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Shedding Light on the Moderating Role of Firm Size and Age on ISO 14001:2015 Certification and Financial Performance Nexus

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Abstract
Purpose: Using a sample of Malaysian firms operating in carbon-intensive industries, this study examines the moderating effect of firm size and age on ISO 14001:2015 certification and firm financial performance (FFP) nexus.
Design/methodology/approach: Panel data regression analysis analyses 1,174 firm-year observations from 237 listed firms from 2016 to 2020.
Findings: The study provides evidence that adopting ISO 14001:2015 helps firms improve their financial performance. Furthermore, the firm size and age minimise the detrimental effect of this certification on FFP.
Research limitations/implications: The study only spans five years, used a dummy variable to measure ISO 14001:2015 certification, and merely considered firm size and age as the moderating variables on ISO 14001:2015 certification and FFP nexus.
Practical implications: The ISO 14001:2015 certification provides a financial benefit for the firms and hints investors that investing in an environmentally friendly firm is a wise strategic choice.
Originality/value: This study investigate the impact of the adoption of ISO 14001:2015 by high-polluting sectors in Malaysia on financial performance using accounting and market-based performance indicators and examining the moderating role of firm size and age on this relationship.
Paper type: Research paper

Keywords: Carbon-intensive industries, Environment management system, Financial performance, ISO 14001, Market performance

Introduction

The natural environment is facing unprecedented times because of increasing temperatures caused by carbon dioxide (CO_2) emissions, to which carbon-intensive industries contribute substantially (Cunanan, 2018; Grover, 2021). Firms in these industries are increasingly embracing the pressure from different stakeholders to address climate change effectively. This situation has compelled carbon-intensive firms to devote resources and pay extra cost to legitimise their existence (Radu & Maram, 2021).
Investors have complained about climate-related problems, but they are equally worried about the firm's financial performance (Choi & Luo, 2021). Considering continued concerns over

both issues, an increasing number of carbon-intensive firms are balancing their business and sustainability functions (Fuzi et al., 2019) and adopting voluntary actions in environmental management aimed at improving environmental performance. The most notable practise is adopting the International Organisation for Standardisation (ISO) 14001 standard (Khan et al., 2021).

The performance of ISO 14001 certified firms is a widely discussed subject in scholarly publications published all over the globe. A large body of literature (see Asbari, 2019; Baird et al., 2021; Fahmi et al., 2021; Hutagalung, 2020; Purwanto, 2020) has specified the link between ISO 14001 certification and FFP. However, past research on this relationship has not yielded conclusive results (Anggara et al., 2021; Brahmana & Kontesa, 2021; Treacy et al., 2019; Wang & Zhao, 2020). This study aims to examine the ISO 14001 certification-FFP nexus and investigate the moderating factor that mitigates the effect of this relationship. Little is known about the potential moderating effect on this relationship, which is a gap that this study seeks to fill. While majority of previous studies on this relationship focused on developed countries (Liu et al., 2020; Salim et al. 2018; Wang & Zhao, 2021), it is possible that the findings will not apply to developing countries (Liu et al., 2019). Hence, the link between ISO 14001 certification and FFP in developing nations, which account for more than half of all ISO 14001 certifications globally (Sartor et al., 2019), requires more investigation.

Literature Review

Environmental Management Systems

Two standards related to ISO 14001 in Malaysia, i.e., national standard- MS ISO 14001:2004 – Environmental Management Systems and the internal ISO 14001:2015 - Environmental Management Systems. ISO 14001 was issued by the International Organisation for Standardisation (ISO) in 1996. In the current age, it is the most commonly utilised environmental certification (Aravind & Christmann 2011; Delmas & Montes-Sancho, 2011; Sartor et al., 2019). ISO 14001:2015[1] is targeting any organisation that has implemented a systematic strategy to safeguard the environment, for instance, by minimising pollution in the air, water, land, and noise. Organisations may comply with the legal obligations outlined in the Environment Quality Act 1974 (Act 127) and related regulations by adhering to the standards. EMS serves as a foundation for Green Supply Chain Management (GSCM), and by adhering to EMS, organisations complement GSCM. ISO 14001 defines the criteria for an EMS that a firm may employ to improve its environmental performance. The standard applies to any organisation size, and may implement these standards to obtain third-party (ISO Certification Bodies[2]) certification. There are three major ‘reason-groupings" why firms apply for the ISO 14001 certification in Malaysia (Tan, 2005). These included registering to obtain a competitive edge, anticipating expected government incentives, and gaining influence from authoritative parties such as the parent business.

