

GREEN SUSTAINABILITY AND FINANCIAL PERFORMANCE OF HALAL FOOD COMPANIES: EVIDENCE OF MALAYSIA

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ABSTRACT

With growing concerns about environmental degradation and its impact on global ecosystems, the Halal food industry is facing increasing scrutiny and pressure to adopt sustainable practices. This research examines the relationship between green sustainability and the financial performance of Halal food companies in Malaysia. Applying a dynamic panel modelling to a sample of 75 companies over 10 years, we document diverse effects of sustainable practices on firms' financial performance. More specifically, we note that efficient material usage is positively associated with both Return on Assets (ROA) and Tobin's Q (TBQ). Likewise, by reducing costs and enhancing the company's public image, effective emission management boosts both ROA and TBQ. However, energy-related initiatives negatively impact both ROA and TBQ. Biodiversity efforts, although costly in the short term, contribute to improved long-term market valuation. In a similar vein, while its decreases short-term profitability, environmental sustainability positively influences market valuation. Finally, water management initiatives often lead to decreased ROA and TBQ, which possibly is related to their high costs. From the results, policymakers should support efficient material usage and emission management through incentives to enhance profitability and market valuation. Additionally, they should consider providing financial assistance for biodiversity and environmental compliance initiatives while evaluating ways to mitigate the high costs associated with energy and water management to ensure sustainable industry growth.

Keywords: Sustainability, Green, Halal food companies, Financial performance, Malaysia

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I. INTRODUCTION

Islamic economics and finance intricately blend divine teachings with the analytical rigor of social sciences, valuing both the insights of religious scholars and the advancements of modern methodologies (Indra & Ascarya, 2022). This integration enriches the theoretical framework and directly influences practice in industries. Pivotal to Islamic economics, the halal industry operates on principles that ensure adherence to Islamic dietary laws encompassing ethical sourcing, processing, and distribution. This not only ensures compliance with religious mandates but also promotes core Islamic economic values such as fairness, transparency, and community welfare. These principles are implemented across the halal industry to enhance economic, social, and environmental sustainability, showcasing a direct application of Islamic economic theories in real-world business practices.

In recent decades, there has been a growing realization of the importance of environmental concerns to ecological stability and human well-being alignment with the Islamic concept (Nair & Ahmed, 2022). As concerns about climate change, resource depletion, and environmental degradation intensify, businesses across various sectors are urged to reevaluate their practices and embrace sustainable strategies to mitigate their ecological impacts. The food industry holds a substantial role in shaping environmental sustainability due to its substantial resource consumption and waste generation (Salim et al., 2018; Kadrigama et al., 2023). The halal food industry, which serves the dietary needs of the Muslim community, is not exempt from the need for environmentally responsible procedures within the larger food production sector.

The importance of investigating green sustainability within the Halal food industry stems from its unique operational context, marked by compliance with Islamic dietary laws which influence every aspect of production and supply. Unlike its non-Halal counterparts, the Halal industry not only ensures food safety and quality but also adheres to ethical standards prescribed in Islam, including animal welfare, cleanliness, and the avoidance of alcohol and certain animal products (Ahmad et al., 2023; Amid, 2024). This dual commitment to religious conformity and ethical sustainability presents distinct challenges and opportunities for environmental stewardship. Despite the growing global demand for Halal products, which underscores the industry's economic significance, there remains a gap in understanding how these unique characteristics of the Halal industry can coalesce with green sustainability practices to enhance financial performance. This research aims to fill this gap by providing empirical insights into the interaction between stringent Halal compliance and robust environmental practices, offering a novel perspective on sustainability that could set a precedent for other sectors. Furthermore, references such as Ali & Suleiman (2016) and Mabkhot (2023) highlight the operational differences and challenges in integrating green practices within Halal-certified establishments, which can serve as a benchmark for environmental strategies in similar religiously compliant industries.

