

The Nexus between Environmental Standard and Firm Financial Performance: Insight from Carbon-Intensive Industries

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Abstract

Purpose: The purpose of this study is to examine the longitudinal impacts of ISO 14001 adoption on corporate financial performance (FP) of Malaysian carbon-intensive firms.

Design/methodology/approach: The study is based on a sample consisting of carbon-intensive firms listed on the Main Board of Bursa Malaysia for the period 2010-2020. Accounting-based and market-based measures are used as indicators of FP and the relationship between ISO14001 adoption and FP is analysed using panel data regression analysis.

Findings: The results show that ISO 14001 was not associated with accounting-based financial measures. Conversely, the direct relationship between ISO 14001 adoption and market-based financial measures showed significant results.

Research limitations/implications: Findings contribute to the corpus of environmental management system and financial performance literature. The paper highlights the effectiveness of ISO 14001 certification with respect to financial performance.

Practical implications: This research has significant ramifications for distinct groups that have an interest in the company's commitment to Sustainable Development Goals (SDGs).

Originality/value: The paper combines accounting-based and market-based indicators and examines the longitudinal impacts of ISO14001 on financial performance in the Malaysian context.

Paper type: Research paper

Keywords: Carbon emissions, Environmental standard, Environmental management system, ISO 14001, Financial performance, Market performance

Introduction

Scientists agree that human activities are causing climate change. Thence, environmental responsibility has become an essential component of corporate social responsibility to reduce environmental impact (Petera et al., 2021). Companies are increasingly called upon to establish sound management of environmental issues and apply specific management strategies to minimise the impact of their activities on the environment (Miroshnychenko et al., 2017). In this matter, environmental issues are confronted in management decisions, moving beyond the ethical perspective to promote sustainable economic success (Alexopoulos et al., 2018). The adoption of environmental management systems (EMS) is seen as a robust platform for creating

proactive environmental strategies to manage and solve environmental problems and enhance firm performance (Nowicki et al., 2021; Sam & Shuqi, 2019).

The adoption of EMS has the advantages of constituting a device that signals the company's environmental commitment to its external stakeholders and improves their financial performance (Boakye et al., 2021; Jiang et al., 2020; Karim et al., 2021; Sam & Shuqi, 2019). The most notable EMS practise being adopted is the International Organisation for Standardisation (ISO) 14001 standard (He et al., 2015; Karim et al., 2021). This standard serves as a guideline for companies to continuously enhance their environmental performance (Salim et al., 2018; Sartor et al., 2019).

Malaysia confronts environmental problems due to significant carbon dioxide (CO₂) emissions, energy consumption, and building waste due to the fast growth of the industrial sector in recent decades (Chong et al., 2019). Companies engaged in high-polluting sectors, such as carbon-intensive industries, face significant environmental risk and rigorous governmental oversight. As a result, these companies can make greater use of their ISO 14001 certification to safeguard against risk and capitalise on market opportunities (Ye et al., 2020). Most importantly, adopting ISO 14001 certification increases the legitimacy of highly polluting enterprises' operations (Darnall et al., 2010).

Even though many studies have focused on ISO 14001 drivers, few studies have connected strategic environmental management to financial performance (Lee et al., 2021). From an empirical standpoint, the impact of EMS adoption on corporate financial performance (FP) has been extensively studied in developed nations (Manrique & Mart-Ballester, 2017). Much remains unclear regarding the effects of ISO 14001 on sales and stock market performance (Sartor et al., 2019), particularly in Malaysia (Lee et al., 2021).

