

Article

Does Environmental Cost Expenditure Matter? Evidence from Selected Countries in the Asia-Pacific Region

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Abstract: This study investigated the effect of companies' environmental cost expenditure on environmental performance and the disclosure thereof by selected companies in the Asia-Pacific region. This region is vulnerable to significant environmental degradation due to its substantial economic development. This study examined the issue from a legitimacy theory perspective. Secondary data, collected from the Bloomberg database of 578 listed companies from 2008 to 2020, were used as the sample for the study. The results show that the level of environmental cost expenditure does matter because it was positively associated with environmental performance and its disclosure. The environmental performance variable also served as a mediating variable between environmental cost expenditure and disclosure. Disclosure provides a signal to investors to access companies' environmental initiatives and risks, which could influence their investment decision. The findings highlight the importance of companies' financial commitment to protect and preserve the environment in their daily operation. The findings also help managers to make strategic business decisions to strengthen their companies' legitimacy by operating within the norms and values shared by society. The results from this study provide an insight which can be generalized with respect to companies from other regions.

Keywords: environmental cost expenditure; environmental performance; environmental disclosure; legitimacy theory; mediation analysis



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1. Introduction

Society's ever-increasing concern over the impact of business activities on the natural environment has pressured companies to implement more effective environmental management and conservation programs. In fact, the sustainability of companies can be determined by the management of their natural environmental impact [1]. Environmental management accounting (EMA) is one of the programs that companies can use to manage their environmental impact, achieved by implementing a system that can trace, manage and report the effect of business activities on the environment. EMA focuses not only on recording quantitative business transactions that contribute towards profitability but also on other qualitative transactions that affect the natural environment such as water, air and land pollutions, climate change and waste of natural resources.

The information provided by EMA assists companies in assessing the cost and benefit of manufacturing environmentally friendly products which can be recycled and reused. EMA also provides information on the usage of natural resources in the manufacturing process [2–4] and the effect of those processes on industrial wastage and pollution [3]. In general, the implementation of EMA can lead to the improvement of the companies' overall environmental management and performance [5]. Companies with good environmental performance are more competitive and valued by the stakeholders.

Additionally, companies with good environmental performance will provide more information to the public to keep investors and other stakeholders informed about the

companies' environmental initiatives and impacts [6]. This reporting reduces agency costs and information asymmetry between managers and stakeholders. It is beneficial to investors in estimating the company's environmental risk, which can affect the value of their investment in the company [7]. The report also indicates the company's commitment to fulfilling the shareholders' expectations with regards to their environmental management practices [8]. Previous studies have provided evidence of the association between EMA practices and environmental performance and disclosure [9–11]. Previous studies also confirm a positive association between environmental performance and environmental disclosure [12–15].

However, those previous studies employed a general measurement method to gauge EMA practices [9–11]. This method inhibits us from determining the degree of companies' actual financial commitment towards the effective management of the environment. According to [16], the actual level of environmental cost (EC) expenditures incurred by a company would be the best measure to evaluate the extent of the company's actual commitment to protecting and preserving the environment. Furthermore, investment in environmental matters by companies in emerging markets are still behind those by developed markets.

Thus, this study proposes a specific measurement of EMA, based on the actual level of environmental cost (EC) expenditures incurred by a company, to measure the extent of companies' actual environmental commitment [16]. If the level of EC expenditure is high, it is a signal that the companies are committed to managing environmental issues more effectively in their operation. The importance of EC expenditure in the management of the environment has provided us with an opportunity to expand research from previous studies by examining the impact of environmental cost expenditure on environmental performance and the disclosure thereof by selected listed companies in Asia Pacific region. The finding from this study will add new insights on the issue.

This study also investigated the mediating role of environmental performance between EC expenditure and environmental disclosure. Understanding the role of environmental performance is important because companies with good environmental performance will provide better and more transparent environmental disclosure. Disclosure can be used as a tool to strengthen the legitimacy of companies in society. To the authors' knowledge, the evidence of the mediating role of environmental performance has not been empirically tested before. Thus, this study fills in the research gap.

This study used legitimacy theory to provide justification for the predicted relationship amongst variables. The theory indicates that companies legitimize their actions and existence by operating within the acceptable norms and values preferred by society [17]. Companies' financial commitment towards the preservation and protection of the environment, improving environmental performance and disclosure, will earn them stronger support from society. This legitimacy theoretical perspective is translated into the research objectives stated as follows:

1. To investigate the relationship between environmental cost (EC) expenditure and environmental performance.
2. To investigate the relationship between environmental cost (EC) expenditure and environmental disclosure.
3. To investigate the relationship between environmental performance and environmental disclosure.
4. To investigate whether environmental performance can mediate the relationship between environmental cost (EC) expenditure and environmental disclosure.

