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Environmental Innovation, Environmental Performance and Financial Performance: Evidence from Malaysian Environmental Proactive Firms

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Abstract: This study is aimed to investigate the relationship between environmental performance, environmental innovation, and financial performance of firms. A total of 124 responses were collected from managers of manufacturers certified by ISO 14001 EMS in Malaysia, and the data was subjected to a structural equation analysis using the Smart PLS version 3.2.7 software. The results have endorsed environmental competitive capabilities i.e. environmental innovation and environmental performance as the key enablers for the creation of economic values for environmental proactive manufacturing firms. Moreover, environmental innovation is also found to be the mediator that transforms the benefits of environmental performance into financial performance.

Keywords: environmental competitive capabilities; environmental performance; environmental innovation; financial performance; environmental management system; Malaysia

JEL Classification: Q550; Q560; O310; O320

1. Introduction

Business firms are increasingly adopting proactive environmental management as a business strategy to address the environmental challenges and enable the shift to green market competition. In doing so, it is crucial for these firms to be equipped with environmental capabilities for sustaining firms' competitive capabilities in terms of environmental performance and innovation, which would eventually lead to superior firm performance. However, to date, business owners are still uncertain about what kind of environmental capabilities are required in order to enhance the performance of their firms. As such, there were extant empirical researches conducted focusing on the examination of the direct effects of proactive environmental management on the performance of a firm. Thus, this study examines how dynamic capabilities emerged from proactive environmental practices can foster the creation of environmental capabilities that in turn enhance the competitive capabilities and financial performance of the firms. Environmental capabilities refer to emergence of dynamic capabilities following the implementation of environmental strategies by the firms [1]. Environmental competitive capabilities such as environmental innovation and environmental performance are arising from the outcome of proactive environmental management [2]. Furthermore, the natural resource-based (NRBV) theories have clearly specified innovation as the core factor enabling superior firm performance from

environmental management. The purpose of an environmental management is to develop, implement, manage, coordinate and monitor corporate environmental activities. Environmental innovation and environmental performance emerge as the outcome of environmental management. Many studies had proven the significant relationship between environmental performance and firm's performance [3,4]. However, there were very limited empirical studies which linked the environmental performance to the performance of the firm involving environmental innovation simultaneously. In view of this, this study has examined the mediating role of environmental innovation in the relationship between environmental performance and financial performance among environmental proactive firms. Literature showed that environmental innovation is a robust predictor of firm's performance [5–8] and it plays a mainstream role in literature examining competitiveness and performance of a firm [9]. Grekova et al. [10] demonstrated the mediating role of environmental innovation between environmental management and firm's performance. Likewise, environmental studies have also proven the positive correlation between environmental performance and firm's performance [4,11]. Past literature posited that proactive environmental strategies are associated with the emergence of environmental innovation (such as innovative products, improved manufacturing, and operational processes), as well as the emergence of environmental performance (such as lower cost from lower pollutions and waste), which enable firms to realize its competitive benefits. Based on the NRBV theory, environmental innovation and environmental performance constitute environmental competitive capabilities of firms which are firm specific, rare, valuable, and difficult to imitate by others [12,13]. Environmental performance signifies the firms' success in implementing environmental strategies, which forms the basis for innovation practices [7]. Superior environmental performance reflects firms' ability to identify new environmental knowledge and to apply it to improve products and processes. Currently, there are only a few writers who are able to draw systematic research relating to environmental performance, environmental innovation and firm's performance. Therefore, there is very little attention paid explicitly to the role of environmental innovation between the environmental performance and firm's performance. Only Grekova et al. [10] used environment innovation between environmental management and a firm's performance. Besides that, the items measuring the environmental innovation were not comprehensive where [10] only four items were used to measure the environmental innovation. In terms of a firm's performance, this study uses financial performance compared to [10]'s cost effective advantage. In this study, authors have considered the environmental performance and this study also focuses on the environmental proactive context i.e. ISO 14001, where environmental strategies (environmental capabilities) are mostly in place, how would environmental competitive capabilities (i.e. environmental performance and environmental innovation) influence the financial performance of these firms? Therefore, this study aims to investigate the relationship between firms' environmental performance, environmental innovation, and financial performance.

The remainder of this paper consists of: Section 2 discussing the literature review and the development of the hypotheses of the study; Section 3 explaining the methodology of the study including variables and data collection; Section 4 discussing the empirical findings; Section 5 addressing the discussions; Section 6 presenting the conclusion and implication of the study; and lastly, Section 7 discussing the limitations and offering directions for future study.

2. Literature Review

2.1. Effects of Environmental Performance on Environmental Innovation

Environmental performance reflects firms' environmental capabilities generated from the implementation of environmental strategies as underpinned by the dynamic capabilities theory [14–16]. Likewise, Crossan and Apaydin [17] confirmed the role of organizational capabilities as the determinants of innovation. This is due to the fact that environmental performance signifies the firms' success in implementing environmental mission and strategies, structure and systems, which forms the basis for innovation practices [17]. These environmental routines and processes provide basis for continuous

innovations in product design and production process targeting at environmental improvements. Further, environmental performance also reflects a firms' absorptive capacity [18,19] as it represents the strengths gained by firms from adoptions of environmental practices. Superior environmental performance reflects firms' ability to identify new environmental knowledge, and to apply it to improve products and processes.