Prior research had numerous flaws as a result of the following factors. Most prior research used cross-sectional data, resulting in inconclusive findings (Arocena et al., 2020). A longitudinal empirical study is needed better to understand the actual outcome of ISO 14001 implementation. Second, previous research measured FPs using a single indicator. Existing ISO 14001 research has concentrated on economic or stock market aspects of performance. Financial metrics such as return on assets (ROA), return on equity (ROE), and return on sales (ROS) are insufficient indicators to measure overall financial performance (Klingenberg et al., 2013; Treacy et al., 2019). These metrics reflect a short-term standpoint, reliance on estimates, and are backward-looking (Orlitzky et al., 2003; El-Sayed Ebaid, 2012). Market-based metrics are used to reflect the notion that shareholders are the primary stakeholder group and represent stakeholders' value of corporate environmental sustainability policies (Garca-Sánchez & Prado-Lorenzo, 2012). The current study is motivated by the above considerations. Specifically, this study examines the effect of ISO 14001 adoption on accounting-based and market-based indicators of 237 Bursa Malaysia-listed carbon-intensive businesses from 2010 to 2020.

The remainder of the paper is structured as follows. The following section is a review of the literature, followed by a description of the methodology used. This study presents the results and discusses the main findings, implications of the findings, limitations, and future research directions.

Literature Review

ISO 14001 Adoption

The ISO 14001 is considered an essential component of a company's management system (Nowicki et al., 2021) and a widely used indicator of an organisation's EMS (Karim et al., 2021). It was developed under license by the International Organisation for Standardisation (Hazudin et al., 2015) and has emerged as the most well-known environmental standard (Boiral et al., 2028). It aims to lessen the harmful effect on the environment by taking action beyond

the existing environmental legislation and planning for the continuous improvement of environmental activities (Ociepa-Kubicka et al., 2021). ISO14001 enables companies to find the right balance between generating profits and providing dividends to shareholders while acknowledging their ethical obligations to be sustainable and ecologically benign for future generations (Jiang et al., 2020).

Increases in ISO14001 adoption may lead to more sustainable development (de Nadae et al., 2020) and climate change mitigation (Laskurain et al., 2017; Ociepa-Kubicka et al., 2021). The benefits of EMS implementation are to reduce energy consumption, reduce the risk of lawsuits related to environmental damage, and improve organisational management (Nga, 2009; Ociepa-Kubicka et al., 2021). It is especially important for carbon-intensive businesses because, in addition to lowering the company's environmental impact and firm carbon emission intensity (Arocena et al., 2020), it may assist a company in building a valued organisational capacity that competitors find difficult to imitate (Delmas & Montes-Sancho, 2011).

Adopting ISO14001 enables companies to better manage their operations by improving effectiveness and operational efficiency (Treacy et al., 2019). Through ISO 14001 adoption, companies may prioritise pollution prevention and waste management practises related to their goods and operations. The companies can improve overall organisational efficiency in the long run (Zimon et al., 2021). This may be accomplished through lowering operating costs, increasing productivity, and removing superfluous waste and materials from the manufacturing process (Lo et al., 2012; Sam & Shuqi, 2019).

Companies that have implemented ISO 14001 also indicated a noticeable improvement in the economic effects of the company's activity (de Jong et al., 2014; Ociepa-Kubicka et al., 2021). Most importantly, market participants take ISO 14001 certification as a sign that the organisation has made an effort to improve its environmental management (Jiang et al., 2020; Sam & Shuqi, 2019). Companies that have successfully built a "green image" or "responsible environmental firm" are more attractive to potential customers and can increase their competitiveness in the market; as a result, companies receive better access to the global market (He et al., 2015; Liu et al., 2020; Ociepa-Kubicka et al., 2021; Sam & Shuqi, 2019).

Hypotheses Development

The primary argument for the ISO 14001–FP association is based on the resource-based view (RBV). The firm's RBV is based on the idea that a firm's performance is determined by the resources it has at its disposal. RBV, in particular, is founded on the premise of unique internal resources and capabilities (Treacy et al., 2019). The company's competitive edge is based on the efficient utilisation of its tangible and intangible assets, which are difficult to imitate (Arda et al., 2019). More precisely, the proponents of RBV argue that being less pollution-oriented is likely to be a burden on a company's resources (Porter & Van der Linde, 1995). Fujii et al. (2013) contended that environmental problems impede contingency cost, whereas continual improvements in environmental policies and reducing environmental risk are appropriate for economic performance. Hence, an RBV framework suggests that implementing innovative environmental strategies to sound environmental management practises may help companies improve corporate sustainable strategic growth, leading to financial gains by gaining access to critical resources (Christmann, 2000). Excellent environmental management may enhance a company by improving its image and creating stronger relationships with key stakeholders, and as a consequence, its financial performance can improve (Sam & Shuqi, 2019).