The sample of this study comprised selected public listed companies in the Asia-Pacific region that are registered in the Bloomberg database in the years 2008 to 2020. The results show that environmental cost expenditure positively affects environmental performance and disclosures. Moreover, environmental performance is shown to have a positive effect on environmental disclosure and to mediate the relationship between environmental cost expenditure and environmental disclosure.

The findings add to an understanding of the effect of environmental management accounting practices, which are measured by the level of environmental cost expenditure, environmental performance and environmental disclosure. In other words, the findings provide evidence of the importance of monetary commitment to managing environmental issues, as this commitment will lead to better environmental performance and disclosure. Disclosure provides a positive signal to investors and strengthens the legitimacy position of companies in society. The findings from this study, which used data from multiple countries in the Asia-Pacific region, provide an insight which can be generalized in terms of countries from other regions.

The following sections present a theoretical and empirical literature review of the study, which comprise a discussion of the development of the hypotheses. This is followed by the research design and the results of the analysis. The last section presents the conclusion.

2. Theoretical Literature Review

A business organization must strive for legitimacy to sustain its existence [18–20]. Corporate legitimacy is defined as the congruence of a company's values and norms with social values and expectations [17]. According to [21], there is a "social contract" between companies and society whereby a company must operate within the norms and values set by society. With the increase in public awareness of environmental and social responsibility issues, companies are expected to be more careful in their daily operations not to have damaging effects on the natural environment. Companies with good environmental performance and reputation will be more competitive, favored by stakeholders and, through the supply and demand of market mechanisms, will improve their financial performance. Environmentally conscious consumers prefer to buy services and products manufactured by environmentally friendly processes. Products must contain materials that have been recycled, are easy to recycle, or are gathered from natural resources. These products should be made in processes that use the least number of natural resources as possible.

Legitimacy theory is commonly used in the study of corporate environmental performance and disclosure. In this study, legitimacy theory provides justification for corporate environmental management accounting practices and their implication for environmental performance and disclosure [22]. The theory provides a basis for increasing companies' initiatives in managing the environment in their operation, such as implementing EMA practices. EMA practices, which lead to the improvement of environmental performance and disclosure, are vital to obtain, maintain and improve a company's legitimacy in society [23]. However, some companies tend to exaggerate their positive environmental impact (greenwashing), which can mislead stakeholders as to the company's actual performance and disclosure.

3. Empirical Literature Review and Hypothesis Development

3.1. Environmental Cost Expenditure and Environmental Performance

An environmental management accounting (EMA) system enables companies to get detailed financial information with regards to the identification, collection and analysis of environment-related costs. The major areas for the application of EMA are in product pricing, budgeting, investment appraisal, the costing of environment-related activities and the setting of quantified performance targets [16]. The information generated by the system supports internal environmental management processes and decision making [16]. Environmental cost expenditure as part of the EMA implementation process complements the conventional financial management accounting approach, with the aim of developing appropriate mechanisms which assist in the identification and allocation of environment-related costs [24].

The implementation of EMA also guides managers towards using available resources effectively and efficiently. Thus, the implementation of EMA could directly or indirectly have a significant positive effect on environmental performance. In this study, EMA is measured based on companies' actual monetary commitment towards environmental issues.

The budgeted expenditure enables companies to install environmentally friendly processes and activities [25]. The importance of environmental cost expenditure is highlighted from two different perspectives [26], to evaluate current alternative environmental projects, and the future environmental performance of the company. The findings have provided companies with indicators to manage their business risk and ongoing environmental issues [27]. Companies invest substantially by installing various environmental programs with specific environmental budget allocations to reduce the usage of natural resources in their production line [2], lower manufacturing costs [3,4] and improve productivity and financial performance [3]. Companies which demonstrated better environmental performance strengthens their legitimisation in society. Therefore, the first hypothesis is stated as follows:

Hypothesis 1 (H1). *Environmental cost expenditure has a positive effect on environmental performance.*

3.2. Environmental Cost Expenditure and Environmental Disclosure

The implementation and design of environmental management accounting (EMA) may improve a company's management and measurement of environmental information [11]. EMA aims to provide companies with quantitative and qualitative information on how environmental management accounting functions within the company [28]. The implementation of EMA facilitates the measurement and collection of environmental cost and benefit information. This enables companies to disclose that information to stakeholders [29]. According to agency theory, disclosure will reduce information asymmetry between the management and stakeholders. The information assists shareholders and investors to make informed decisions. The reporting of environmental information in the Sustainability Report or in companies' annual reports has been considered a preferred and credible reporting platform [30].