Empirical studies have proven the contribution of environmental performance on environmental innovation. Wagner (2009) [20] conducted a survey on approximately 2,000 manufacturing firms in Europe and demonstrated the positive association between environmental performance and environmental innovation, in terms of both products innovation and process innovation. Likewise, environmental innovation measured as environmental patents was found to be associated with environmental performance in terms of reductions in toxic pollution [21]. In addition, green product innovation was demonstrated to be correlated positively to environmental performance in manufacturing sector in Taiwan [6]; and green process innovation was demonstrated to be positively associated with environmental performance among manufacturing firms in Taiwan [22] and Turkey [23].

Taken together, this research posits that the greater environmental performance, the better environmental innovation will be at firm level. On top of all empirical literature, studies are required to be conducted in order to obtain evidences from different countries and industries. Accordingly, the hypothesis below is proposed:

H1: *Environmental performance is positively related to environmental innovation.*

2.2. Environmental Performance and Financial Performance

The natural-resourced based view (NRBV) asserted that a firms' competitive advantage and performance are highly depending on their resources and capabilities [24]. Corporate strategy that creates capabilities would be more likely to generate superior firm performance [13]. Thus, the NRBV endorsed the critical impact of environmental influences on competitive landscape of business firms and stresses the critical role in creating capabilities that facilitate environmentally sustainable economic activity. As underpinned by the NRBV theories [12,13], the implementation of environmental strategies will help to improve productivities and lower operational costs as a result of innovations in environmental protections, which in turn improves financial performance. Numerous empirical studies have proven the positive relationship between environmental performance and firm's performance [3,4,25,26]. Similarly, longitudinal design studies concluded that environmental performance was positively associated with financial performance [4,27,28]. Empirical studies in Malaysia have also proven the positive link between environmental initiatives and financial performance [25,29]. On the contrary, numerous empirical studies [30,31] found a negative relationship between environmental performance and financial performance. In addition, some researchers found no relationship [31,32] between environmental performance and financial performance.

Accordingly, despite a small number of studies have demonstrated contrary evidence, the positive link between environmental performance and financial performance at firm level has been validated by a large number of empirical studies including those studies conducted on manufacturing firms in Malaysia. Thus, as underpinned by the NRBV, this research posits a positive link between environmental performance and financial performance. However, there were very limited empirical studies which linked environmental performance to firm's performance within an integrated model involving environmental innovation simultaneously, thus allowing concurrently testing the effects of both environmental competitive capabilities on financial performance. Accordingly, the hypothesis below is proposed:

H2: *Environmental performance is positively related to financial performance.*

2.3. Environmental Innovation and Financial Performance

Innovation research studies have largely postulated environmental innovation as a core antecedent of firms' financial performance [6,7,26,33]. Environmental innovation contributes to the improvement of financial performance in two manners: (1) firms equipped with higher level of environmental innovation are more likely to realize their competitive benefits in the form of innovative products, improved manufacturing and operational processes, and lower operational costs [34,35]; and (2) these firms can differentiate themselves from their competitors, create legitimacy and reputation, thereby increase their total revenues [34,35]. Empirical studies have proven the positive relationship between environmental innovation and various aspects of financial performance including turnover and export [36], return on investment, profits, market share and sales [33], and changes in return on assets [37].

As underpinned by the natural resource based view (NRBV), this research posits a positive association between environmental innovation and financial performance at firm level. However, there were very limited empirical studies, which linked environmental innovation to a firm's performance within an integrated model involving environmental performance simultaneously, thus allowing concurrently testing the effects of both environmental competitive capabilities on financial performance. Furthermore, empirical studies are required to be conducted in order to obtain further evidences from different countries and industries as the majority of the studies were conducted on firms in Taiwan and Western Countries. Accordingly, the hypothesis below is proposed:

H3: *Environmental innovation is positively related to financial performance.*

2.4. Environmental Innovation as a Mediator between Environmental Performance and Financial Performance

Environmental strategies guided by eco-efficiency concept define environmental actions that pay-off financially, thus linking environmental performance to a firm's performance [38,39]. According to eco-efficiency concept, firms seeking for economic benefits must operate at an optimum level of environmental performance; and implement their environmental activities in the most efficient manner, with the lowest possible costs, thereby achieving eco-efficiency [27,40]. Underpinned by value based eco-management literature [27,41–43], environmental performance reflects a low level of eco-efficiency, as it measures solely on a firm's achievements in reducing adverse environmental impact, with little element of market orientation. Whereas, environmental innovation reflects higher level of eco-efficiency, as its presence indicates a firms' focus on market and product development within their environmental management that would likely bring about economic benefits. This is because firms equipped with higher level of environmental innovation are more likely to be able to create market differentiation through innovative products, thereby increasing total revenues [34,35]. Likewise, green process improvements also contributed to reduction of operation costs resulting from reduced waste from manufacturing activities. Consequentially, firms would need to extend the capabilities generated from their environmental processes and routines into environmental innovation in order to enjoy the benefits of superior financial performance. Accordingly, firms can gain superior financial performance when they use their strengths in environmental performance to improve green products design and green processes. Thus, this research proposes the hypothesis below:

H4: *Environmental innovation mediates the effects of environmental performance on financial performance.*

3. Methodology

Based on the discussion above, a conceptual framework connecting the research constructs is developed, as shown in Figure 1 below. Environmental performance and environmental innovation are the environmental competitive capabilities of environmental proactive firms. Environmental performance measures the extent to which environmental practices have brought environmental benefits to their firms. Environmental innovation reflects environmental process and product innovation. The environmental product innovation dimension measures the extent

of incorporation of environmental actions in products developments. The environmental process innovation dimension includes the extent of implementation of environmental actions at manufacturing processes in their firms. It must be noted that in a developing country like Malaysia, these environmental innovations are gradual innovations instead of drastic innovations such as new patent and new technology creations. Financial performance measures the extent to which environmental practices have led to financial performance in their firms. Finally, firm size is used as the control variable which indicates that larger firms are more advantageous. This serves as sources of a firm's performance [25,44]. Credit must be given to [10] that the hypotheses developed in this paper and methodology used closely followed their study.

In addition, Table 1 indicates the research constructs and the operationalization of the constructs based on the past studies.

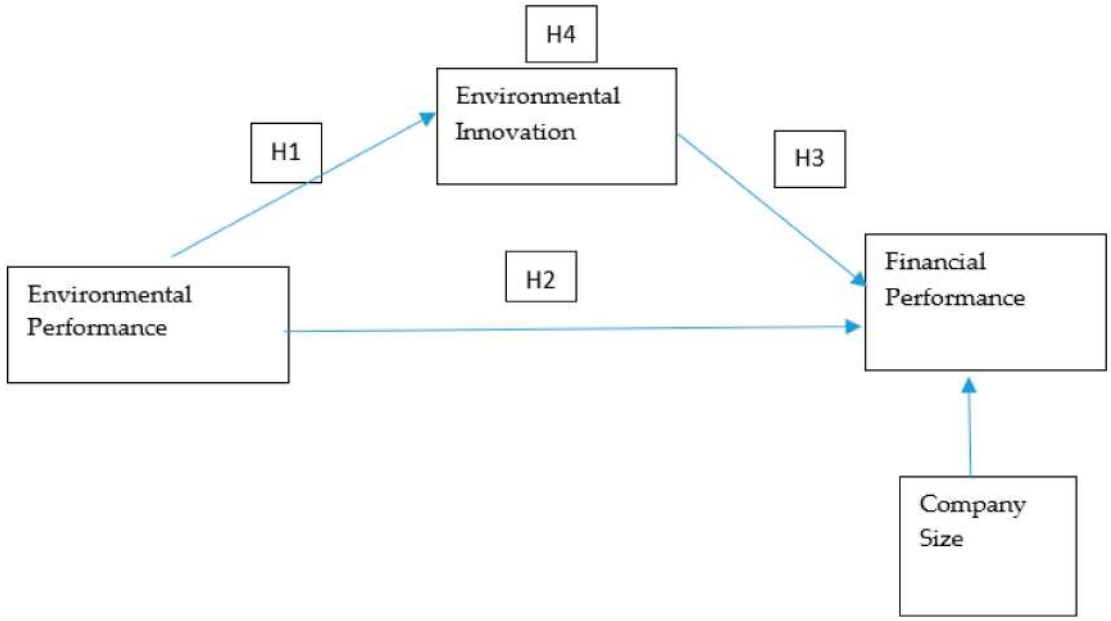

Figure 1. Research Framework.

Table 1. Operationalization of Research Constructs and Sources of References.

Construct	Operationalization	Source of References
Financial performance	1. Increases in profit margin 2. Increases in market share 3. Increase in sales revenues 4. Increase in return on investment 5. New market opportunities 6. Increase in overall financial performance	adapted from scales of several authors [45–47]
Environmental performance	1. Reduction of air emission 2. Reduction of waste water 3. Reduction of solid waste 4. Decrease consumption for hazardous / harmful / toxic materials 5. Decrease frequency of environmental accidents 6. Improved environmental situation.	Adapted from the scale developed by [48]

Table 1. *Cont.*

Construct	Operationalization	Source of References
Environmental Innovation	Environmental product innovation dimension: 1. Use non-polluting or non-toxic materials 2. Design for recycling, reuse, and decomposition 3. Collect back products after end-of-life for recycling 4. Use environmental friendly packaging for existing and new products 5. Use materials that consume lower energies 6. Use materials to the least amount possible 7. Use eco-labeling. Environmental process innovation dimension: 1. Carried out recycle, reuse, and remanufacturing of materials or parts 2. Redesign manufacturing process to lower pollution (air, water, noise) 3. Redesign manufacturing process to lower solid waste 4. Redesign manufacturing process to lower energies consumption (water, electricity, gas, petrol) 5. Redesign manufacturing process to lower material use 6. Use cleaner technologies to make savings (e.g. Energy, water, waste).	Adapted from scales of several authors: [6,22,46,47,49,50]
Control variable: Firm size	Number of employees of a firm	[25,51]