The ISO 14001:2015 certification helps identify and manage a firm's environmental problems (Riaz et al., 2019). The goal of the ISO 14001:2015 certification is to minimise the quantity of waste generated by the business and reduce environmental contamination to the greatest extent possible. It is critical in achieving efficient environmental management and reducing environmental harm, hence improving the firm's operations (Boakye et al., 2021). Even though ISO 14001 certification is obtained based on stakeholders' demand, the current environment encourages top management of several organisations to consider this certification one of the most effective ways to demonstrate that their organisation is highly responsible for caring for the environment (Riaz et al., 2019).

[1] Retrieved from: https://www.jsm.gov.my/ms-iso-14001#.YOvMougzaUk
[2] Retrieved from: https://www.fmm.org.my/images/articles/GI20-attachement.pdf

Tan (2005) found that in terms of marketing benefits, ISO 14001 certification may help promote a positive environmental image and attract more green customers. Implementing an EMS followed by third-party registration offered marketing benefits such as faster entrance into the global market and more outstanding market share. According to Ann et al. (2006) and Jacobs et al. (2010), ISO 14001 certification has a long-term beneficial effect on the financial markets, including increased market growth, market share and profitability.

ISO14001 Certification on Financial Performance

The influence of ISO14001 certification on FFP can be explained by signalling theory. Markets are characterised by information asymmetry. ISO 14001 certification communicates to stakeholders a company's unobservable environmental initiatives (Wang & Zhou, 2020). Quality certification signals may help firms convey their unobserved quality to stakeholders more reliably, decreasing information asymmetry, and obtaining better access to external funding (Ullah, 2020). The signalling theory support the idea that ISO 14001 certification may lower barriers to trade, expand market share, raise a firm's worldwide competitiveness, and lower search and communication cost (Feng et al., 2016).

A substantial body of research highlights the importance of ISO 14001 certification in promoting firm financial performance. These studies suggest that adopting ISO 14001 may improve operational and economic performance significantly by reducing a firm's operating costs (see Ali et al., 2020; Ann et al., 2006; Arocena et al., 2020; Boakye et al., 2021; Bromiley & Rau, 2016; de Nadae et al., 2020; Fahmi et al., 2021; Heras-Saizarbitoria et al., 2011; Hutagalung, 2020; Lo et al., 2012; Karim et al., 2021; Khan et al., 2021; Koe & Nga, 2009; Ochieng, 2015; Ong et al., 2016; Treacy et al., 2019; Yusof et al., 2020). Meanwhile, Arts and Vos (2001), Aslam et al. (2021), Boakye et al. (2021), Feng et al. (2020), Jacobs et al. (2010), Karim et al. (2021), Kiryanto et al. (2021) and Wahba (2008) showed ISO 14001 increased market confidence, resulting in favourable market performance. Not only that, ISO 14001 certification may significantly boost a business's competitiveness in the global market (Wang & Zhao, 2020). Given that signalling theory and a large body of literature emphasises the importance of ISO 14001 certification in driving FFP, following hypothesis is proposed.

H1: There is a significant relationship between ISO14001 certification and FFP

The Moderating Role of Firm Size

Given the growing acceptance of ISO 14000 certification, it is expected that in the future, implementing an EMS via ISO 14001 certification will be the rule rather than the exception. The emergence of positive environmental behaviour is becoming increasingly common. This standard will have a significant impact on Malaysian management practices.

Considering its visibility and cost, quality certification is an unmistakable and trustworthy indication. Large firms have an edge in executing expensive, innovative environmental initiatives (Govindarajan & Trimble 2010). Smaller firm with larger information asymmetry could benefit more from signalling through quality certificates (Ullah, 2020).