Empirical results on the relationship between ISO 14001 implementation and FP remain inconclusive. Hazudin et al. (2015), He et al. (2015), Hojnik and Ruzzier (2017), Miroshnychenko et al. (2020), Testa and D'Amato (2017), and Watson et al. (2017) are among the research findings that find that certification has little explanatory power on company

performance (2004). According to this research, ISO 14001 certification has failed to demonstrate how this certification may affect performance. Furthermore, the implementation of ISO14001 increased companies' sales and expenses by similar magnitudes, resulting in an insignificant net effect on financial performance. Another viewpoint on the relationship between ISO 14001 and financial performance is that it has a negative effect. Zhao (2006) discovered that certification led to lower return on revenue and ROA. Lee et al. (2008) find that ISO 14001 certification can negatively affect profit margin, ROE and earnings per share (EPS). Ye et al. (2020) assert that ISO 14001 adoption hinders companies' enabling capability and limits the company's growth.

Concerning market performance, Cañón-de-Francia and Garcés-Ayerbe (2009) explore how the Madrid stock market responds to ISO 14000 certification announcements and find that news of initial certification creates a substantial negative impact on abnormal stock returns. Paulraj and de Jong (2011) demonstrate a recurring finding. In comparison, Riaz and Saeed (2019), Miroshnychenko et al. (2020), Tuesta et al. (2020), and Wang and Zhao (2020) provide evidence that companies with environmental certification have a detrimental effect on market performance in terms of Tobin's-Q.

A substantial body of research highlights the importance of ISO 14001 standards in promoting FP. Heras-Saizarbitoria et al. (2011) discovered that accredited companies had a higher average ROA. Lo et al. (2012) find that implementing this certification has a substantial beneficial effect on both the ROA and the ROS of the fashion and textiles sectors. De Jong et al. (2014) used publicly listed US companies reported that the firm's first ISO 14001 accreditation may result in immediate short-term increases in ROA by increasing productivity. Treacy et al. (2019), Arocena et al. (2020), de Nadae et al. (2020), Boakye et al. (2021), and Karim et al. (2021) all come to the same conclusion. These findings imply that ISO 14001 certifications may potentially improve the firm's image, thereby increasing its sales concerning its asset base. In Malaysia, a similar study was conducted to determine the benefits of ISO 14001 certification. According to Ann et al. (2006), there is evidence that certification has a beneficial effect on economic performance, and the advantages significantly exceed the expenses. Koe and Nga (2009) reveal that certification by companies improves average ROE. Ong et al. (2016) also reached the same conclusion. They discovered a link between ISO 14001 certification and a company's financial performance in ROA and ROE. Yusof et al. (2020) also indicate that ISO 14001 implementation has a favourable and substantial impact on construction companies' FP. While Ali et al. (2020) reported that ISO 14001 adoption generates a higher ROA for textile firms. These results imply that ISO14001 certification aids in the development of a better system, resulting in cost savings and revenue growth in the long term. The aforementioned studies prove that ISO 14001-certification boosts sales, increases customer satisfaction, improves company image, and results in superior FP.

From the standpoint of market performance, Arts and Vos (2001) investigated the impact of ISO 14001 certification announcements by New Zealand companies on stock performance. The news of ISO 14001 adoption resulted in a substantially favourable stock price response, implying that investors perceive ISO 14001 adoption as positive information. In addition, a return upon adoption is found to be much higher than the return prior to the announcement. Jacobs et al. (2010) also discovered that such an announcement is related to substantially favourable abnormal returns. Sebastianelli et al. (2015) back up the claim that attaining this accreditation is a strategy that "pays off" for investors and may offer long-term value for shareholders. In line with Jacobs et al. (2010) and Sebastianelli et al. (2015), Feng et al. (2020) reveal that when a company announces their ISO14001 implementation, it improves the firm's image, attracts environmentally concerned investors, and drives share prices.