3.1. Data Collection and Procedures

Questionnaire was employed to collect data for this study. Questionnaires were sent to respondents in the targeted firms. Targeted respondents were identified to ensure they are well-versed with the environmental practices of the companies. Follow-up calls to the targeted respondents were made to improve the response rate. A survey package containing cover letter addressed to the targeted respondent, questionnaire and a post-paid self-addressed envelope, was sent to the targeted respondent in the targeted firm via postal service. The questionnaires were also sent by fax or e-mail upon request by the respondents.

All manufacturing firms (483 to date) certified by ISO 14001 Environmental management system (EMS) and registered with Federation of Malaysian Manufacturers (FMM) were selected as the population of this study. EMS is known as the advanced environmental practices adopted by manufacturing firms as its implementation consumes substantial resources of firms. A certified ISO 14001 EMS is not mandatory for manufacturing firms in Malaysia. However, EMS certification enables a firm to show to its stakeholders about the quality of its environmental management as well as its commitment to environmental protection [29,52]. Thus, firms equipped with ISO 14001 EMS reflect higher level of environmental proactivity with the need to implement proactive environmental strategies. This population was targeted in order to ensure that the firms selected to participate this survey are environmental proactive firms which have fulfilled the requirements of ISO14001 EMS certification.

3.2. Common Method, Non-Response Bias and Endogeneity Problem

Harman's single-factor test was conducted in order to examine the possibility of common method bias. Results pointed out that the first factor explains 36.99% of the total variance. According to [53,54], common method bias is critical when a single factor accounts for more than 50% of the explained variance. Hence, the common method bias is not an issue in this study. In terms of non-response bias, an independent t-test was conducted on all constructs. The findings showed that data collected were significantly different between early respondents (18 responses) and late respondents (106 responses). The results demonstrated non-significance of Levene's values and thus the risk of non-response bias is not critical in this study. In addition, authors have used SPSS to test the endogeneity problem.

The value of Durbin-Watson test was (1.735), which showed that there was no high correlation among independent variables. This can be further confirmed by looking at the values of discriminant validity analysis in Table 5. Endogeneity problem in PLS SEM can be fixed by using control variable and this study has used the firm size as a control variable. Therefore, authors have statistically and methodologically addressed the issue of endogeneity.

4. Results

4.1. Descriptive Statistics

Although the targeted population was relatively small with a total of 483 firms and yet we managed to obtain 27% of response rate with a total of 124 firms. However, it has fulfiled the 1 to 10 rule for PLS-SEM modelling [55]. Table 2 shows the profiles of the companies of the respondents. Majority of the companies were from electrical and electronics sector (n = 29, 23%) followed by basic metal products, motor vehicles and transport equipment (n = 22, 18%), rubber and plastics (n = 18, 15%), chemicals and chemical products, manmade fibres (n = 16, 13%), and others (n = 39, 31%).

Table 2. Company profiles.

Description	Frequency	%
N = 124		
Sector		
Electrical machinery, radio television & communication equipment, optical equipment	29	23%
Basic metals and fabricated metal products, motor vehicles and transport equipment	22	18%
Rubber and plastics products	18	15%
Chemicals, chemical products and man-made fibres	16	13%
Others	39	31%
Employees size		
Below 200	52	42%
Between 200 to 500	41	33%
Above 500	31	25%

The number of full time employees indicated the relative size of the companies of the respondents. Majority of the companies (n = 52, 42%) are of small size with 200 to 500 employees. Second larger group was from companies with 200 to 500 employees (n = 41, 33%). The remaining companies are larger in size with more than 500 employees (n = 31, 25%).

Table 3 shows the descriptive statistics of measurement items. The results indicated that mean values for all items were ranging from lowest of 4.84 to the highest of 5.15, which confirmed the presence of environmental proactivity within the targeted companies. All measurement items having Kurtosis and skewness are within the normality range of −1.96 to +1.96 [56].

Table 3. Data statistics.

Constructs	Item Code	Mean	SD	Kurtosis	Skewness
Financial performance (FP)	FP1	4.85	0.67	0.489	0.516
	FP2	4.89	0.74	(0.360)	0.425
	FP3	5.07	0.97	(0.789)	0.507
	FP4	4.95	0.91	(0.319)	0.690
	FP5	5.11	0.87	(0.546)	0.391
Environmental performance (EP)	EP1	4.97	0.78	(0.007)	0.159
	EP2	4.96	0.78	0.362	0.280
	EP3	4.85	0.87	0.440	0.750
	EP4	4.94	0.90	(0.077)	0.537
	EP5	4.92	0.85	(0.214)	0.236
Environmental product innovation (ENP)	ENP1	5.05	0.68	(0.419)	0.093
	ENP2	5.15	0.71	0.686	0.599
	ENP3	5.02	0.83	0.255	0.733
	ENP4	4.98	0.93	(0.302)	0.721
	ENP5	5.03	0.88	(0.620)	0.441
	ENP6	5.05	0.74	0.056	0.408
	ENP7	5.07	0.73	(0.155)	0.283
Environmental process innovation (ENC)	ENC1	4.98	0.73	(1.117)	0.025
	ENC2	4.99	0.76	(0.005)	0.466
	ENC3	4.95	0.74	0.318	0.563
	ENC4	4.99	0.93	(0.354)	0.688
	ENC5	4.84	0.79	(0.989)	0.397
	ENC6	4.88	0.85	(0.860)	0.476