Firms with globally recognised quality certification have greater access to external funding than comparable uncertified firms. Hence, the function of firm size is crucial in evaluating the signalling value of quality certification in obtaining external funding (Ullah, 2020). As a result, large-scale businesses profit more from ISO 14001 accreditation (Johnstone & Labonne, 2009). According to Ruiz-Tagle (2006), firm size may impact visibility, which increases the value of ISO 14001 certification as a signalling tool. However, the increased credibility of the signal is partly a result of the more significant fixed expenses paid by large firms (Sinclair-Desgagne & Gozlan, 2003). Arocena et al. (2020) provide evidence that firm size plays a role in moderating

the effect of ISO 14001 certification on FPP. Larger firms frequently have more resources and capabilities (Bianchi & Noci, 1998), hence certified ISO 14001 firms achieve significant improvements in environmental and business performance (Ferron-Vílchen, 2016). Hence, the following hypothesis is proposed.

H2: Firm size moderates the relationship between ISO 14001 certification and FFP

The Moderating Role of Firm Age

Past research has shown that ISO 14001 certification can positively impact FFP with the influence of firm age. (Wang & Zhao, 2020). Founding conditions play a significant role in the organisational process (Cesaroni et al., 2021). Older firms have an excellent organisational structure, process, and system while existing for an extended period in the market assists a firm gain a competitive edge (Bose et al., 2017; Cesaroni et al., 2021). Older firms are more creative and have more strong business ethics that guarantee a better way of maintaining the business legacy than young firms. Through ongoing operations, older firms gained experience and enhanced returns on their investment (Mallinguh., 2020).

On the other hand, the younger firm is lacking in experience, credibility, and external connections. Withisuphakorn and Jiraporn (2015) suggested that younger firms lack an attractive track record, possess unpredictable cash flow, and experience more growth, which leaves the firm with reduced financial capabilities to invest in corporate environmental activities. These characteristics put them at a disadvantage (Rafiq et al., 2016).

Consistent with the signalling theory, older firms with a long track record have better access to external financing and less reliance on equity and internal funding (Ullah, 2020). According to Wang and Zhao (2020), the nexus between ISO 14001 certification and a firm's financial performance is favourably related to the firm's age. Older businesses gain expertise, experience, and more affluent, profitable social networks, all of which contribute to strategy transformation (Li & Liu, 2009). According to Hazudin et al. (2015), certification does not enhance business performance in the short term. The realisation time for the beneficial effect of ISO 14001 certification takes a significantly longer length of time. Implementing ISO 14001 could improve FFP and become realised as the firms become more mature. Hence, the following hypothesis is proposed:

H3: Matured/older firms moderates the relationship between ISO 14001 certification and FFP

Methods

Data Collection and Samples

The study sample is 237 Malaysian public listed firms operating in carbon-intensive industries. These firms may likely to implement better EMS because it is easier for the firms to achieve pollution reduction (Hart & Ahuja, 1996). This study analysed available data from 2016 to 2020, resulting in 1,174 firm-year observations. The financial information of sample firms was retrieved from the Thomson Reuters Datastream, while the data of ISO 14001:2015 certification was obtained from the Federation of Manufacturing Malaysia (FMM) directory 51st edition.

Dependent Variables

Tobin's Q (TQ) is a dependent variable in this study. The approximate TQ by Chung and Puritt (1994) was adopted.

$$TQ = \frac{\text{Market value equity} + PS + \text{Debt}}{\text{Book value of total asset}} \quad (1)$$

Whereas market value equity is the share price multiplied by the number of outstanding shares, PS is the liquidity value of outstanding preferred stocks, and debt is the sum of long-term debt and current liabilities. However, the definition of debt provided by Bursa Malaysia is used in this study, which refers to short-term debt, related loans, and long-term debt (Kamardin, 2014). Following Kamardin (2014), this study used the book value of liabilities to measure debt. In calculating market value equity, the term "share price" refers to the share price at the financial year-end. Thus, the measurement of TQ is as follows:

$$TQ = \frac{\text{Market value equity} + \text{Book value of liabilities}}{\text{Book value of total asset}} \quad (2)$$