Similarly, Kiryanto et al. (2021) found that the announcement of certification is critical information for the general public, particularly investors, and has received favourable market reaction. Using a different proxy for market valuation, Wahba (2008), Aslam et al. (2021), Boakye et al. (2021), and Karim et al. (2021) find that ISO 14001 certifications increase Tobin's Q. These results confirm Feldman et al.'s (1997) claim that if a company improves its corporate EMS and the improvement is publicised, it allows investors to determine overall risk associated with their investment in a company, resulting in lower cost of capital and higher stock price.

Given that a vast body of literature emphasises the importance of ISO 14001 in driving FP, one could argue that ISO 14001 can positively affect FP because involvement of stakeholders in a company's ISO 14001 can contribute to a valuable and unique organisational capability (Delmas & Montes-Sancho, 2011). In addition, the above studies prove that ISO 14001-certification helps companies improve sales, customer satisfaction, company image, and market share, resulting in better FP. Hence, it can be argued:

H1: ISO 14001 adoption has a positive impact on FP

Methodology

Data and Sample

The sample of this study is carbon-intensive companies listed on the main board of Bursa Malaysia from 2010 to 2020. These companies are chosen as their operations directly impact the environment, are considered the primary contributors to CO₂ emissions and are more exposed to climate risks. Hence, the adoption of ISO 14001 is expected to be more likely among these companies (Liu & Qio, 2021). The initial sample included 237 carbon-intensive companies, consisting of 2,607 firm-year observations from eight industries. This study excluded all observations for which a value was missing. Hence, the resulting unbalanced panel dataset consists of 2,529 firm-year observations. The financial information of sample companies was obtained from Thomson Reuters Datastream, while the data for the ISO 14001 certification was obtained from the Federation of Manufacturing Malaysia (FMM) directory 51st edition.

Variables

As independent variables, following Huang and Li (2018) and 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 adopted (1) or not (0).

Concerning the dependent variable (FP), this study uses both accounting-based and market-based indicators to allow a more integrated view of ISO's impact on multiple aspects of FP, such as profitability, efficiency, and effectiveness (Devie et al., 2020). While the accounting measures are based on historical data and evaluate past and short-term performance, the market measure reflects long-term performance and considers growth possibilities (Farza et al., 2021). Extant research on FP widely employs accounting-based indicators, that is, ROA, ROE, ROS, and return on invested capital (ROIC) and market-based indicators, that is, Tobin's Q, market capitalisation, and EPS (Sánchez-Ballesta & García-Meca, 2007). In this study, the ratio of net income to total assets is used to measure ROA, the ratio of net income to shareholders' equity is used to calculate ROE, the ratio of total operating income to total revenue is used to calculate ROS, and the ratio of profit after taxes to total capital invested to determine ROIC (Simionescu et al., 2020).

Tobin's Q (TQ) is estimated as the ratio between (the market value of equity + book value of liabilities) and the book value of the total assets (Kamardin, 2014). To lessen the weight of

extreme outliers, the study used a logarithm of market capitalisation (Zaigham et al., 2019). Following Qiu et al. (2016) and Deswanto and Siregar (2018), the current study also includes EPS as the FP.

Company size (SIZE), financial leverage (LEVERAGE), liquidity (LIQUIDITY), sales growth (GROWTH), and firm age (AGE) have all been incorporated as control variables in all regression models. To control the effect of company size, the natural logarithm of total assets was included in all regression models (Daz-Chao et al., 2021). Leverage is the dominant factor in explaining the amount of profit variation (Qureshi & Yousaf, 2014). This study used the natural logarithm of the total long-term debt to be scaled by total assets to measure leverage (Jaffar & Abdul-Shukor, 2016). Numerous studies predict that liquidity has an inverse relationship with profitability (Haddad et al., 2020). This study uses the current asset to current liability ratio as the proxy for liquidity (Alipour et al., 2019). A considerable amount of research suggests that sales growth positively influences firm profitability (Enache & Hussainey, 2020). The natural log-difference of turnover between the current year and the preceding year, divided by the turnover in the preceding year base, is used to measure growth (Abdullah et al., 2020). From an institutional perspective, founding conditions play a significant role in the organisational process and could affect financial performance. The firm's age (AGE) is measured as the natural log of the number of years since the firm's incorporation (Wang & Zhao, 2020). A summary of the variables used in this study is presented in Table 1.