4.2. Assessment of Model Using PLS-SEM

The proposed research framework including the measurement model and structural model were assessed using Partial Least Squares (PLS-SEM) which was also used by [10]. The Smart PLS 3.2.8 [57] was used to perform the PLS-SEM analysis. As suggested by Hair, Hult, Ringle & Sarstedt, (2016) [56], the measurement model was tested at the early stage followed by an evaluation of the structural model. The measurement model explains the relations between the variables and the indicators that make up each latent variable which can be assessed based on reliability and validity of latent variables, whereas, the structural model represents the relationships between the latent variables by assessing the significance and strength of these relationships [58,59]. The authors have adopted a two-stage approach to test the second order formative construct of environmental innovation. In this method, the latent variable scores of product innovation and process innovation were initially estimated without the present of second-order construct, but with all the first-order constructs only within the model [60,61]. The latent variable scores were subsequently used as indicants in a separate higher-order structural model analysis.

4.2.1. Measurement Model Assessment

In order to assess the reflective measurement model, the reliability of indicators and constructs followed by convergent and discriminate validity should be assessed [62]. In order to confirm the reliability of indicators, the loading of each item on its relevant latent variable should be higher than

0.50. In order to ascertain the reliability of constructs, the composite reliability (CR) for each construct should be higher than 0.70 [59].

Table 4 presents the convergent validity of the constructs. The factor loadings for all measurement items are ranging from 0.731 to 0.897. Composite reliability values are ranging from 0.877 to 0.920. Average variances extracted are ranging from 0.561 to 0.699. Cronbach's Alpha values are ranging from 0.738 to 0.892. All the three criteria have fulfilled the threshold required for robustness of the structural relationship before further analysis is conducted [59].

Table 4. Convergent Validity.

Items	Loadings	Constructs	AVE	CR	CA
FP1	0.787	Financial performance (FP)	0.588	0.877	0.826
FP2	0.732				
FP3	0.763				
FP4	0.794				
FP5	0.755				
EP1	0.897	Environmental Performance (EP)	0.616	0.888	0.841
EP2	0.830				
EP3	0.603				
EP4	0.773				
EP5	0.791				
ENC1	0.855	Environmental Process Innovation (ENC)	0.699	0.920	0.892
ENC2	0.806				
ENC4	0.796				
ENC5	0.868				
ENC6	0.853				
ENP1	0.820	Environmental Product Innovation (ENP)	0.561	0.836	0.738
ENP2	0.705				
ENP4	0.737				
ENP7	0.731				

Notes: CR = Composite reliability; AVE = Average variance extracted; CA = Cronbach's Alpha.

Table 5 shows the factor loadings and reliability of seconder-order constructs. In this case, environmental process innovation and product innovation were grouped as one constructs namely environmental innovation. Higher loadings were generated where ENS has loading value of 0.928 and ENP has value of 0.923. All three criteria threshold were fulfilled, of which the AVE value, CR value, and CA value are 0.856, 0.923, and 0.832, respectively.

Table 5. Second order Constructs.

First-Order Constructs	Loadings	Second-Order Constructs	AVE	CR	CA
ENC	0.928	EN	0.856	0.923	0.832
ENP	0.923				

Notes: CR = Composite reliability; AVE = Average variance extracted; AC = Cronbach's Alpha.

The results presented in Table 6 support the establishment of discriminant validity of the constructs. All constructs have achieved adequate threshold criteria at below 1 [63]. This indicates that each construct reflects distinctive concept on its own.

Table 6. Discriminant Validity Analysis.

	FP	EP	ECS	ECC	ECM
FP	0.767				
EP	0.458	0.785			
EN	0.495	0.558	0.813		

Table 7 presents the VIF values generated ranging from 1.885 to 2.335. All VIF values fell below the threshold value at five, which shows that there was no threat of multi-collinearity among constructs [57].

Table 7. Inter-constructs VIF values.

	EN	EP	FP
EN		2.335	
EP	2.218		1.885

4.2.2. Structural Model Assessment

The finding presented in Table 8 strongly supports H1 (standardised beta= 0.684, $p < 0.01$). As anticipated, firms' environmental innovation is positively predicted by their achievements in environmental performance through effective environmental protection routines and processes. The result shows that environmental performance has significant effects on financial performance (standardised beta = 0.054, $p < 0.01$), and H2 was supported but with very weak effect (T value = 0.472). As shown in Table 8, the result strongly supports H3 (standardised beta = 0.602, $p < 0.01$). As anticipated, firms' financial performance is positively predicted by their achievements in environmental innovation. In terms of company size, there was no significant association found on financial performance. This shows that size of a company has no influence on financial performance. The findings included in Table 8 shows that the modelled constructs explain substantial variances in endogenous constructs with good predictive relevance. R^2 values were found to be at substantial level for all endogenous constructs: FP (R^2 = 40.6%); and EN (R^2 = 46.7%). Figure 2 demonstrates the structural and measurement models of this study.