Alternatively, this study also uses return on assets (ROA) as the measure of firm financial performance. ROA reflects the firm's efficiency in utilising its real investment and financial resources to generate income (Hassan & Bashir, 2003). While comparing profits to sales is a helpful operational metric, comparing earnings to the resources a firm used to obtain them raises questions about its sustainability. The simplest of these business bang-for-the-buck metrics is the ROA. ROA is displayed as a percentage; the higher the ROA is, the better.

$$ROA = \text{Net Income} / \text{Total Assets} \quad (3)$$

Independent Variable

To assess ISO 14001 implementation, this study relies on prior research (Huang & Li, 2018; Miroshnychenko et al., 2017). The ISO 14001 variable (ISO) is assessed as a dummy variable. This variable specifies whether an ISO 14001:2015 standard has been applied (1) or not (0).

Moderating Variables

Previous studies have found that ISO 14001 certification and FFP nexus is positively related to firm size (Arocena et al., 2020; Wang & Zhao, 2020) and age (Wang & Zhao, 2020). Larger firms frequently have more resources and capabilities (Bianchi & Noci, 1998), hence could achieve environmental performance improvements and business performance excellence (Ferron-Vílchen, 2016). The natural logarithm of total assets is used to measure the firm size (Díaz-Chao et al., 2021).

Firm age can be used to gauge a firm's level of experience in its industry. The age of a firm may have an impact on its financial performance since a long presence in the market allows it to gain a competitive edge (Bose et al., 2017). Because of the learning curve and survival bias effects, older firms are more efficient than younger firms (Reddy et al., 2008). The firm's age is calculated in this study as the natural log of the number of years from its inception (Alipour et al., 2019; Wang & Zhao, 2020).

Control Variables

Control variables in this study are sales growth, financial leverage, and liquidity. Previous research has claimed that increased sales have a favourable impact on firm profitability (Delmar et al., 2013). Following Abdullah et al. (2020) and Borghei et al. (2018), the difference between the current year and the preceding year's sales divided by the sales in the preceding year's base is used as a measured for sales growth (Growth).

A vast amount of research suggests that, high indebtedness results in considerable financial constraints and, eventually, poor financial performance. Inoue and Lee (2011) contended that huge debts pose an extensive risk, which adversely affects the firm's performance as the market feels that the firm is too risky. Higher debt depletes more resources in terms of interest payments, hence, financing assets with current debt has an influence on financial performance (Nanda & Panda, 2019). The ratio of total debt to total assets is used to estimate financial leverage (Leverage).

Numerous studies predict that liquidity has an inverse relationship with profitability. The failure of the firm to meet its short-term debt obligations that are due will adversely affect the firm's earnings and capital, which could lead to bankruptcy (Haddad et al., 2020). In contrast, high liquidity reduces the firm's chances of investing in other potential projects, which could reduce profits (Zainudin et al., 2018). In line with Alipour et al. (2019) and Chithambo and Tauringana (2014), this study uses the current asset to current liability ratio to proxy for liquidity (liquidity).

Model Specification

The following equations are the models utilised to analyse ISO certification and FPP nexus.

$$FP_{it} = \beta_0 + \beta_1 Size_{it} + \beta_2 Growth_{it} + B_3 Leverage_{it} + \beta_4 Liquidity_{it} + \beta_5 Age_{it} + u_{it} \quad (4)$$

$$FPit = \beta 0 + \beta_1 ISO_{it} + \beta_2 Size_{it} + \beta_3 Growth_{it} + \beta_4 Leverage_{it} + \beta_5 Liquidity_{it} + \beta_6 Age_{it} + u_{it} \quad (5)$$

$$FP_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Size_{it} + \beta_3 ISO_{it} x Age_{it} + \beta_4 Growth_{it} + B_5 Leverage_{it} + B_6 Liquidity_{it} + B_7 Age_{it} + u_{it} \quad (6)$$

$$FP_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Age_{it} + \beta_3 ISO_{it} x Age_{it} + \beta_4 Growth_{it} + \beta_5 Leverage_{it} + \beta_6 Liquidity_{it} + \beta_7 Size_{it} + u_{it} \quad (7)$$

$$FP_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 Age_{2it} + \beta_3 ISO_{it} x Age_{it} + \beta_4 ISO_{it} x Size_{it} + \beta_5 Growth_{it} + \beta_6 Leverage_{it} + \beta_7 Liquidity_{it} + \beta_8 Size_{it} + u_{it} \quad (8)$$

FP is a dependent variable (Tobin's Q and ROA), with i representing the firm and t representing the year; α_1 is a t; and u_{it} is error terms.

