress shareholder return rates in the short term, particularly in capital-intensive material sectors with high compliance costs. The control variable debt to equity ratio (DER) also has a significant negative effect, indicating that a high debt-based funding structure reduces equity profitability. Conversely, the current ratio does not show a significant effect on ROE. Firm size has a significant positive effect (coefficient 0.0543), indicating that large companies are better able to optimize resources to generate profits for shareholders. Meanwhile, age and asset turnover (ATO) show a significant negative effect on ROE, reflecting that older companies and increased asset activity are not always directly proportional to equity return efficiency, especially when increased sales are not accompanied by adequate profit margins.

The fourth model analyzes the effect of each ESG pillar on ROE by using the Fixed Effect Model approach. The regression results show that only the environmental pillar (EDS) has a negative and significant effect on ROE at a 10% confidence level, indicating that investment in environmental initiatives tends to suppress equity returns in the short term in asset-intensive material sectors. The social (SDS) and governance (GDS) pillars do not show a significant effect on ROE. The control variable debt to equity ratio (DER) has a significant negative effect (-0.139), reflecting that increased leverage reduces shareholder returns due to higher financial costs. The current ratio remains insignificant, indicating that short-term liquidity does not directly affect ROE. Conversely, firm size has a significant positive effect (0.5723), indicating that large companies have better efficiency and competitiveness. The age and asset turnover (ATO) variables show a significant negative effect, illustrating that older companies and those with high asset turnover rates are not necessarily able to convert their operational activities into equity returns, especially when profit margins are inadequate or cost structures are high.

The fifth model tests the effect of composite ESG scores on company market value when measured using Tobin's Q with a Fixed Effect Model approach. The regression results show that ESG scores have a negative and significant effect on Tobin's Q (coefficient -0.001904), indicating that the capital market tends to give lower valuations to companies with high ESG commitments in the materials sector. This may occur because investors consider that ESG implementation still incurs additional costs and has not yet generated direct financial benefits. Control variables such as debt to equity ratio, current ratio, firm size, and age did not show a significant effect, indicating that basic structural factors do not sufficiently influence market perception. However, asset turnover (ATO) had a significant negative effect (-0.2451), indicating that high operational efficiency does not always translate into increased market valuation in the materials industry, which has low profit margins and high production cost pressures.

The sixth model analyzes the influence of each ESG pillar on company market value as measured by using Tobin's Q. The regression results show that only the environmental pillar (EDS) has a negative and significant effect, indicating that environmental initiatives in the materials sector are not yet fully appreciated by the market. This finding contradicts the predictions of stakeholder theory and legitimacy theory, which state that environmental commitment should enhance a company's reputation and value. However, this result can be explained by the high cost of implementing long-term environmental programs, which reduces short-term profitability. On the other hand, control variables show that asset turnover (ATO) has a significant positive effect on Tobin's Q, reflecting that operational efficiency remains a major factor in market valuation. Meanwhile, debt to equity ratio, current ratio, firm size, and age do not show a significant effect, indicating that structural and liquidity factors are not yet considered key determinants in market valuation in this sector.

The seventh model tests the effect of composite ESG scores on profit-based market value as measured by the price earning ratio (PER). The regression results show that ESG scores, current ratio, and age have no significant effect on PER, indicating that corporate sustainability, short-term liquidity, and operational age are not yet major considerations for investors in determining profit-based valuations in the materials sector. Conversely, several control variables show a significant effect. Debt to equity ratio (DER) has a significant positive effect, indicating that the market tends to give higher valuations to companies with more aggressive funding structures because they are considered to have greater profit growth potential. Firm size, on the other hand, has a significant negative effect, reflecting that large companies in the mature stage are considered to have more limited growth space and therefore do not receive high valuation premiums. Meanwhile, asset turnover (ATO) has a significant positive effect on PER, indicating that the market appreciates the efficiency of asset utilization in generating revenue.

The eighth model tests the influence of each ESG pillar on profit-based market value as measured using the price earning ratio (PER). The regression results show that the environmental, social, and governance pillars do not have a significant effect on PER, so it can be concluded that sustainability disclosure at the pillar level does not sufficiently influence market valuation in the form of earnings-based valuation. However, several control variables show a significant effect. The debt to equity ratio (DER) has a significant positive effect, indicating that debt-based funding structures are viewed by the market as a signal of expansion and higher potential earnings growth. Asset turnover (ATO) also has a significant positive effect, indicating that investors appreciate efficient asset utilization.

Conversely, firm size has a significant negative effect on PER, reflecting that large companies tend to be assessed as having more limited profit growth prospects than smaller companies. Meanwhile, current ratio and age do not show a significant effect, so that liquidity and company age are not considered major determinants in the formation of earnings-based market valuation.

## 6 Conclusion

The study analyzes the effect of ESG scores, both composite and based on each pillar of environment, social, and governance, on the operational performance (ROA), financial performance (ROE), and market value (Tobin's Q and Price Earning Ratio) of material sector companies in the Asia Pacific during the period 2019–2023. Based on the panel regression results, several key findings were obtained.

First, composite ESG scores were found to have a negative and significant effect on ROA and ROE, indicating that the implementation of ESG in the materials sector tends to cause short-term trade-offs in asset efficiency and equity returns due to the high costs of sustainability implementation. Second, at the pillar level, only the environmental pillar consistently showed a significant negative effect on ROA and ROE, while the social and governance pillars had no significant impact on profitability. Third, composite ESG scores also had a significant negative effect on market value as measured by Tobin's Q, indicating that investors view ESG commitments as a cost burden rather than a source of value. The environmental pillar is again the only dimension that has a significant negative impact on market valuation, while the social and governance pillars are insignificant. Fourth, neither the overall ESG score nor each pillar has an impact on the Price Earning Ratio, indicating that ESG is not yet a major consideration in profit-based market valuation.

Overall, the results of this study conclude that ESG practices in the materials sector in Asia Pacific are still perceived as a cost center rather than a value driver, so the financial and market benefits of ESG are likely to only be seen in the long term.

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