Past studies show that companies that invest substantially in EMA have had a positive effect on the quality of corporate carbon disclosure in 114 large companies in the US, Germany, Australia and Japan [9]. Refs. [10,11] also indicated that good environmental management has a positive effect on the level of environmental disclosure. This relationship between environmental management accounting practices and the disclosure of environmental information is consistent with legitimacy theory [21]. Companies strengthen their legitimacy in society by implementing processes and procedures in environmentally friendly business operations, fulfilling the community's expectations and disclosing this information in annual reports. Reporting is one of the legitimizing strategies which can be used by a company. Thus, higher levels of companies' commitment towards EMA implementation have generated more information to be reported to the public. Disclosure also increases the transparency and accountability of reporting. Therefore, the following proposed hypothesis is stated as follows:

Hypothesis 2 (H2). *Environmental cost expenditure has a positive effect on environmental disclosure.*

3.3. Environmental Performance and Environmental Disclosure

Companies with superior environmental performance have an incentive to disclose more environmental information to investors and other stakeholders [6,8,14,31]. Good environmental performance information is considered good news. It indicates companies are successfully fulfilling shareholders' expectations with regards to their environmental protection and conservation initiatives [8]. Hence, companies that implement EMA with proper environmental policies or strategies would accomplish better environmental performance and would likely provide detailed environmental disclosure [32]. Disclosure assists investors in estimating environmental management risks which can affect their investment decision [7]. It would also strengthen the company's legitimacy in society and reduce

information asymmetry with stakeholders [21]. This study predicts a positive relationship between environmental performance and environmental disclosure. Therefore, the third hypothesis is stated as follows:

Hypothesis 3 (H3). *Environmental performance has a positive effect on environmental disclosure.*

3.4. Mediation Role of Environmental Performance

EMA practices through EC expenditure guide managers towards using available resources effectively and efficiently, which will reduce companies' negative environmental impact [33]. The established relationships between EMA practices and environmental performance and disclosure, as well as the relationship between environmental performance and environmental disclosure, create a relationship chain between these three variables; environmental performance can serve as a mediator variable in this relationship. The implementation of EMA, measured based on environmental cost expenditure, could directly or indirectly have a significant positive effect on environmental performance, which will eventually lead to better environmental disclosure [34]. Therefore, this study predicts a mediation role by environmental performance between EMA and environmental disclosure. Therefore, the fourth hypothesis is stated as follows:

Hypothesis 4 (H4). *Environmental performance mediates the relationship between environmental cost expenditure and environmental disclosure.*

4. Research Design

4.1. Data and Sample

The population of this study is publicly listed companies in the Asia-Pacific region that are registered in the Bloomberg database. The region is vulnerable to environmental problems and climate change due to its significant economic development without much concern for the environmental consequences [35]. Companies were selected as samples if they have complete information on their environmental disclosure score (EDS), EC expenditure and environmental performance (EP) from 2008 to 2020. The year 2008 was chosen as the starting year of this study because it was the first year when EDS data were made available in the Bloomberg database. The final sample of this study comprised 578 companies, with an unbalanced panel data set per year of observation [36–38].

4.2. Measurement of Variables

The dependent variable is environmental disclosure (ED). It is measured based on the Environmental Disclosure Score (EDS) provided in the Bloomberg database [39–41]. EDS provides information on 60 environmental data items. The detail measurement of the data items is provided by [41]. The environmental data points are adjusted by industry and weighted by importance. The percentage score ranges from 0 to 100 percent, where each datum is assessed according to its importance [39–41]. For instance, greenhouse gas emissions information is given more weight than other disclosure items due to the significance of companies' impact on air pollution [41]. Bloomberg gathers the data from companies' annual reports, press releases, sustainability reports and third-party research output [40]. The EDS score covers various types of environmental information that could broadly be classified as either 'hard' items or 'soft' items. 'Hard' items include quantifiable data such as Carbon/GHG emissions, energy/water consumption, waste recycled and investments in sustainability and ISO certification, among others. 'Soft' items include firms' environmental policies and initiatives such as waste reduction policy, energy efficiency policy and green building policy, amongst others. Bloomberg summarizes these environmental data into scores, with higher scores indicating more transparent disclosure on environmental matters. In this study, EDS data were converted into percentages, ranging from zero percent for companies that do not disclose the data to 100 percent for companies that disclose all 60

data points [39–41]. The EDS score provides information on the level of environmental disclosure given by a company to the public.