The six dimensions of environmental sustainability, namely materials, energy, biodiversity, environmental compliance, water, and emissions, are important in promoting sustainability in the halal food industry. The choice of these six dimensions is based on their relevance and critical impact on the halal food industry as well as the availability of robust and comparable data across the

sector (Mabkhot, 2023). These dimensions are widely recognized in environmental studies for their direct impact on ecological stability and are pivotal in assessing the sustainability practices within industries heavily reliant on natural resources (Bux et al., 2022). Materials and energy consumption are core components of manufacturing processes, directly affecting resource depletion and energy efficiency. Biodiversity, water management, and emissions are essential for maintaining ecological balance and adhering to environmental regulations, which are becoming increasingly stringent in global markets. Lastly, environmental compliance is crucial for legal adherence and risk management. The framework of these six dimensions allows for a focused and structured analysis of sustainability's impact on financial performance, aligning with both sector-specific challenges and global sustainability goals. This selection ensures the study's applicability and relevance to policymakers, industry stakeholders, and academic discourse in environmental economics. Using eco-friendly and biodegradable materials in the production process can promote resource productivity by reducing natural resource consumption and using hazardous materials (Salim et al., 2018). The usage of renewable energy sources, such as wind power and solar, can decrease conservatory gas emissions and improve energy efficiency (Kadirgama et al., 2023). The conservation of natural habitats and ecosystems can enhance biodiversity and promote environmental health. Compliance with environmental regulations and standards can reduce the risk of legal and reputational issues while promoting environmental health (Rezai et al., 2015). Reduction of greenhouse gas emissions and other forms of pollution can promote environmental health and mitigate climate change (Gao et al., 2018). Therefore, implementing sustainable practices in the halal food industry can help promote environmental sustainability by reducing waste generation, conserving natural resources, and minimizing pollution.

With its rich cultural heritage and vibrant culinary diversity, Malaysia is home to a thriving Halal food industry, both domestically and internationally. As the demand for Halal products grows globally, so does the industry's responsibility to safeguard environmental health while maintaining economic viability (Ali & Suleiman, 2016; Mabkhot, 2023). While prior research has explored the importance of environmental sustainability in various industries, a focused investigation of the Halal food companies and their financial performance in Malaysia remains relatively limited. In the literature, the halal food sustainability is examined for the principles of environmental friendliness, food safety, fair trade, and animal welfare (Ali & Suleiman, 2016). Some studies focus on Malaysia's sustainability of halal product performance and the effect of supply chain incorporation, demand for halal products, marketing, and halal certification on (Mabkhot, 2023; Muhammed et al., 2023). Since the COVID-19 pandemic has brought attention to the importance of sustainable procedures in the halal food sector, studies have been conducted to ensure that halal products in Malaysian businesses will continue to thrive even in the face of adversity (Timpanaro & Cascone, 2022; Batool et al., 2023). Therefore, due to the lack of the investigation into green environmental sustainability and Malaysian halal food companies' financial performance, the current work has great significance.

The primary objective of this research is to investigate the interrelation between green environmental sustainability practices and the financial performance of Halal

food companies in Malaysia. This study seeks to fill the gap in existing literature by providing a comprehensive analysis of how adopting sustainable practices impacts companies' economic outcomes. More specifically, it aims to empirically assess whether environmentally friendly practices within the Halal food sector correlate with enhanced financial performance, thereby offering a compelling case for the adoption of green strategies in the Halal food industry.

In this paper, we employ dynamic panel models to examine the relationship between green environmental sustainability and financial performance for the case of Halal food industry in Malaysia. This research aims to inform policymakers, investors, and business leaders in the Halal food industry with data-driven evidence highlighting the economic advantages and long-term viability of environmental sustainability. By acknowledging the importance of embracing sustainable practices, businesses can cultivate a competitive edge while actively contributing to preserving of the environment. Ultimately, this study seeks to advance the collective effort towards a more environmentally conscious and sustainable Halal food industry in Malaysia and beyond.

This research contributes to the literature by rigorously evaluating the impact of green sustainability practices on the financial performance of Halal food companies in Malaysia. It explores comprehensive environmental dimensions—materials, energy, biodiversity, environmental compliance, water, and emissions—and their correlation with financial metrics, namely return on assets (ROA) and Tobin's Q (TBQ). Moreover, the study's timeframe spans over a decade, providing a robust dataset for the analysis. Through this approach, the research seeks to provide a nuanced understanding of how adopting green practices can influence financial outcomes, serving as a vital resource for policymakers, investors, and business leaders in the Halal food industry to make informed decisions that balance economic benefits with environmental responsibilities.