Table 8. Results of Hypothesis Testing.

Hypothesis	Path	Standard Beta	Standard Error	t Value	p Value	Results	f^2	R^2
H1	EP>EN	0.684	0.044	15.691 ***	0.000	Supported	0.035	0.467
H2	EP>FP	0.054	0.067	0.472	0.000	Supported	0.063	0.406
H3	EN>FP	0.602	0.094	6.411 ***	0.000	Supported	0.116	
Control Variable	Log EY>FP	0.015	0.071	0.217^{NS}	0.829	Unsupported	0.000	

Note: NS= non-significant; *** $p \leq 0.0001$. f^2 or effect size is a measure used to assess the relative impact of a predictor construct on an endogenous construct. R^2 or coefficient of determination is a measure of the model's predictive accuracy and is calculated as the squared correlation between a specific endogenous construct's actual and predicted values.

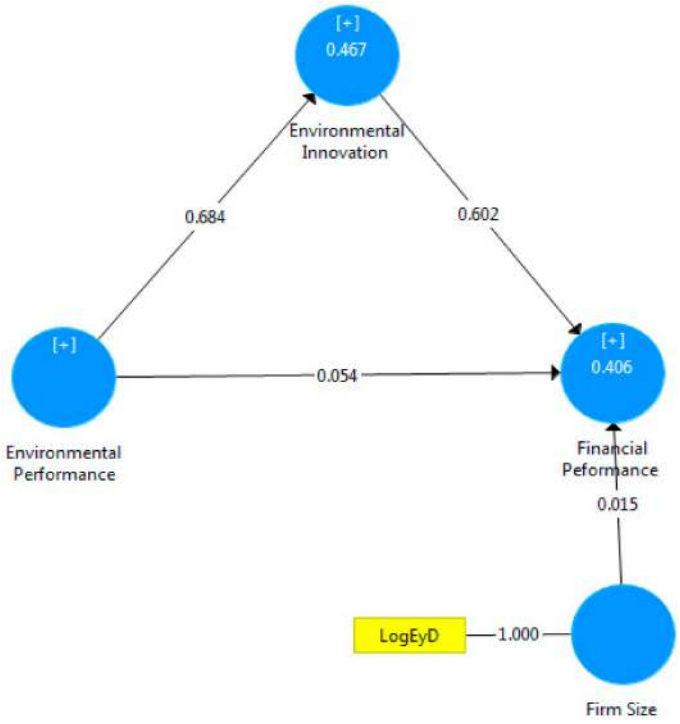

Figure 2. Measurement Model.

4.2.3. Mediation Effect of Environmental Innovation between Environmental Performance and Financial Performance

Table 9 presents the results of hypothesis testing for the indirect path. The findings in Table 9 concluded a significant indirect effect of environmental innovation on the relationship between environmental performance, and a significant indirect effect of environmental innovation on the relationship between environmental performance and financial performance (β = 0.412, $p < 0.01$). This can be shown by the increment of t-value from 0.472 (Table 8) to 5.673 (Table 9). The results confirmed that environmental innovation is a mediator that partially mediates the effects of environmental performance on financial performance, thus it supports H4. The partial mediation of environmental innovation is generated as all three direct relationships H1, H2, and H3 are statistically significant, as shown in Table 8.

Table 9. Extracted results of hypothesis testing for indirect effects.

Path	Hypothesis	Indirect Effects			Results
		Beta	Standard Error	t-Value	
EP to FP mediated by EN	H4	0.412	0.073	5.673 ***	Supported

Notes: NS = insignificant; *** p ≤ 0.0001; FP = financial performance; EP = environmental performance; and EN = environmental innovation.

5. Discussion

5.1. Environmental Performance and Environmental Innovation

As anticipated, firms' environmental innovation was positively predicted by their achievements in environmental performance through effective environmental protection routines and processes. This result is consistent with the past empirical studies [6,20,22,23], which have proven the positive association between environmental performance and environmental innovation in terms of products

and process innovation. Additionally, some other studies have proven the positive association between environmental patents and reductions in toxic pollution [21], as well as between environmental responsive behavior and developments of new products [64].

This result has endorsed environmental performance as a predictor for environmental innovation. These firms are more likely to perform better in environmental innovations when they achieve higher level of environmental performance such as achievements in reducing air emissions, waste water, solid waste, usage of hazardous materials and environmental accidents. This is mainly due to the fact that environmental performance reflects the strengths of environmental capabilities such as effective environmental protection routines and processes, superior environmental knowledge, committed environmental goals that form the resources required for supporting continuous environmental innovations in product design and production process [17]. Furthermore, these firms are able to develop a higher level of absorptive capability as superior environmental performance reflects a firm's ability to identify new environmental knowledge and to apply it to improve its green products and green processes [19]. As such, achieving superior environmental performance is crucial to the manufacturing firms as it is the key sources of environmental capabilities required for improving environment innovation. Moreover, the path coefficient showed that environmental performance has a moderately strong driving effect on environmental innovation among environmentally proactive manufacturing firms in Malaysia.