Findings and Discussion

This study investigates the impact of ISO 14001:2015 certification on different aspects of FFP, i.e., TQ and ROA. Table 1 represents the number of firms according to the eight industries investigated in this study. The highest sample of firms in this study is 91 from the construction and building materials industry. The smallest sample is from the oil and gas industry, comprised of only five firms.

Table 2 shows main descriptive statistics. First, it is essential to note that, between 2016 and 2020, only 1,174 firm-year observations are considered as the final sample for this study. The mean of TQ shows an average amount of 0.859, implying that its market worth is less than its assets. The second dependent variable (ROA), which is the tested variable for robustness check, has a mean value of 1.704. The return is more than what the firms have invested in their assets. The main variable of the study, ISO, shows that nearly 45.50% of the firms adopted ISO 14001. All the firms in the sample are big (20.283), and their capital structure is financed by debt at a rate of more than 30% of their assets on average (0.34). On average, the age of the firms in this

sample is three years in operation. The sales growth of firms is positive and increasing on average (0.013). The firms in the sample, on average, hold current assets 2.907 times more than their current liabilities.

Table 1: Number of Firms According to Industry

	Industry	No. of companies
1.	Chemicals and pharmaceuticals	38
2.	Construction and building materials	91
3.	Industrial Metal and Mining	27
4.	Manufacturing	26
5.	Oil and gas	5
6.	Paper and packaging	13
7.	Transport and logistics	26
8.	Utilities	11
	Total	**237**

Table 2: Descriptive Statistics (N= 1174)

Variable	Mean	Std Dev	Minimum	Maximum	Median
TQ	0.859	0.775	0.014	9.319	0.643
ROA	1.704	7.863	-44.120	56.670	1.985
ISO	0.455	0.498	0	1	0
Size	20.283	1.566	16.114	25.924	20.150
Liquidity	2.907	4.390	0.020	68.290	1.745
Leverage	0.340	1.297	-3.649	33.280	0.190
Growth	0.013	1.554	-22.920	26.895	0.014
Age	3.374	0.447	1.386	4.820	3.401

Tables 3 and 4 show the breakdown of the ISO implementation of the firms in this study. As mentioned above, the percentage of non-certified firms is more than certified firms by 9.02 percent. This study used unbalanced panel data for the analysis, and the percentage of ISO variable is nearly the same for all years in this study, i.e., 2016 to 2020.

Table 3: Frequency of ISO Implementation (N= 1,174)

ISO	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Non-Certified	640	54.51	640	54.51
ISO Certified	534	45.49	1,174	100.00

Table 4: Frequency Distribution of ISO Implementation According to Years

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2016	234	19.93	234	19.93
2017	235	20.02	469	39.95
2018	235	20.02	704	59.97
2019	235	20.02	939	79.98
2020	235	20.02	1,174	100.00

The correlation of all variables is presented in Table 5. On univariate analysis, a relationship is found between TQ and ISO. The finding indicates TQ and ISO have a positive yet weak

association. A similar relationship is also observed between ROA and ISO. The correlation matrix highlights the highest correlation coefficient is between ISO and Size (0.406), but the result indicated the non-existence of a multicollinearity problem. In addition, the variance inflation factor (VIFs) for individual variables ranges from 1.01 to 1.22. While, the total VIF for all independent variables is 6.555[3], this show is that multicollinearity in all models does not seem to be an issue (Hair et al., 2012).