Table 1: Summary of Dependent, Independent and Control Variables Used

Variables	Expected Sign	Operational Definition
Dependent variables		
ROA		The return on asset
ROE		The return on equity
ROS		The ratio of total operating income to total revenue
ROIC		The return on invested capital
EPS		Earnings per share; The net income divided by the number of stocks outstanding.
TQ		The ratio between (the market value of equity + book value of liabilities) and the book value of the total assets
TQ -1		This variable is Tobin's q-1. Tobin's q is defined as (total debt+ stock prices × the number of stocks)/total assets.
LNMCAP		The natural log of market capitalisation
Independent Variables		
ISO	-/+	A dummy variable is given value "1" if there is an implementation ISO 14001: 2015, and "0" otherwise.
Control Variables		
SIZE	+	The natural log of total assets
LEVERAG	-	The natural logarithm of the total long-term debt is scaled by total assets.
E		
LIQUIDITY	-	Current Assets / Current Liabilities
GROWTH	+	Sales growth
AGE	+	The natural log of firm's age

Econometric Model

The following econometric model was used to test the study's hypothesis

$$FP_{it} = \beta_0 + \beta_1 ISO_{it} + \beta_2 SIZE_{2it} + \beta_3 LEVERAGE_{it} + \beta_4 LIQUIDITY_{it} + \beta_5 GROWTH_{it} + \beta_6 AGE_{it} + u_{it} \quad (1)$$

Where FP represents various performance indicators. ISO, SIZE, LEVERAGE, LIQUIDITY, SGROWTH and AGE are defined in Table 1.

Finding

Table 2 describes the number of companies according to industry representation. The total number of firms according to the industry is 237. The construction and building materials industry has the most firms (91), followed by the chemical and pharmaceutical industries (38). The least sampled category is the oil and gas industry, with only five firms in the sample.

Table 2: Number of Companies 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 3 represents descriptive information for all the variables used in the analysis. The result indicated 40.8% of the firms adopted ISO 14001. The mean value of the companies shows ROA 2.73%, ROIC 3.67%, ROE 3.85%, ROS 6.03%, EPS 0.07 and TQ 0.826. The table also indicates that all of the firms in the sample are big (20.098), and their capital structure is often financed by debt at a level above 40 percent of the company's assets (0.43).

Table 3: Descriptive statistics (N= 2,529)

Variable	Mean	Std Dev	Minimum	Maximum	Median
ISO	0.408	0.492	0.000	1.000	0.000
ROA	2.742	7.831	-61.071	56.670	2.800
ROIC	3.670	18.728	-396.510	143.300	4.980
ROE	3.851	14.994	-201.640	176.700	4.260
ROS	6.026	23.925	-218.390	754.262	6.304
EPS	0.066	0.223	-2.370	2.030	0.040
TQ	0.826	0.717	0.002	9.319	0.640
TQ - 1	-0.174	0.717	-0.998	8.319	-0.360
LNMCAP	19.290	1.763	14.509	25.214	19.008
SIZE	20.098	1.547	16.114	25.924	19.947
LEVERAGE	0.433	1.475	-3.649	44.590	0.220
LIQUIDITY	2.569	3.846	0.020	68.290	1.690
GROWTH	0.105	1.413	-22.920	33.274	0.054
AGE	3.250	0.521	0.693	4.820	3.296