Accordingly, it appears that manufacturing firms with higher level of environmental performance are more likely to achieve superior environmental innovation. In line with dynamic capabilities view [14–16,65], the demonstrated positive role of environmental performance on environmental innovation has validated environmental performance as environmental capabilities among environmentally proactive manufacturers in Malaysia. These environmental capabilities eventually form the basis of dynamic capabilities that strengthen a firms' competitive capabilities in the form of environmental innovation.

5.2. Environmental Performance And Financial Performance

It is found in this study that environmental performance indeed act as a contributing factor towards financial performance among environmentally proactive manufacturers. These firms are more likely to gain financial performance directly from their environmental performance such as reduction in air emissions, waste water, solid waste, hazardous materials and environmental accidents.

According to proponents of value-based eco-management [27,41–43,66], in most cases, firms with ability to integrate their environmental performance and financial performance are more likely to benefits financially from their environmental practices. This is because continuous improvements in environmental performance would bring economic benefits [3]. Environmental investment will help to reduce the operating cost due to improved efficiency. As such, firms' performance is depending on their ability to generate eco-efficiency of which environmental value and economic value can be created concurrently.

The findings of this study consistent with the previous researches [3,4,11,25–27,32] which has proven that environmental performance improves financial performance. However, the result contradicts with some other findings which demonstrated negative association between environmental performance and financial performance [30,31,67–69]. Nevertheless, despite conflicting results, the said studies did not include environmental innovation construct into their research models. As such, empirical studies thus far have not evaluated mediating effects of environmental innovation as a firm's environmental competitive capabilities on the influence of environmental performance on financial performance, thus, there are probably deficiency of omitted variable. The analysis presented in Table 9 shows that environmental innovation exerts a partial mediating effect on the influence of environmental performance on financial performance of the environmentally proactive manufacturers in Malaysia. Environmental innovation reflects higher level of eco- efficiency as it shows a firm's focus on market and product development within its environmental management. As such, firms'

financial performance would improve as a result of market differentiation or cost advantage generated through environmental innovation. Consequentially, it is important for firms to convert environmental performance into environmental innovation which serves as a predictor of financial performance.

5.3. Environmental Innovation and Financial Performance

As anticipated, the financial performances of the firms were positively predicted by their achievements in environmental innovation. This finding is consistent with the previous studies [6,7,10,22,26,33,36,70], which asserted that environmental innovation would improves financial performance significantly.

This result confirms that environmental innovation in terms of product innovations and process innovations are the main contributing factor to financial performance among environmentally proactive manufacturing firms. These firms are more likely to gain superior financial performance when their environmental activities incorporate redesign of processes and products for environmental improvements. This is mainly due to the reason that environmental innovation provides widest scope for gaining competitive capabilities among environmentally proactive manufacturers. Redesign of processes to reduce pollution, solid waste, energies and materials as well as improvement of processes to enable recycle, reuse and remanufacture of parts would likely to bring fundamental change to the productivity of resources. These process enhancements would lower the cost and in turn to gain superior financial performance. Likewise, fundamental change in product designs for environmental improvements by using non-toxic materials, eco-friendly packaging, eco-labelling, least materials, low energy consumption, as well as design for recycling and decomposition would enable the firms to create market differentiation. These green product designs and choices of materials would lead to improvement of green product features and functions. Market differentiation and improvement of productivity of resources would enable these firms to gain superior financial performance. As such, high achievement in environmental innovation is crucial to the manufacturing firms as it is the core competitive capabilities, which is essential for the realization of eco-efficiency [39,66], where firms can concurrently create environmental value and financial performance. This is further proven by large positive path coefficient between environmental innovation and financial performance among environmentally proactive manufacturers in Malaysia, as demonstrated in this study.

In conclusion, the result of this study confirms that environmental innovation is a predictor of financial performance among environmentally proactive manufacturing firms in Malaysia. Following the resource-based theory of a firm's performance [24,71], the demonstrated predictor role of environmental innovation on financial performance has validated environmental innovation as competitive capabilities, which improves financial performance among environmentally proactive manufacturers in Malaysia.

5.4. Environmental Innovation as a Mediator between Environmental Performance and Financial Performance

As foreseen, the results of this study indicated that environmental innovation exerts a full mediating effect on the relationship between environmental performance and financial performance. This finding is inconsistent with the proponents of eco-efficiency [27,40] which posited that environmental performance did not directly influence financial performance. Instead, it indirectly channels its influence through environmental innovation [10] where economic value and environmental value are concurrently created.