The independent variable is the implementation of environmental management accounting (EMA) measured by the actual environmental cost (EC) expenditure incurred by sample companies. Bloomberg defined EC expenditure as the cost of environmental conservation and other environmental initiatives undertaken by a company. The level of EC expenditure represents the actual financial commitment of companies to environmental matters. In general, it provides financial information on production and service costs based on environmentally friendly processes and material flow balances to increase efficiency [42]. Environmental cost expenditure includes environmental improvement costs, pollution prevention costs, investment costs in environmental research and development (R&D) and the costs of implementing environmental management systems [12]. The EC data were converted to US dollars (USD) [12].

The mediator variable is environmental performance (EP). It is assessed based on environmental performance indicators which were evaluated based on the use of natural resources, waste disposal, emissions and/or water consumption. In this study, the EP measurement was adopted from [43] in accordance with a checklist of four environmental performance dimensions, as follows:

1. Energy efficiency policy;
2. Emission reduction initiatives;
3. Waste reduction policy; and
4. Water policy.

The range of scores for each environmental performance dimension is 0–4, depending on the achievement indicators. A score of '0' is given if a company has not achieved any of the environmental performance indicators and a maximum score of '4' is given if a company has achieved all performance indicators. The total possible maximum score for the environmental performance indicator is 16. Thus, the score for each company EP variable is calculated as follows:

$$EP_{it} = \frac{\text{Actual score environmental performance indicators achieved}}{\text{Total maximum possible score}}$$

There are five control variables that have been confirmed in past studies that can explain the level of environmental performance and disclosure. They are total assets (SIZE), profitability (return on equity-ROE), board independence (ID), governance disclosure score (GDS) and board size (BS) [39–41]. SIZE represents the visibility of companies, whilst ROE signifies the company's ability to generate a net income for owners or investors. ID represents the governance monitoring mechanisms to improve performance and disclosure measured based on the ratio of independent board members to total board members. GDS represents the company's overall governance mechanisms measured by the level of disclosure from quantitative environment, social and governance (ESG) data taken from the Bloomberg database. BS represents the number of board members monitoring the company's management.

4.3. Data Analysis Technique

The multiple linear regression method was used to test all hypotheses. The basis of regression analysis is the dependence of one dependent variable on one or more independent variables to estimate and predict the population average [44]. Several classical regression assumption tests were conducted, such as normality, multicollinearity and heteroscedasticity, to test the data set. The multicollinearity test was checked by examining the correlation values in the Pearson correlation analysis.

The four research models to test all hypotheses are as follows:

1. Model 1 to test H1—the direct relationship between EC and EP together with five control variables.

$$EP_{it} = \alpha_0 + \beta_0 EC_{it} + \beta_1 SIZE_{it} + \beta_2 ROE_{it} + \beta_3 ID_{it} + \beta_4 GDS_{it} + \beta_5 BS_{it} + \varepsilon_{it} \quad (1)$$

2. Model 2 to test H2—the direct relationship between EC and ED together with five control variables.

$$ED_{it} = \alpha_0 + \beta_1 EC_{it} + \beta_2 SIZE_{it} + \beta_3 ROE_{it} + \beta_4 ID_{it} + \beta_5 GDS_{it} + \beta_6 BS_{it} + \varepsilon_{it} \quad (2)$$

3. Model 3 to test H3—the direct relationship between EP and ED with five control variables.

$$ED_{it} = \alpha_0 + \beta_1 EP_{it} + \beta_2 SIZE_{it} + \beta_3 ROE_{it} + \beta_4 ID_{it} + \beta_5 GDS_{it} + \beta_6 BS_{it} + \varepsilon_{it} \quad (3)$$

4. Model 4 to test H4—the mediating role of EP in the relationship between EC and ED. This study followed the three-step process suggested by [45] as follows:

Step 1 The independent variable (EC) needs to be significantly associated with the dependent variable (ED). In this step, the study will test Equation (2) above.

Step 2 The independent variable (EC) needs to be significantly associated with the mediator variable (EP). In this step, the study will test Equation (1) above.

Step 3 The mediating variable (EP) needs to be significantly associated with the dependent variable (ED) after controlling the independent variable (EC). In step, the study will test the following equation.

$$ED_{it} = \alpha_0 + \beta_0 EP_{it} + \beta_1 EC_{it} + \beta_2 SIZE_{it} + \beta_3 ROE_{it} + \beta_4 REV_{it} + \beta_5 ID_{it} + \beta_6 GDS_{it} + \beta_7 BS_{it} + \varepsilon_{it} \quad (4)$$

where:

ED = Environmental disclosure, EP = Environmental performance, EC = Environmental cost expenditure, SIZE = Total asset, ROE = Return on equity, ID = Independent director, GDS = Governance disclosure score, BS = Board size.