II. LITERATURE REVIEW

This section reviews the six dimensions of green sustainability, elucidating their impacts on environmental conservation and financial success within Halal food companies. It encompasses studies that investigate the influence of eco-friendly and biodegradable materials on waste reduction and resource conservation, as well as the effects of renewable energy sources on greenhouse gas emissions, energy efficiency, and biodiversity. Additionally, it delves into the pivotal relationship between environmental compliance and efficient water usage. Moreover, it scrutinizes the repercussions of gas emissions and other pollutants on environmental well-being and climate change. Finally, it discusses the sustainability initiatives and company's financial performance.

2.1. Theoretical Underpinnings

The theoretical underpinnings of this research are rooted in the Resource-Based View (RBV), which highlights how environmental sustainability can serve as a strategic asset enhancing competitive advantage (Ali et al., 2022). The view is particularly pertinent to the halal food industry, where sustainability efforts

can lead to both cost reductions and value creation through enhanced consumer trust and market differentiation. Theories such as the Natural Resource-Based View (NRBV) further elucidate this by demonstrating how companies can align environmental and economic objectives to achieve a sustainable competitive advantage. Johnson-Hall & Hall (2022) integrate the NRBV with convention theories to develop a new set of quality dimensions for food supply chains, addressing sustainability and competitive advantage. These frameworks support our exploration of how sustainable practices in the halal food industry impact financial performance by potentially reducing costs associated with energy consumption and waste management, while also benefiting from increased consumer loyalty and operational efficiencies. Studies such as Mabkhot (2023) and Ahmad et al. (2024) provide empirical evidence supporting these theoretical predictions, showcasing the link between robust environmental strategies and the profitability within the halal sector.

2.2. Materials

Abderahman et al. (2021) emphasize the crucial role of waste reduction, energy efficiency, and sustainable material sourcing in advancing both environmental sustainability and financial success. A conceptual framework proposed by Abdullah et al. (2018) encompasses sustainable material sourcing, waste reduction, and energy efficiency, all of which contribute to improved environmental performance and financial outcomes. Rejeb et al. (2021) provide a detailed examination of sustainability, considering social, economic, and environmental factors. Thus, the literature suggests that sustainable practices related to material sourcing and efficiency may constitute a vital part of enhancing both environmental performance and financial outcomes for Halal food companies.

2.3. Energy

Energy efficiency and sustainability are critical components of green Halal supply chain management practices. Abdullah et al. (2018) present a theoretical framework with considerations of energy efficiency and environmental impact for the implementation of a green Halal supply chain in Malaysian Halal food businesses. While direct studies specifically linking energy efficiency to financial performance in the Halal food industry are limited, broader research on energy management in green supply chains suggests that energy-efficient practices can lead to significant cost savings and improved profitability (Marchi & Zanoni, 2017). These practices are essential for businesses that aim to align with global sustainability standards and maintain competitiveness in increasingly eco-conscious markets. The literature thus suggests that incorporating energy-efficient practices within the Halal food supply chain can contribute to improved financial performance, supporting the broader goals of sustainability and profitability in the Halal food industry.

2.4. Biodiversity

Biodiversity is fundamental in promoting sustainable practices, holding particular significance within the Halal food industry. Prior literature based on the Food and Agriculture Organization (FAO) underscores the critical importance of biodiversity for sustainable diets (FAO, 2012). Ahmad et al. (2021) emphasize the paramount importance of Halal integrity in both products and processes across the food supply chain. Halal food companies should prioritize the conservation of biodiversity within their production and supply chains to ensure green sustainable practices. The biodiversity approach may contribute to conserving the natural resources essential for Halal food production and guarantees that these resources can meet the needs of current and future generations without compromising the environment, economy, or society.