The correlation analysis is reported in Table 4. As seen in the table, the variable ISO is positively and significantly correlated with all the FP indicators, implying that companies who

adopt ISO may tend to have a higher performance. Before the multivariate analysis, this study had verified the correlation between different variables. As indicated in Table 4, the highest inter-correlation between variables is 14 percent (between AGE and LIQUIDITY). However, the correlation coefficient between variables did not exceed the value of 0.8. It can be considered that there is no potential multicollinearity bias that could distort the results of model estimation (Field, 2013; Gujarati & Porter, 2009). In addition, the variance inflation factor (VIF) is used to detect the presence of linear relationships between two or more independent variables. The VIF for the independent and control variables is in the range of 1.013 to 1.239. The variable's VIFs does not exceed 10, these results indicate that the analysis fulfils the multicollinearity assumption (Hair et al., 2010).

Table 4: Pearson Correlation Coefficients (N = 2,529)

	1	2	3	4	5	6	7
1. ISO	1.00						
2. ROA	0.11***	1.00					
3. ROIC	0.10***	0.76***	1.00				
4. ROE	0.11***	0.79***	0.86***	1.00			
5. ROS	0.06**	0.49***	0.48***	0.43***	1.00		
6. EPS	0.15***	0.53***	0.46***	0.42***	0.30***	1.00	
7. TQ	0.11***	0.34***	0.22***	0.25***	0.14*	0.20	1.00
8. LNMCAP	0.37***	0.33***	0.27***	0.26***	0.28***	0.42***	0.42***
9. SIZE	0.42***	0.15***	0.14***	0.12***	0.21***	0.31***	0.08***
10. LEVERAGE	-0.05**	-0.02	-0.02	-0.01	-0.03*	-0.01	-0.05**
11. LIQUIDITY	-0.12***	0.09***	0.05**	0.04*	0.03	0.04**	0.02
12. GROWTH	0.00	0.09***	0.06**	0.13***	0.03	0.04*	0.03
13. AGE	0.04**	-0.01	0.01	-0.01	-0.05**	0.06**	-0.06**
	8	9	10	11	12	13	
8. LNMCAP	1.00						
9. SIZE	0.83***	1.00					
10. LEVERAGE	-0.02	-0.03	1.00				
11. LIQUIDITY	-0.03	-0.11***	-0.04**	1.00			
12. GROWTH	0.03	0.02	0.10***	0.04*	1.00		
13. AGE	0.07**	0.12***	0.08***	0.14***	-0.01	1.00	

Note: (1) *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

As for the estimation method, this study employs panel data analysis. To choose the best estimation model, the Breusch and Pagan Lagrangian Multiplier (LM) test was used to compare the Pooled Ordinary Least Squares (OLS) model and the random effects (RE) model. The F-statistic probability value of the LM test is not significant ($p < 0.05$), indicating REM was appropriate. The Hausman test was run to choose between RE and the fixed effect (FE) model. The result is statistically significant at 5% of the significance level, indicating FE model is more appropriate for analysis. The models have a decent fit, as shown by an R^2 value that is within the range and the F-statistics. The empirical results for accounting-based performance measures in Table 5 show that the R^2 of research models for (1), (2), (3) and (4) are approximately 45.51%, 40.38%, 32.28% and 35.36%, respectively. While the results for market-based performance measures in Table 6 show that the R^2 of research models for (1), (2), (3) and (4) are approximately 50.64%, 64.25%, 64.19% and 92.30%, respectively. As indicated in Table 5, this study found that there is a positive relationship between ISO adoption and the FP measured based on accounting-based indicators. In particular, the adoption

of ISO 14001 is not statistically significant with ROA (He et al., 2015; Watson et al., 2004), ROE (He et al., 2015; Miroshnychenko et al., 2020), and ROS (He et al., 2015), implying ISO 14001 certification failed to establish how this certification could affect performance. Another explanation is that the adoption of ISO14001 increases companies' sales and costs by equivalent magnitudes, resulting in insignificant net effects on their financial performance (He et al. (2015). Moreover, stakeholders might not consider ISO 14001 adoption as a significant factor in evaluating company financial performance (Seifert & Guenther, 2020). This low stakeholder interest reduces the value of ISO 14001 certification for carbon-intensive companies.