5. Empirical Results and Discussion

5.1. Descriptive Results

Table 1 presents the number and origin of the companies included in the sample for this study. It shows that most sample companies are from China (377 companies or 58.30 percent of sample companies). The next largest representation is from India with, 73 companies or 12.63 percent. The least number of companies are from the Philippines, Sri Lanka and Vietnam, which have a total of only six companies in the sample.

Table 1. Data of sample companies (2008–2020).

No.	Country	Number of Companies	Percent
1	China	337	58.30
2	India	73	12.63
3	Indonesia	57	9.86
4	Thailand	31	5.36
5	Hong Kong	28	4.84
6	Malaysia	26	4.50
7	Pakistan	11	1.90
8	Taiwan	9	1.56
9	Philippine	3	0.52
10	Sri Lanka	2	0.35
11	Vietnam	1	0.17
	Total	578	100.0

Table 2 shows the distribution of the sample companies according to the years of the study. The number of companies in the Bloomberg database increased from only one company in 2008 to 176 companies in 2019. Table 3 shows the distribution of the sample companies by industry. The highest sample companies come from the Materials, Food, Beverage & Tobacco and Capital Goods industries.

Table 2. Number of Companies According to Years of Study.

Year	Frequency	Percent
2008	1	0.17
2009	3	0.52
2010	8	1.38
2011	12	2.08
2012	18	3.11
2013	26	4.50
2014	32	5.54
2015	39	6.75
2016	60	10.38
2017	71	12.28
2018	90	15.57
2019	176	30.45
2020	42	7.27
Total	578	100.0

Table 3. Number of sample companies according to industry.

Industry	Frequency	Percent
Materials	193	33.39
Food, Beverage & Tobacco	68	11.76
Capital Goods	62	10.73
Pharmaceuticals, Biotechnology & Life	57	9.86
Energy	56	9.69
Technology Hardware & Equipment	43	7.44
Utilities	29	5.02
Automobiles & Components	17	2.94
Media & Entertainment	8	1.38
Consumer Durables & Apparel	9	1.56
Banks	7	1.21
Real Estate	7	1.21
Transportation	5	0.87
Consumer Services	6	1.04
Food & Staples Retailing	4	0.69
Semiconductors & Semiconductor Equipment	2	0.35
Software & Services	2	0.35
Health Care Equipment & Services	1	0.17
Household & Personal Products	1	0.17
Insurance	1	0.17
Total	578	100

Table 4 depicts the descriptive information of all variables included in the study. Data on environmental cost expenditure (EC), environmental performance (EP), environmental disclosure (ED), total assets (SIZE), return on equity (ROE), independent director (ID), governance disclosure score (GDS) and board size (BS) were all transformed into the natural logarithm of the variable.

Table 4. Descriptive statistics of variables ($n = 578$).

	Mean	Median	Maximum	Minimum	Std. Dev.
ED	3.155	3.274	4.490	−1.109	0.773
EP	−0.270	−0.288	0.000	−1.386	0.322
EC	5.192	2.528	22.393	−6.075	6.734
SIZE	13.644	11.063	25.765	6.597	5.693
ROE	−2.370	−2.239	0.558	−6.908	1.099
ID	3.679	3.593	4.487	2.996	0.237
GDS	3.970	3.947	4.471	3.524	0.164
BS	2.207	2.197	2.890	1.099	0.261

Notes: ED = Environmental disclosure, EP = Environmental performance, EC = Environmental cost expenditure, SIZE = Total asset, ROE = Return on equity, ID = Independent director, GDS = Governance disclosure score, BS = Board size.

5.2. Multicollinearity Analysis

Table 5 shows the Pearson correlation results amongst the variables. The results show that there are no multicollinearity issues among independent variables as all correlations are below 0.80 [46]. Moreover, all VIF values are less than 10. Results indicate that EC expenditure is positively correlated with EP (correlation coefficients = 0.227) and ED (correlation coefficients = 0.124).

Table 5. Pearson correlation ($n = 578$).