2.5. Environmental Compliance

Implementing green environmental measures stands as an initial driving force for achieving sustainability (Sureeyatanapas et al., 2018). Sustainability within the Halal food sector is explored through the lenses of environmental friendliness, food safety, fair trade, consumer, and animal welfare perspectives (Rezai et al., 2015). Drawing on the results and consequences of implementing China's new Environmental Protection Law, Liu et al. (2021) examine the causal association between environmental legislation and business green innovation. Research indicates that following the enactment of the latest Environmental Protection Law, environmental compliance positively impacts firm performance (Yang & Yao, 2012). Therefore, by adhering to environmental regulations and embracing sustainable practices, the Halal food industry may make substantial contributions to both environmental sustainability and financial success.

2.6. Water Management

The literature underscores the critical role of water management in sustainability practices (Kasim et al., 2014). A comprehensive understanding of the diverse uses and consumption patterns of water across industries is imperative for efficient water resource management (Northey et al., 2019). Deng & Lu (2017) investigate food companies' environmental performance, corporate social responsibility, and food safety from the vantage point of green finance. While Ariefiara et al. (2022) research the impact of Halal certification on businesses' operations and bottom lines, their study lacks a specific focus on water. Water conservation for green sustainability practices involves reducing water consumption as much as possible, using water as effectively as possible, and implementing recycling measures. The sustainable management of current natural water resources is essential to ensure their availability for the foreseeable future (Junejo et al., 2023).

2.7. Emissions

Emission reduction is crucial for achieving sustainable development in the Halal food industry. The implementation of blockchain technology can enhance the

traceability and trustworthiness of Halal foods, which can contribute to reducing emissions and promoting environmental sustainability (Bux et al., 2022). By implementing renewable resources, suppliers can convert their manufacturing processes and services to sustainable assets, reducing emissions and promoting sustainability (Khan & Ali, 2021). Furthermore, sustainable practices, such as using renewable energy sources and implementing energy-efficient technologies, can help reduce emissions and promote sustainability (Jiang et al., 2022).

2.8. Sustainable Initiatives and Firm Financial Performance

Ye & Dela (2023) report that the impact of green and CSR investments on financial performance is not uniform across studies, highlighting a gap in understanding their true benefits. While some studies show that these investments can enhance financial performance, others find no significant effect. Although CSR activities can improve a company's reputation and profitability, the associated high costs do not always lead to better financial or sustainable outcomes. This inconsistency underscores the need for further research into the relationship between green investment, CSR, and business performance.

Despite these mixed findings, the literature generally shows an overwhelmingly positive association between sustainable initiatives and firm financial success (Alshehhi et al., 2018). Many studies document that companies adopting green sustainable practices, such as efficient resource use, waste reduction, and the usage of renewable energy sources, can improve their environmental performance, reduce costs, and enhance their reputation, potentially leading to increased profitability and competitiveness in the market (Kumar et al., 2012; Stuart et al., 2018; Ameer & Othman, 2012). Empirical findings from Sweden indicate a positive correlation between corporate sustainability and financial performance (Pham et al., 2021). Given the increasing demand for transparency regarding environmental, social, and governance (ESG) matters, sustainability reporting has been widely adopted by firms globally. The investigation of the relationship between ESG and Return on Assets (ROA), and Tobin's Q (TBQ) finds that environmental disclosure positively affects the ROA and TBQ (Buallay, 2019).

2.9. Hypothesis Development

Adopting sustainable practices, such as efficient resource use, waste reduction, and renewable energy sources, can enhance environmental performance, reduce costs, and boost reputation. Ali & Suleiman (2016) demonstrate a positive impact of sustainable food production practices on Malaysian Halal small and medium-sized enterprises. Shaheen et al. (2022) emphasize cleaner technology and resource management for environmental sustainability and economic development. Rezai et al. (2015) highlight the role of sustainable practices in improving the sustainability of Halal food production. External integration, including sustainable practices, can also enhance the integrity of Halal food supply chains (Tan et al., 2017).

Return on assets (ROA) and Tobin's Q (TBQ) are financial metrics linked to green sustainability strategies. While research results vary, some studies suggest a positive correlation between eco-friendly practices and financial performance.

Rahman et al. (2023) investigate the impact of environmental, social, and governance (ESG) aspects on financial metrics, finding mixed results. Meanwhile, Dincer et al. (2023) explore sustainability reporting's connection with ROA and Tobin's Q, but no significant results emerged.