Table 5: Pearson Correlation Coefficient (N=1,174)

	1	2	3	4	5	6	7	8
1. TQ	1.000							
2. ROA	0.361***	1.000						
3. ISO	0.079**	0.120***	1.000					
4. Liquidity	-0.014	0.113***	-0.164***	1.000				
5. Leverage	-0.031	-0.014	-0.006	-0.074**	1.000			
6. Growth	0.033	0.091**	0.043	0.008	0.038	1.000		
7. Size	0.072**	0.187***	0.406***	-0.157***	0.004	0.078**	1.000	
8. Age	-0.037	0.008	0.042	0.117***	0.066**	-0.016	0.071**	1

Note: Abbreviations: TQ; Tobin's Q, ROA, Return on Assets; ISO; ISO 14001 certification.
***Significant at 0.1%, **Significant at 1%, *Significant at 5%

The impact of ISO 14001 certification on FFP is estimated and presented in Table 6. As for the estimation method, this study employs panel data analysis. The fixed effect (FE) model is deemed appropriate for analysis as it meet the Breusch and Pagan Lagrangian Multiplier (LM) and the Hausman test specifications. The model fits well, as shown by an R^2 value within the range and the F-statistic. Model 1 is a benchmark regression that solely considers control variables. The leading explanatory variable ISO is added to Model 2. Models 3 and 4 correspondingly incorporate the two interactions of firm size and age. Model 5 is the complete model, with all predictor variables and interactions included. This study predicts that the adoption of ISO will impacts FFP. The relationship between the ISO and TQ variables should have a positive/negative significant relationship. The findings indicate in Table 6 that the adoption of ISO has a negative but insignificant effect on FFP in Model 2. The coefficient of the ISO variable is negative and significant at 0.1 percent in Model 5 when the interactions variable is included. Based on the findings presented in Table 6, there is a negative relationship between ISO adoption and the TQ. Hence, H1 is not supported.

However, the coefficient of variable interaction size with ISO shows a positive and significant at 0.1 percent in Model 3. As a result, increasing business size moderates the negative relationship between ISO certification and FFP. Hence, H2 is supported. The finding appears to be consistent with the study's expectations that when the scale of a business is grown, the positive (negative) relationship between ISO 14001 certification and FFP will be strengthened (weakened). This result suggests that in large-scale companies, financial abundance, R&D capabilities and risk adverse culture may mitigate the detrimental impact of ISO 14001 certification on FFP. The performance of larger firms is higher due to ISO certification. As observed from Figure 1, larger firms (represented by dashed lines) have a positive and steeper slope than smaller firms (represented by a solid line). This indicates the incremental impact of ISO 14001 adoption on FFP for both firms, but to different degrees.

[3]VIF identifies the impact of collinearity among variables in a regression model. A value of 1 implies that there is no correlation between the independent and control variables. Multicollinearity exists when the VIF of each variable is greater than 5, or when the total VIF for all variables is greater than 10 (Kim, 2019).

In contrast, Model 5 does not provide sufficient statistical support to support H3. However, considering ISO x Size and ISO x Age, Model 5 gives a different result. This could be the reverse effect of both interactions at the same time. Nevertheless, the hypothesis is only supported if the interaction of ISO x Size in Model 3 is considered. A closer examination of the results reveals some anomalies and hence needs further investigation.

Table 6: The Moderating Effect of Firm Size and Age on the Relationship between ISO Certification and Tobin's Q

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Liquidity	-0.001	0.003	0.006	0.003	0.005
	(0.004)	(0.006)	(0.006)	(0.006)	(0.006)
Leverage	-0.003	-0.001	-0.002	0.000	-0.001
	(0.008)	(0.012)	(0.012)	(0.012)	(0.012)
Growth	0.012*	0.006	0.007	0.004	0.005
	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)
Size	-0.101***	-0.216***	-0.348***	-0.220***	-0.347***
	(0.025)	(0.054)	(0.064)	(0.054)	(0.064)
Age	-0.235**	-0.229	-0.291	-0.213	-0.275
	(0.107)	(0.473)	(0.470)	(0.472)	(0.470)
ISO		-0.097	-6.470***	1.575*	-4.793**
		(0.106)	(1.737)	(0.849)	(1.980)
ISO*Size			9.148***		-0.430*
			(2.024)		(0.245)
ISO*Age				-0.488**	9.041***
				(0.246)	(2.023)
_con	4.666***	6.414**	9.148***	6.390**	9.041***
	(0.607)	(1.896)	(2.024)	(1.893)	(2.023)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
N	1,174	1,174	1,174	1,174	1,174
R^2	0.6441	0.7464	0.7503	0.7478	0.7512