Table 5: Effect ISO 14001 Adoption on Accounting-based Performance Measures

	(1) ROA	(2) ROE	(3) ROS	(4) ROIC
ISO	0.879 (0.730)	2.021 (1.471)	3.049 (2.505)	2.199 (1.916)
SIZE	2.328*** (0.333)	3.546*** (0.672)	6.173*** (1.143)	5.860*** (0.874)
LEVERAGE	0.185* (0.106)	0.286 (0.214)	-0.087 (0.364)	0.139 (0.279)
LIQUIDITY	0.415*** (0.055)	0.516*** (0.110)	0.584** (0.1880)	0.740*** (0.144)
GROWTH	0.273** (0.094)	0.915*** (0.190)	-0.277 (0.324)	0.372 (0.248)
AGE	-0.904 (1.613)	-2.625 (3.247)	-1.049 (5.537)	-7.419** (4.235)
_con	-34.659*** (8.394)	-55.283*** (16.939)	-107.761*** (28.819)	-88.813*** (22.040)
Year Fixed Effect	YES	YES	YES	YES
Firm Fixed Effect	YES	YES	YES	YES
N	2,529	2,529	2,529	2,529
R ²	0.4551	0.4038	0.3228	0.3536

Note: (1) ***Significant at the 1% level, **Significant at the 5% level, *Significant at the 10% level. (2) Standardised coefficients are presented, with p values in parenthesis.

From market-based financial performance perspective, Table 6 demonstrated mixed results. ISO has a positive and significant relationship with EPS ($p=0.009$) and LNMCAP ($p=0.028$). This result implies that ISO 14001 adoption is both essential and advantageous to market value. Although it is not required by law in Malaysia, market participants value ISO 14001 adoption by companies. This finding suggests that shareholders are knowledgeable, and firms that adopt ISO 14001 might proactively provide their external stakeholders with frequent communication that showcases the impact of their initiatives (Halkos & Evangelinos, 2002). An effective means of communication between stakeholders and the companies that have implemented ISO 14001 will offer stakeholders accurate information about the firm's operations and enable feedback mechanisms that will allow businesses to integrate stakeholder expectations and desires. This connection will further expose the real objectives of the firm's shareholder wealth.

Table 6: Effect ISO 14001 Adoption on Market-based Performance Measures

	(1) EPS	(2) TQ	(3) TQ - 1	(4) LNM CAP
ISO	0.032*** (0.009)	-0.098*** (0.025)	-0.110** (0.055)	0.552*** (0.028)
SIZE	0.005* (0.003)	-0.003 (0.008)	-0.099*** (0.025)	0.013 (0.009)
LEVERAGE	0.005*** (0.002)	-0.001 (0.004)	-0.003 (0.008)	0.013** (0.005)
LIQUIDITY	0.003 (0.003)	0.011 (0.007)	-0.002 (0.004)	0.000 (0.008)
GROWTH	-0.021 (0.044)	-0.324** (0.121)	0.012* (0.007)	-0.078 (0.138)
AGE	-0.014*** (0.004)	-0.020* (0.011)	-0.308** (0.121)	-0.029** (0.012)
_con	-0.512** (0.229)	4.913*** (0.628)	-0.110** (0.055)	9.709*** (0.716)
Year Fixed Effect	YES	YES	YES	YES
Firm Fixed Effect	YES	YES	YES	YES
N	2,529	2,529	2,529	2,529
R ²	0.5064	0.6425	0.6419	0.9230

Note: (1) ***Significant at the 1% level, **Significant at the 5% level, *Significant at the 10% level. (2) Standardised coefficients are presented, with p values in parenthesis.

