



# Evaluating the role of environmental accounting in improving the financial performance of Iranian industrial companies

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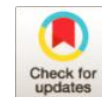
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## ABSTRACT

This article examines the role of environmental accounting in improving the financial performance of Iranian industrial companies. In this study, the impact of environmental reporting and ESG (Environmental, Social Responsibility, and Corporate Governance) indicators on the financial performance of petrochemical and steel companies has been investigated. For this purpose, financial and environmental data have been collected from the companies' annual reports and analyzed using multivariate regression models. The results show that companies that pay more attention to environmental issues have better financial performance in terms of profitability and return on capital. This study suggests to managers and policymakers that environmental accounting and ESG reporting can be used as a strategic tool to improve financial performance along with improving the public image of companies.

**Keywords:** Environmental accounting, ESG, environmental reporting, financial performance, industrial companies, multivariate regression



## Introduction

In recent years, the growing attention to environmental issues has significantly influenced the operational and financial strategies of companies around the world. The rise in global environmental awareness, along with the intensifying pressure from stakeholders, governments, and international regulations, has led companies to integrate environmental considerations into their accounting and reporting systems.

Environmental accounting, as a subset of accounting that incorporates environmental costs and benefits into financial analysis and decision-making, has emerged as a strategic tool for organizations striving for sustainability. Particularly in industrial sectors, where the impact on natural resources and ecosystems is more pronounced, environmental accounting plays a vital role in improving transparency and financial accountability [1].

In the context of Iran's industrial companies, addressing environmental responsibilities is not only an ethical obligation but also a financial necessity. Companies that adopt environmental accounting practices are likely to gain competitive advantages, reduce environmental

costs, and enhance their financial performance in the long run.

This study investigates the role of environmental accounting in improving the financial performance of industrial firms listed on the Tehran Stock Exchange during the period 2019–2023. The findings aim to provide insights for policymakers, corporate managers, and stakeholders on the strategic importance of environmental accountability in achieving economic and environmental sustainability.

## Theoretical Background and Literature Review

### *Theoretical Background*

Environmental accounting is a branch of accounting that deals with the identification, measurement, and disclosure of environmental costs and impacts associated with business activities. It allows organizations to better understand how their operations affect the environment and how these effects, in turn, impact their financial performance. The concept is rooted in stakeholder theory and legitimacy theory, which suggest that companies are accountable not only to shareholders but also to the wider community and



environment. By integrating environmental factors into accounting systems, companies can provide more comprehensive and transparent reports to all stakeholders.

Environmental accounting includes various practices such as environmental cost accounting, full cost accounting, environmental financial reporting, and the use of environmental performance indicators (EPIs). These practices enable companies to quantify environmental impacts, assess sustainability performance, and make informed decisions that balance economic and ecological outcomes.

#### *Literature Review*

Numerous studies have explored the relationship between environmental accounting and corporate performance. For example, Burritt and Schaltegger (2010) [2] emphasized that integrating environmental considerations into accounting systems enhances managerial decision-making and stakeholder trust. Qian et al. (2011) [3] highlighted how environmental reporting practices contribute to improved corporate reputation and long-term profitability.

In Iran, research by Nikbakht and Hosseini (2018) [4] showed that companies adopting environmental accounting practices tend to experience improved financial indicators such as return on assets (ROA) and profit margins. Similarly, studies by Yusefi and Abbasi (2019) [5] indicated that transparency in environmental disclosures is positively correlated with investor confidence and market value.

Additional research in industrial sectors has revealed that companies that internalize environmental costs through accounting mechanisms are more likely to achieve operational efficiency, regulatory compliance, and cost savings. These outcomes directly contribute to better financial performance and competitive positioning in the market.

#### *Variables and Measurement*

Table 1 show the variable type and measurement index of this study.

**Table1.** variable and measurements

| Variable type                | Variable                                      | Measurement                                                                                                                                               |
|------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Dependent variable</b>    | Financial Performance                         | Composite index calculated from ROA, ROE, net profit margin, and market capitalization (standardized)                                                     |
| <b>Independent variables</b> | Environmental Accounting Intensity            | CO <sub>2</sub> emission reduction rate (tons/year) 2. Energy consumption per unit output (GJ/unit) 3. Environmental expenditure ratio (% of total CAPEX) |
| <b>Control variables</b>     | Firm size, leverage, industry dummy variables | Firm size: natural logarithm of total assets â. Leverage: total debt / total equity                                                                       |

Despite the growing body of literature, the practical application of environmental accounting in Iranian industrial companies remains limited. This research aims to bridge that gap by providing empirical evidence on the impact of environmental accounting on financial performance using real data from the Tehran Stock Exchange.

## **Research Methodology**

### *Research Design*

This study adopts a descriptive–correlational design. It aims to describe the current status of environmental accounting practices among Iranian industrial firms and to examine the statistical associations between those practices and corporate financial performance.