Note: (1) *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively. (2) Standardised coefficients are reported; the numbers in parentheses are the p values

To investigate the interaction variables of ISO x Age, the study begins by comparing the ISO coefficient in Model 4 and 5. In Model 4, the coefficient of ISO is positive and significant. However, in Model 5, the ISO coefficient is negative and significant at 5%. The interaction variable ISO x Age in Model 4 shows a negative and significant -0.488 (p = 0.246). The findings are surprising since, in Model 5, the interaction ISO x Age is positive and significant at 0.1 percent. It is impossible to draw any firm conclusions because of the reverse when we consider both interaction variables of ISO x Size and ISO x Age. Hence, the conclusion is based on Model 5, the interaction of ISO x Age. In that case, the result agrees with the expectation of the study that the firm age strengthens (weakened) the positive (negative) relationship between ISO certification and FFP. Hence, there is statistical support for H3.

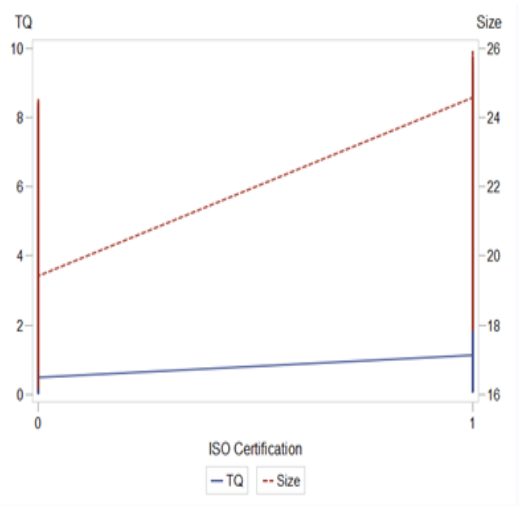

Figure 1: Moderating Effects of Firm Size on ISO 14001 Certification

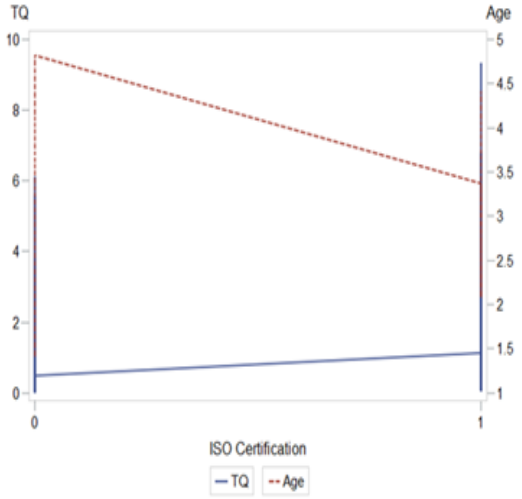

Figure 2: Moderating Effects of Firm Age on ISO 14001 Certification

Further investigation into the moderating effect of firm age in Figure 2 can justify that the moderating effect of firm age differs from two groups of firm age. It must be stressed that the results are not entirely comparable to only two groups of age, i.e., older and younger firms as from Figure 2, it is observable that the slopes for younger firms (illustrated by a solid line) are positive and the older firms are negative (illustrated by a dashed line). This is the only notable exception here where the finding contradicts previous findings (Wang & Zhao, 2020) that claim that when a firm is young, its financial performance worsens due to adoption of ISO. These results are entirely contrary to those shown in Figure 2, that when a firm is old, the firm will worsen. This finding is interesting to note that Malaysia could have different scenarios as compared to other countries. More stringent rules and regulations are imposed on matured firms.

Furthermore, past studies revealed that early adoption of ISO 14001 did not improve corporate environmental performance (Bansal & Hunter 2003; Ivanova et al. 2014). A closer examination of the results reveals some anomalies, and hence further investigation is needed for future research. Considering the business life cycle of firms could be beneficial when claiming the justification of firms' age.