	ED	EP	EC	SIZE	GDS	BS	ROE	ID	VIF
ED	1								
EP	0.008 (1.830)	1							3.114
EC	0.124 ** (4.933)	0.227 ** (2.990)	1						2.568
SIZE	0.040 (0.297)	−0.458 ** (4.457)	0.502 ** (8.868)	1					2.615
GDS	0.041 ** (2.082)	0.340 ** (2.259)	0.387 (1.146)	0.091 ** (4.450)	1				8.497
BS	−0.004 (0.238)	0.641 ** (0.495)	−0.250 (0.228)	−0.673 * (1.999)	−0.571 ** (5.352)	1			2.410
ROE	0.014 (0.335)	−0.020 (0.474)	0.062 (1.493)	−0.047 (1.711)	−0.028 (0.502)	0.013 (0.303)	1		1.000
ID	0.034 (1.001)	−0.250 ** (1.560)	0.353 (0.236)	0.824 ** (3.560)	0.018 ** (3.803)	−0.469 ** (2.845)	−0.036 (0.861)	1	2.922

Notes: ED = Environmental disclosure, EP = Environmental performance, EC = Environmental cost, SIZE = Natural logarithm of total asset, GDS = Governance disclosure score, BS = Board size, ROE = Return on equity, ID = Independent director. T statistics are in parentheses, ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

5.3. Testing of Hypothesis

This study initially performed three sets of data analyses to determine which analysis was statistically the most appropriate method for our dataset: the ordinary least square (OLS) pooled model, the fixed effects model and the random effects model. The Hausman's test results showed that the fixed effect model was the most appropriate method to be employed because its probability value is significant at p less than 5 percent. Detailed results are presented in Table 6.

Table 6. Results of fixed effect regression model.

	EP	ED	ED	ED
Dependent Variable	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Constant	1.710 ** (2.703)	−7.595 * (−2.016)	−9.946 * (−2.257)	−8.916 * (−2.358)
EP			1.523 ** (3.101)	0.772 * (2.407)
EC	0.003 * (1.986)	0.108 ** (11.339)		0.106 ** (11.096)
SIZE	−0.014 * (−2.280)	0.189 ** (5.087)	0.317 ** (7.586)	0.201 ** (5.379)
GDS	1.151 ** (7.716)	1.461 (1.645)	0.288 (0.258)	0.573 (0.599)
BS	−0.648 ** (−3.470)	0.378 (0.340)	1.170 (0.893)	0.879 (0.781)
ROE	0.000 (−0.004)	0.175 (0.583)	0.514 (1.488)	0.175 (0.588)
ID	0.013 (0.173)	0.417 (0.896)	0.302 (0.302)	0.404 (0.879)
R ²	0.955	0.849	0.971	0.979
R ² adjusted	0.923	0.848	0.952	0.965
F stat	30.299	5.363	4.929	67.229
p-value	0.000	0.000	0.000	0.000
Hausman test	62.643 *	135.198 *	275.829 *	144.933 *

Notes: ED = Environmental disclosure, EP = Environmental performance, EC = Environmental cost, SIZE = Total asset, GDS = Governance disclosure score, BS = Board size, ROE = Return on equity, ID = Independent director. T statistics are in parentheses, ** Coefficient is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

The study also performed the Ramsey Reset test to ensure the suitability of the linear function assumption. The results showed that the regression model was acceptable (F-statistic 1.319, $p = 0.251$). The Sargan specification test was carried out to test the validity of the instrument variables used as a whole by testing samples which are analogous to the control moment used. The results showed that all variables had a statistical probability above 0.05, which means that the instrument used was valid. The ARCH test, moreover, showed that the data distribution was free from heteroscedasticity problems. The study also conducted an autocorrelation test and obtained a probability value of the Breusch–Godfrey Serial Correlation LM above 0.05, indicating that the model was free of autocorrelation problems. We applied the central limit theorem theory, whereby the distribution of sample means is considered to be nearly normal if the sample size is large, regardless of the population distribution.

5.3.1. Environmental Cost (EC) Expenditure and Environmental Performance (EP)—Hypothesis 1

Model 1 in Table 6 shows that environmental cost (EC) expenditure has a positive effect on environmental performance ($\beta = 0.003$; $t = 1.986$, $p < 0.05$). The results indicate that the financial commitment incurred by companies helps managers to manage natural resources more effectively to achieve better environmental performance [33]. Hence, it can be concluded that H1, which states that environmental cost expenditure has a significant positive effect on environmental performance, is accepted.

Expenditure on the environment matters because it enables top management to conduct product improvement, inventory and environmental impact analysis. Companies can

afford to implement various environment-related programs to reduce their usage of natural resources [2], lower manufacturing costs [3,4] and improve productivity and financial performance [3]. These financial resources enable companies to recognize, estimate and classify costs and liabilities more accurately, and use the information to make strategic decisions related to environmental matters. The environmental management strategy directs the company to implement an effective environmental management system that improves environmental performance.