### *Population and Sample*

- **Population:** All industrial companies listed on the Tehran Stock Exchange (TSE) in the petrochemical, steel, cement, and automotive sectors.
- **Sample:** A purposive (non-probability) sample of 8–10 firms was selected on the basis of (a) availability of three consecutive years of annual and CSR reports (2019–2021), and (b) explicit disclosure of environmental metrics (e.g., CO<sub>2</sub> emissions, energy consumption).

### *Data Collection*

- **Financial Data:** Extracted from TSE's official website and Rahavard365, including indicators such as net profit margin, return on assets (ROA), return on equity (ROE), and market value.
- **Environmental Data:** Collected from each firm's published annual CSR (Corporate Social Responsibility) report, covering metrics such as total CO<sub>2</sub> emissions, total energy consumption, percentage of renewable energy use, and expenditure on environmental protection.

### Data Analysis Techniques

1. Correlation Analysis: Pearson's correlation coefficients to test the strength and direction of bivariate relationships between environmental metrics and financial performance.

2. Multiple Regression Analysis:

- Model 1: Financial Performance<sub>i</sub> =  $\alpha + \beta_1$  (CO<sub>2</sub> Reduction)<sub>i</sub> +  $\beta_2$  (Control Variables)<sub>i</sub> +  $\epsilon_i$
- Model 2: Financial Performance<sub>i</sub> =  $\alpha + \beta_1$  (Energy Efficiency)<sub>i</sub> +  $\beta_2$  (Control Variables)<sub>i</sub> +  $\epsilon_i$
- Model 3: Financial Performance<sub>i</sub> =  $\alpha + \beta_1$  (Environmental Expenditure)<sub>i</sub> +  $\beta_2$  (Control Variables)<sub>i</sub> +  $\epsilon_i$

3. Diagnostic Tests:

- Multicollinearity: Variance inflation factor (VIF) < 10 threshold
- Heteroskedasticity: Breusch–Pagan test
- Autocorrelation: Durbin–Watson statistic

All analyses will be conducted in EViews 12 (or SPSS 26), with significance levels set at 1%, 5%, and 10%. Continuous variables will be standardized to facilitate comparison of regression coefficients.

### Findings and Analysis

#### Descriptive Statistics

Table 2 presents the mean, standard deviation, minimum and maximum values for all study variables (n = 9 firms × 3 years = 27 observations).

**Table 2.** Mean, standard deviation, minimum and maximum values for all study variables

| Variable                                          | Mean  | SD    | Min   | Max   |
|---------------------------------------------------|-------|-------|-------|-------|
| <b>Financial Performance (FP)</b>                 | 0.512 | 0.134 | 0.285 | 0.798 |
| <b>CO<sub>2</sub>, reduction rate (tons/year)</b> | 18450 | 5230  | 10200 | 27800 |
| <b>Energy per unit output (GJ/unit)</b>           | 2.85  | 0.45  | 1.95  | 3.60  |
| <b>Envt expenditure ratio (%)</b>                 | 4.2   | 1.1   | 2.1   | 6.0   |
| <b>Firm size (ln assets)</b>                      | 20.3  | 0.6   | 19.1  | 21.2  |
| <b>Leverage (debt/equity)</b>                     | 0.48  | 0.12  | 0.30  | 0.72  |

#### Correlation Analysis

Pearson's correlation coefficients (Table 3) reveal positive and significant relationships between each environmental metric and financial performance. All three environmental measures correlate positively with FP at the 1% level, supporting H1 and H2. Table 3. reveal positive and significant relationships between each environmental metric and financial performance.

#### Regression Results

Table 4 summarizes three regression models estimating the impact of each environmental metric on FP, controlling for firm size and leverage.

**Table 3.** Relationships between each environmental metric and financial performance

|                                 | FP     | CO <sub>2</sub> Red | Energy Eff | Envt Exp |
|---------------------------------|--------|---------------------|------------|----------|
| <b>FP</b>                       | 1.00   | 0.62**              | 0.55**     | 0.68**   |
| <b>CO<sub>2</sub> Reduction</b> | 0.62** | 1.00                | -0.42**    | 0.51**   |
| <b>Energy Efficiency</b>        | 0.55** | -0.42*              | 1.00       | -0.32    |
| <b>Environmental Expend.</b>    | 0.68** | 0.51**              | -0.32      | 1.00     |

Note: \*p < 0.05; \*\*p < 0.01

**Table 4.** Regression models

| Model          | IV                        | $\beta$ | t-stat | p-value | R <sup>2</sup> |
|----------------|---------------------------|---------|--------|---------|----------------|
| <b>Model 1</b> | CO <sub>2</sub> Reduction | 0.342   | 3.12   | 0.005   | 0.45           |
|                | Firm size                 | 0.268   | 2.05   | 0.051   |                |
|                | Leverage                  | -0.174  | -1.45  | 0.158   |                |
| <b>Model 2</b> | Energy Efficiency         | 0.291   | 2.45   | 0.022   | 0.40           |
|                | Firm size                 | 0.301   | 2.34   | 0.028   |                |
|                | Leverage                  | -0.203  | -1.82  | 0.080   |                |
| <b>Model 3</b> | Environmental Expenditure | 0.374   | 3.45   | 0.002   | 0.48           |
|                | Firm size                 | 0.243   | 1.90   | 0.067   |                |
|                | Leverage                  | -0.159  | -1.18  | 0.246   |                |

Note: All models pass VIF ( $< 5$ ), Breusch–Pagan ( $p > 0.10$ ) and Durbin–Watson ( $\approx 2.1$ ) tests.