Robustness Checks

This study tested the robustness of all the models in this research and found inconsistent results. Table 8 illustrates the effect of ISO certification on FFP when ROA is used as the performance metric. Model 1 is a benchmark regression that considers all the control variables. The main explanatory variable ISO is added to Model 2. Models 3 and 4 incorporate the two interactions in their places. Model 5 is the complete model, including all predictors, variables, interactions, and interactions. In order to explain the findings, this study used Model 5. In this study, the coefficient of ISO was 48.234 (p = 25.377), indicating that the adoption of ISO is positively associated with the improvement in the firm's financial performance. As a result, when the accounting-based performance measures sign is used, the H1 is not supported. The interaction between ISO and Size had a coefficient of -2.673 (p = 1.143), which was significant. In addition, the coefficient of ISO in Model 3 was -2.688 (p = 1.140), which was a negative value. Additionally, the coefficient of ISO was positive. The interaction variables of ISO x Size are negative and significant. This finding indicates that the size of firms moderates the positive

relationship between ISO and the FFP. Nevertheless, the interaction of ISO x Age is not significant in Model 5.

Table 7: The Moderating Effect of Firm Size and Age on the Relationship between ISO Certification and ROA

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Liquidity	0.510***	0.509***	0.516***	0.540***	0.516***
	(0.076)	(0.076)	(0.076)	(0.076)	(0.076)
Leverage	0.295*	0.296*	0.261*	0.248	0.260*
	(0.155)	(0.154)	(0.154)	(0.154)	(0.154)
Growth	0.191	0.194	0.204*	0.230*	0.206*
	(0.121)	(0.121)	(0.120)	(0.120)	(0.121)
Size	4.429***	4.459***	5.898***	4.889***	5.897***
	(0.678)	(0.678)	(0.821)	(0.683)	(0.822)
Age	-17.571***	-16.867***	-8.922	-5.108	-8.946
	(2.821)	(2.862)	(6.016)	(10.847)	(6.021)
ISO		-1.920	50.652**	1.021	48.234*
		(1.346)	(22.227)	(3.139)	(25.377)
ISO*Size			-2.688*		-2.673**
			(1.140)		(1.143)
ISO*Age				0.540***	0.621
				(0.076)	(3.136)
_con	-31.841**	-33.801**	-86.203	-94.567***	-86.048**
	(15.108)	(15.162)	(25.910)	(14.066)	(25.936)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
N	1,174	1,174	1,174	1,174	1,174
R^2	0.5909	0.5918	0.6024	0.5990	0.6025

Note: (1) *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively. (2) Standardised coefficients are reported; the numbers in parentheses are the p values

Discussion and Conclusion

This study draws on signalling theory to examine the relationship between ISO 14001:2015 certification and the financial performance of listed carbon-intensive firms in Malaysia. Most current empirical studies on this issue are conducted in developed countries, with little empirical data from developing countries. Consistent with signalling theory, the finding show that ISO 14001:2015 certification helps firms perform better, and firm size and age play a significant role in mitigating the negative impact of ISO 14001:2015 certification on FFP.

Theoretical Implications

Given the plethora of conflicting empirical results on the relationship between ISO 14001 certification and FFP, this study contributes to the current body of knowledge by investigating the relationship between both variables as well as the moderating effect of firm size and age on this relationship.

Practical and Social Implications

The findings of the study have potential policy and managerial implications. As for firm managers, this study reveals that adopting ISO 14001:2015 improves FFP measured using an accounting-based measure, ROA. Therefore, the firm should strengthen their corporate

environmental responsibility and seek ISO 14001:2015 certification in order to achieve better financial results from their environmental management. This study also shows investors that investing in an environmentally friendly firm is a wise strategic choice. Regarding policy, this study hints at the Malaysian government's planning policies and efforts to promote the implementation of ISO 14001:2015 and positively influence national environmental management.

Limitations and Suggestions for Future Research

The findings of this study have significant ramifications for future research on implementing ISO 14001:2015 standards. The study only spans five years and used a dummy variable to measure ISO 14001:2015 certification. Future studies may examine various ISO 14001:2015 certification characteristics (e.g., passive, invisible, factual, and symbolic) and investigate whether significant financial and economic consequences accompany this certification. Additionally, this study merely considered firm size and age as the moderating variables. Future research could investigate environmental awareness or other moderating variables on the relationship between ISO 14001:2015 certification and FFP.

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