The finding of this study shows that environmental innovation functions as a mediator that transforms achievements in environmental performance into financial performance among environmentally proactive manufacturing firms in Malaysia. Environmental performance signifies the firms' successes in reducing environmental impacts such as reduction in air emissions, waste water, solid waste, hazardous materials, and environmental accidents [72,73]. However, continuous improvement in environmental performance does not bring indefinite economic benefits where the increment of environmental investment will lead to a net cost when net benefits derived from environmental protection efforts are exhausted [40]. By transforming strengths in achieving

environmental performance into environmental innovation, these firms could probably charge higher price premium for their products with superior green features, thus increases total revenues [34,35]. Likewise, environmental process innovation via improved manufacturing and operational processes could probably reduce operational costs [34,35], thus improves the profits of these firms. As such, it is important for manufacturing firms to achieve superior environmental innovation as it functions as a complete mediator that transforms capabilities embedded in environmental performance into financial performance.

Accordingly, it appears that manufacturing firms with a higher level of environmental innovation are more likely to gain superior financial performance from its environmental performance. Following the resource-based theory of a firm's performance [12,13,74], the demonstrated partial mediating role of environmental innovation has validated environmental innovation as the competitive capabilities derived from environmental management. Further, following eco-efficiency concept [27,38,40], the finding of this study has also validated environmental innovation as the enabler of value-based environmental management. These competitive capabilities would eventually improve financial performance among environmentally proactive manufacturers in Malaysia.

6. Conclusions and Implication

This study has achieved its main objective which is "To investigate the association between environmental performance, environmental innovation and financial performance; in order to identify the pathway to realize superior firm performance among manufacturing firms that implement proactive environmental strategies". Data was collected via survey from environmentally proactive manufacturers in Malaysia. The findings of this study have endorsed environmental innovation as the key enabler to generate economic values from environmental management [10,27,38]. This is due to its function as the sole factor that directly contributes to economic benefits. Furthermore, it also acts as the full mediator that transforms the benefits of environmental performance into financial performance of the environmentally proactive manufacturing firms in Malaysia. Thus, environmental performance and environmental innovation have been proven as the competitive capabilities among the environmentally proactive manufacturers in Malaysia.

This study offers several important insights particularly to environmentally proactive manufacturers. This study has proven the successful pathways of a successful green business signifying that manufacturers can leverage on their environmental management for competitiveness while fulfilling their environmental responsibility and accountability at the same time. The crucial role of environmental innovation as the sole predictor which directly improves the financial performance of the manufacturers, suggesting that manufacturers can prioritize their environmental activities to enhance the innovation outcomes in order to gain competitive advantage and superior financial performance. Moreover, the mediating effects of environmental innovation provide a strong basis for manufacturers to justify their efforts in environmental protection. This is feasible so long as they put efforts to ensure that the benefits of environmental performance are being effectively converted into environmental innovation that directly improves the firm's performance.

Several recommendations supported by findings of this study are advanced to manufacturers who wish to be competitive and to gain superior financial performance from their environmental management. As environmental innovation functions as the crucial element through which manufacturers could convert their environmental investment into market related benefits, manufacturers should systematically introduce steady streams of green products with improved design and functionality such as lowered energy consumption, design for recycling, reduced materials consumption, and improved functionality. These environmental friendly products are proven to be favorable to the manufacturers with respect to market share of green products, opportunity to charge premium prices and establishment of green branding. These benefits are particularly important to those manufacturers who desire to be competitive in the green market and to improve their revenues, profits and returns on investment. Likewise, manufacturers should focus its environmental management

towards the implementation of new or improved green manufacturing processes that support recycling, reuse, remanufacture of products, waste reduction, and pollution prevention. Manufacturing processes with these green process features are proven to be fundamental in sustaining manufacturers' competitive capabilities in order to gain superior financial performance. There is a paramount need for Malaysian government to craft policies on the development of environmental innovation at the firm level, as well as the national level. At the firm level, government policies on tax incentives and grants for the adoptions of green innovations are essential to encourage firms to initiate structural environmental innovation. These policy measures may include relatively more tax rebates for income generated from green products and additional capital allowances for the adoptions of radical innovations. In addition, government can reward firms for their achievements in environmental innovation such as patents to encourage the strategic management of environmental issues. In summary, proactive government policies are required in order to realize a green economy in Malaysia.

7. Limitations and Future Directions

There are some limitations needed to be addressed which may lead to possible future directions. Firstly, this study only examines the environmental practices among environmentally proactive manufacturing firms certified with ISO14001 in Malaysia and the sample could be biased as the sample was selected from the population of firms with ISO 14001 registered with FMM. As such, caution should be taken if the findings were to applied to other manufacturing firms in Malaysia. The expansion of the current findings to include other non-ISO 14001 certified manufacturing firms would be more insightful in future study.

Secondly, this study only considered the mediating roles of environmental innovation in the relationship between environmental performance and financial performance. However, there may be other factors such as corporate environmental strategies and environmental competitiveness that might be considered in future study.

Lastly, the solely use of Likert scale in assessing the items of construct is indeed an inherent deficiency of the survey method. Thus, future study could use secondary data to verify the findings of this study and enhance the generalization of the findings.

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