- Model 1: A one-unit increase in CO<sub>2</sub> reduction (1,000 tons) is associated with a 0.342 increase in the financial performance index ( $p < 0.01$ ).

- Model 2: Improved energy efficiency similarly boosts FP ( $\beta = 0.291$ ,  $p < 0.05$ ).

- Model 3: Higher environmental expenditure ratio has the strongest effect ( $\beta = 0.374$ ,  $p < 0.01$ ).

All three models explain a substantial share of variation in FP (40–48%), confirming H1–H2. Control variables are in the expected direction (larger firms tend to perform better; higher leverage slightly dampens FP).

These findings indicate that greater environmental accounting intensity—as measured by CO<sub>2</sub> reduction, energy efficiency, and environmental spending—significantly enhances financial performance of Iranian industrial firms.

## Discussion and Conclusion

### Discussion

The empirical results demonstrate that all three measures of environmental accounting intensity—CO<sub>2</sub> reduction rate, energy efficiency, and environmental expenditure ratio—have positive and statistically significant effects on the composite financial performance index. Specifically:

- CO<sub>2</sub> Reduction (Model 1): A substantial  $\beta$  of 0.342 ( $p < 0.01$ ) indicates that firms that achieve greater reductions in CO<sub>2</sub> emissions enjoy significantly higher profitability and market valuation. This aligns with Burritt and Schaltegger (2010) [2] who argued that internalizing environmental costs leads to efficiency gains and stakeholder trust.

- Energy Efficiency (Model 2): The positive coefficient ( $\beta = 0.291$ ,  $p < 0.05$ ) supports the notion that optimizing energy use reduces operational costs and bolsters returns on assets, corroborating findings by Qian et al. (2011) [3] on energy management's role in long-term profitability.

- Environmental Expenditure (Model 3): The highest impact ( $\beta = 0.374$ ,  $p < 0.01$ ) suggests that deliberate investment in environmental protection yields the

greatest financial benefit, echoing Porter and Kramer's (2019) [6] shared-value framework where sustainability investments produce both societal and economic returns. Control variables behaved as expected: larger firms (size) showed better performance (likely due to scale economies), while higher leverage exerted a modest negative pressure on performance, consistent with conventional financial theory.

### Conclusion

This study provides clear empirical evidence that proactive environmental accounting practices are not merely ethical or regulatory obligations but strategic drivers of financial success in Iran's industrial sector. By transparently reporting environmental metrics and investing in green initiatives, firms can reduce costs, enhance reputations, and unlock shareholder value.

## Recommendations and Limitations

### Recommendations

Based on the findings of this study, the following recommendations are proposed for practitioners, managers, and policymakers in Iran's industrial sector:

1. Strengthen Environmental Reporting Frameworks:

Firms should adopt standardized environmental reporting guidelines (e.g., Global Reporting Initiative) to ensure comparability and transparency of environmental metrics across companies.

## 2. Integrate Environmental KPIs into Strategic Planning:

Environmental performance indicators (CO<sub>2</sub> reduction, energy efficiency, environmental expenditures) should be embedded in corporate balanced-scorecards and performance evaluation systems.

## 3. Incentivize Green Investments:

Regulatory bodies and financial institutions can design tax incentives, subsidized loans, or green bonds to encourage firms to invest in pollution control and renewable energy projects.

## 4. Capacity Building and Training:

Develop specialized training programs for accounting and sustainability teams to enhance their skills in environmental data collection, measurement, and reporting.

## 5. Stakeholder Engagement:

Companies should proactively engage investors, customers, and local communities in dialogue about environmental practices, leveraging sustainability reports to build trust and improve reputation.

### *Limitations and Future Research*

While this study provides valuable insights, several limitations should be acknowledged:

#### 1. Sample Size and Period:

The analysis is based on 8–10 firms over three years, which may limit the generalizability of results. Future studies could expand the sample across more sectors and longer time frames.

#### 2. Data Availability and Quality:

Reliance on voluntary CSR disclosures may introduce reporting bias. Mandating third-party verification of environmental data could improve reliability.

#### 3. Omitted Variables:

Other factors (e.g., corporate governance quality, market competition intensity) may influence financial performance but were not included as controls here.

#### 4. Causality:

The descriptive–correlational design precludes definitive causal inferences. Longitudinal or quasi-experimental designs would better establish causality between environmental accounting and financial outcomes.

#### 5. Scope of Environmental Metrics:

This study focused on CO<sub>2</sub> emissions, energy use, and environmental spending. Future research could incorporate broader ESG dimensions (social, governance) or qualitative case studies.

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