This finding is consistent with the findings of previous studies' which documented the same results [34,47,48]. Environmental management accounting helps companies identify potential environmental benefits and understand corporate environmental responsibility through environmental cost allocation. The findings also indicate that companies which use environmental management accounting are more likely to pay attention to environmental issues and comply with environmental regulations. They spend resources to monitor environmental problems and ensure compliance with laws and regulations, which subsequently improves environmental performance [49]. The positive association between environmental cost (EC) expenditure and environmental performance strengthens the company's legitimacy in society.

5.3.2. Environmental Cost (EC) Expenditure and Environmental Disclosure (ED)—Hypothesis 2

Table 6 (Model 2) shows that the implementation of EC expenditure has a positive effect on environmental disclosure (ED) ($\beta = 0.106$; $p < 0.00$). The results are consistent with the prediction of a positive relationship between environmental cost (EC) expenditure and environmental disclosure (ED). Therefore, H2, which predicts that environmental cost (EC) expenditure has a positive effect on environmental disclosure, is accepted.

The result indicates that the level of companies' financial commitment, measured by EC expenditure, provides companies with detailed information on the resources used in the production process, waste reduction and other environment-related matters. The implementation of environmental management accounting facilitates quantitative and qualitative measurements of environmental cost and benefit analysis. This encourages companies to disclose more information to the public [29].

Disclosure reduces information asymmetry between management and stakeholders. The information also allows potential investors to make a more informed investment decision. The relationship between environmental cost expenditure and disclosure of environmental information is consistent with legitimacy theory. Companies strengthen their legitimacy in society by operating within the norms and values favored by the stakeholders and society [17].

5.3.3. Environmental Performance (EP) and Environmental Disclosure (ED)—Hypothesis 3

Model 3 of Table 6 shows that environmental performance has a positive effect on environmental disclosure ($\beta = 11.523$; $p < 0.00$). This indicates that companies with good environmental performance—those with energy efficiency policies, emissions reduction initiatives, waste reduction policies and water policies—will have higher levels of ED. Hence, H3, which predicts that environmental performance positively affects environmental disclosure, is accepted.

The results suggest that companies with good environmental performance will convey more environmental information to the public. Positive environmental performance information is considered good news. Thus, disclosing good news may positively shape investors' and public perceptions, which are then responded to by making appropriate economic decisions. Companies that provide good environmental protection practices will gain good community support and strengthen the companies' legitimacy and reputations. The information disclosed is not considered greenwashing because it is related to the actual environmental performance. The perceived reliability of the information disclosed will strengthen the company's legitimacy in society. The findings are consistent with the results

from [6,8,14,31], which showed that environmental performance has a positive effect on environmental disclosure.

5.3.4. Mediation Role of Environmental Performance—Hypothesis 4

This study proposes that companies that implement EMA will improve their environmental performance and eventually increase their level of environmental disclosure. Therefore, this study offers Hypothesis 4, which predicts that environmental performance mediates the relationship between EC expenditure and environmental disclosure. In testing the hypothesis, this study followed a three-steps approach, as suggested by [45]. Section 4.3 provides detailed explanation on these steps.

In Step 1, the regression results (Table 6, Model 2) show that EC expenditure is significantly associated with the dependent variable (environmental disclosure—ED) ($\beta = 0.106$; $p < 0.00$). In Step 2 (Table 6, Model 1), the independent variable (environmental cost expenditure—EC) is significantly associated with the mediator variable (environmental performance—EP) ($\beta = 0.003$; $p < 0.00$). Lastly, in Step 3 (Table 6, Model 4), the mediating variable (environmental performance—EP) is significantly associated with the dependent variable (environmental disclosure—ED) after controlling the independent variable (environmental cost expenditure—EC) ($\beta = 0.772$; $p < 0.00$). Thus, all significant results are in accordance with [45]’s requirement. These results suggest that EP can act as a mediator variable in the relationship between EC expenditure and environmental disclosure.

The role of environmental performance as a mediator can encourage companies to invest more in environmental matters because it will eventually lead to better and more transparent environmental disclosure. Information asymmetry and agency costs are reduced in companies with better environmental disclosure. The disclosures also help investors evaluate companies’ possible environmental risks and liabilities. Therefore, H4, which predicted the mediating role of EP in the relationship between EC expenditure and environmental disclosure, is accepted. The results are presented in Table 7.

Table 7. Summary of statistical results for mediation analysis.