The TQ and ISO sign, on the other hand, is negative but significant, showing that ISO 14001 adoption is negatively associated with FP. The high expenses connected with ISO 14001 adoption have become one of the primary impediments to the certification's effectiveness and result in a negative relationship (Riaz & Saeed, 2019; Sing et al., 2015). The current study also conducted the robustness check for this variable, i.e., TQ – 1¹ (Iwata & Okada, 2011; Keizai, 2010; Nikkei Digital Media, 2010) in column (3), where the result is still negative and significant, suggesting that implementation of ISO leads to a decrease in the value of intangible assets. This finding is consistent with what some researchers believe that such ISO 14001 adoption would not be a good signal to the market because certification merely requires companies to apply a "self-formulated" assessment of their EMS without requiring them to report environmental performance outcomes (Miroshnychenko et al., 2020; Rowland-Jones et al., 2005; Tuesta et al., 2020; Wang & Zhao, 2020). The market views a company's move to obtain certification as a reactive response to stakeholder pressure rather than proactive to improve overall operations. Hence, those companies have been penalised by the stock market with significant value of adoption. Furthermore, the time it takes to see the positive impact of the ISO 14001 adoption could be substantially longer (Riaz & Saeed, 2019). This could be true for emerging countries like Malaysia, which must take their time and incur higher costs to improve standards (Wang & Zhao, 2020).

¹ The idea of Tobin's Q may be simply stated as follows, according to Konar and Cohen (2001). The sum of the firm's values from tangible assets (VT) and intangible assets (IV) is the company's market value (MV= VT + VI). Tobin's Q-1 equals VI/VT by a simple calculation as Tobin's Q is defined as MV/VT. As a result, Tobin's Q-1 is understood as the worth of the firm's intangible assets.

Discussion and Conclusion

This study examines the longitudinal impacts of ISO 14001 adoption on the FP of 237 Malaysian companies operating in carbon-intensive industries. The findings indicate that implementing ISO 14001 has a distinct effect on accounting-based and market-based performance metrics. There is limited support for H1, ISO 14001's function as a catalyst for improving financial performance and RBV theory. To some degree, this research provided empirical evidence to validate the possibility of businesses achieving better financial performance by adopting ISO 14001.

Theoretical Implications

This research fills a knowledge gap in the existing literature and enriches previous research in the field of EMS and financial performance. This study adds to the existing literature by providing new evidence on the longitudinal impact of ISO 14001 adoption on various financial performance measures through the lens of RBV theory.

Practical and Social Implications

As this research focused on firm with higher CO₂ emissions, the findings will be of interest for distinct groups that have an interest in the company's commitment to SDGs particularly Goal 13, "Climate action: take urgent action to combat climate change and its impacts". This finding provided support for companies to incorporate environmental concerns and reconcile short-term interests with long-term development, and to justify their investments in ISO 14001 would eventually contribute to business benefits and superior financial performance. Although it is uncommon for companies in underdeveloped nations such as Malaysia to accomplish their objectives in the near term, ISO 14001 accreditation may eventually enhance FP in the long run. The result would imply that the realisation period for the beneficial effect of ISO 14001 adoption might take considerably longer, and would imply to investors that the cost advantages of certification are adequate to offset the expenditure. As the finding reveals ISO 14001 certification has a negative financial impact on some performance metrics, this research provides a hint for certification bodies to look for ways to improve the perceived credibility of issued certificates, because the benefit of ISO 14001 depends on the perceived credibility of their certificates.

Limitations and Suggestions for Future Research

Despite its potential contributions, this study has some limitations, which calls for caution when interpreting its empirical findings. First, the research concentrated on carbon-intensive industries, which may limit the generalisability of research findings. Extrapolating the results to firms from non-carbon-intensive industries may not be accurate or effective. The second limitation is the time frame, which is not standardised as certain companies are adopting ISO 14001 at different years, which could be earlier than the other companies, and the study only spans eleven years. Overcoming the aforementioned limitations can serve as the foundation for future study. For example, carried out studies in other settings with comparable market conditions, using a longer time series analysis and a sample of all ISO 14001-certified companies in Malaysia. Future research may further examine the financial performance of companies before and after ISO 14001 implementation, as well as investigate the variables that may mitigate the negative relationship between ISO 14001 adoption and FP, such as company size, age, and environmental awareness.

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