Steps	Dependent Variable	Independent Variable	Coefficient Value	T Statistics	Results
First step	ED	EC	0.100 **	18.338	Significant
Second step	EP	EC	0.003 *	1.986	Significant
Third step	ED	EP	1.152 **	3.101	Significant
Fourth Step	ED	EP	0.772 *	2.407	Significant
		EC	0.106 **	11.096	Significant

Notes: ED = Environmental disclosure, EP = Environmental performance, EC = Environmental cost expenditure. ** Coefficient is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

The results in Table 6 also show that smaller companies (SIZE) with fewer board members (BS) have better environmental performance. This result means that big companies with more board members do not necessarily achieve more effective environmental management. As predicted, companies with higher governance disclosure scores (GDS) have higher environmental performance.

5.3.5. Additional Analysis

The data in Table 1 show that companies from China formed the majority of sample companies (337 companies or 58.3 percent). Therefore, additional analysis was separately done only on companies from China, to ensure the overall findings were not biased by the dominant presence of companies from China. The results are presented in Table 8.

Table 8. Additional analysis—Sample from China.

Dependent Variable	EP	ED	ED	ED
	(Model 1)	(Model 2)	(Model 3)	(Model 4)
Constant	2.251 * (2.139)	−5.383 (−1.716)	−5.978 (−1.780)	−6.377 * (−2.024)
EP			0.477 * (2.027)	0.442 * (1.999)
EC	0.001 (0.427)	0.038 ** (5.085)		0.038 ** (5.061)
SIZE	−0.034 * (−2.511)	−0.025 (−0.728)	−0.008 (−0.2100)	−0.010 (−0.292)
GDS	0.605 ** (2.5110)	0.286 (0.399)	−0.031 (−0.040)	0.019 (−0.026)
BS	−0.584 * (−1.693)	2.207 * (2.146)	2.612 * (2.384)	2.465 * (2.397)
ROE	−0.039 (−0.506)	−0.552 * (−2.395)	−0.556 * (−2.279)	−0.535 * (−2.337)
ID	0.371 ** (3.030)	0.517 (1.417)	0.296 (0.750)	0.353 (0.952)
R ²	0.941	0.993	0.992	0.993
R ² adjusted	0.890	0.987	0.986	0.987
F stat	18.347	166.572	148.765	168.316
p-value	0.000	0.000	0.000	0.000
Hausman test	42.510 *	410.106 *	670.870 *	417.167 *

Notes: ED = Environmental disclosure, EP = Environmental performance, EC = Environmental cost, SIZE = Total asset, GDS = Governance disclosure score, BS = Board size, ROE = Return on equity, ID = Independent director. T statistics are in parentheses, ** Coefficient is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

The results show that environmental cost (EC) expenditure did not have a significant association with environmental performance (EP), but did have a significant impact on environmental disclosure (ED). The insignificant results of EC expenditure towards EP contradicted the earlier results (Table 7, Model 1). The results indicate that, in China, companies' financial commitment to environmental matters does not improve their environmental performance. These intriguing results need further investigation. At the same time, EP was positively associated with ED. Companies that have good environmental performance provide higher levels of environmental disclosure. The results are consistent with the earlier results (Table 7, Model 3). Due to the insignificant results between EC expenditure and EP, the mediation analysis could be pursued further [45].

6. Conclusions

The protection and preservation of the natural environment by business entities has become an important business strategy, as it is associated with the legitimacy of companies' existence. Stakeholders expect companies to pledge some financial resources to environmental matters by implementing an environmental management accounting (EMA) system. One element of EMA, environmental cost expenditure, indicates companies' commitment towards mitigating environmental problems, improving environmental performance and providing better environmental information to the public.

Following the rationale adopted from the legitimacy theory perspective, the findings of this study illustrate that EMA practices, specifically measured by environmental cost expenditure, improve environmental performance and disclosure. Environmental performance has also been shown to mediate the relationship between environmental cost expenditure

and environmental disclosure. The results indicate that corporate monetary commitment enables managers to achieve better environmental performance by implementing energy efficiency policies, emissions reduction initiatives, waste reduction policies and others. The findings of this study can be used to convince managers of the importance of environmental financial commitment to improve environmental performance and reduce information asymmetry with stakeholders. From a planning and control perspective, environmental cost expenditure provides information to facilitate the proper monitoring, measurement and evaluation of progress towards achieving the company's ecological and financial goals. From an eco-efficiency perspective, a dynamic reciprocal relationship exists between the natural and human environments. The eco-efficiency approach allows the company to produce more useful products whilst reducing negative impacts such as resource consumption and costs. The findings from this study, which used data from multiple countries in the Asia-Pacific region, provide an insight that can be generalized in countries from other regions.

This study has a limitation. It does not incorporate cross-country differences, such as economic, legal and cultural issues, in the research analysis due to the problem of close singular matrices during data processing caused by unbalanced panel data that may have affected the research findings. Therefore, future studies should investigate some cross-country variables to provide better insight into the issue.

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