Therefore, based on the literature and the above discussion, the following hypothesis is developed:

There is a significant relationship between green sustainability and financial performance (ROA or TBQ) of listed Malaysian halal food companies.

2.10. Research Framework

This study explores the relationship between green sustainability practices and financial performance in Malaysian Halal food companies. The framework encompasses six key dimensions of green sustainability: Materials, Energy, Biodiversity, Environmental Compliance, Water, and Emissions. These dimensions serve as the foundation for evaluating the environmental impact of these companies. Additionally, the study considers the role of sustainable initiatives in influencing financial outcomes. Data on green sustainability practices are collected from annual reports, while secondary econometric data are obtained for financial metrics (ROA and TBQ) from Thomson Reuters. The hypotheses posit significant relationships between green sustainability and financial performance. Hypothesis 1 (H1) proposes a direct link between green sustainability and ROA, while Hypothesis 2 (H2) posits a similar relationship with TBQ. Thus, following research framework, Figure 1 has been developed for the current study.

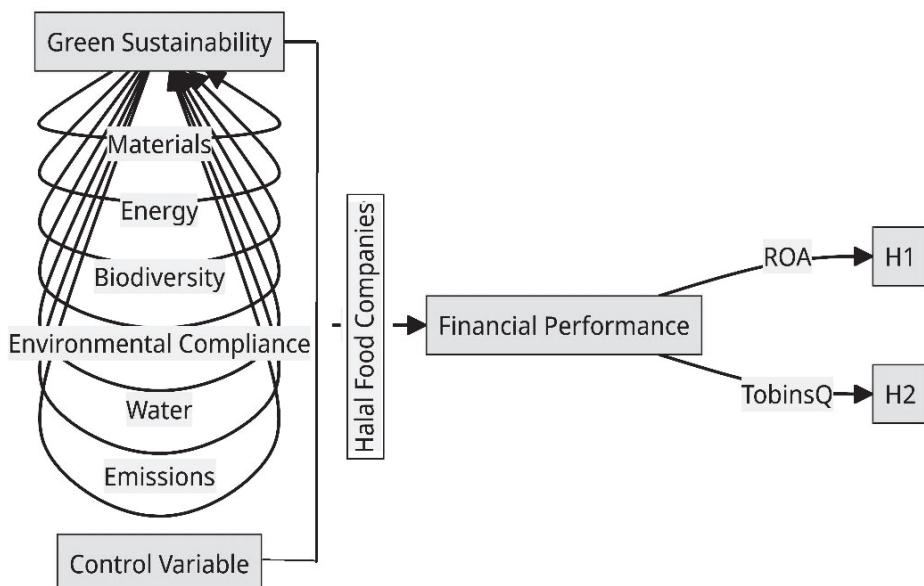


Figure 1.
Research Framework

III. METHODOLOGY

3.1. Sample and Data Collection

3.1.1. Sample Selection

We select 75 Halal food companies based in Malaysia and listed on Bursa Malaysia, focusing on those with publicly available annual reports from the years 2012 to 2021. These companies, situated across various states in Malaysia, reflect a diverse geographic spread, ensuring a varied operational environment that accurately captures the practices across the Halal food industry, particularly in terms of environmental sustainability.

3.1.2. Content Analysis

Collection of Annual Reports

The annual reports of the 75 selected Halal food companies have been systematically collected and reviewed to ensure a consistent and comprehensive dataset. These reports serve as the primary source for extracting information on the companies' sustainability practices across six key dimensions: Materials, Energy, Biodiversity, Environmental Compliance, Water, and Emissions.

Content analysis

Collection of Annual Reports

Systematically collect and review the annual reports of the selected companies.

Keyword

Identify relevant keywords for six sustainability dimensions: Materials, Energy, Biodiversity, Environmental Compliance, Water, and Emissions.

Content Analysis process

Conduct structured content analysis by scanning the reports to identify and count sentences containing the selected keywords for each sustainability dimension.

Content analysis Data Collection

Record the frequency of sentences occurrence to quantify the emphasis on sustainability practice for 75 companies from year 2012 to 2021

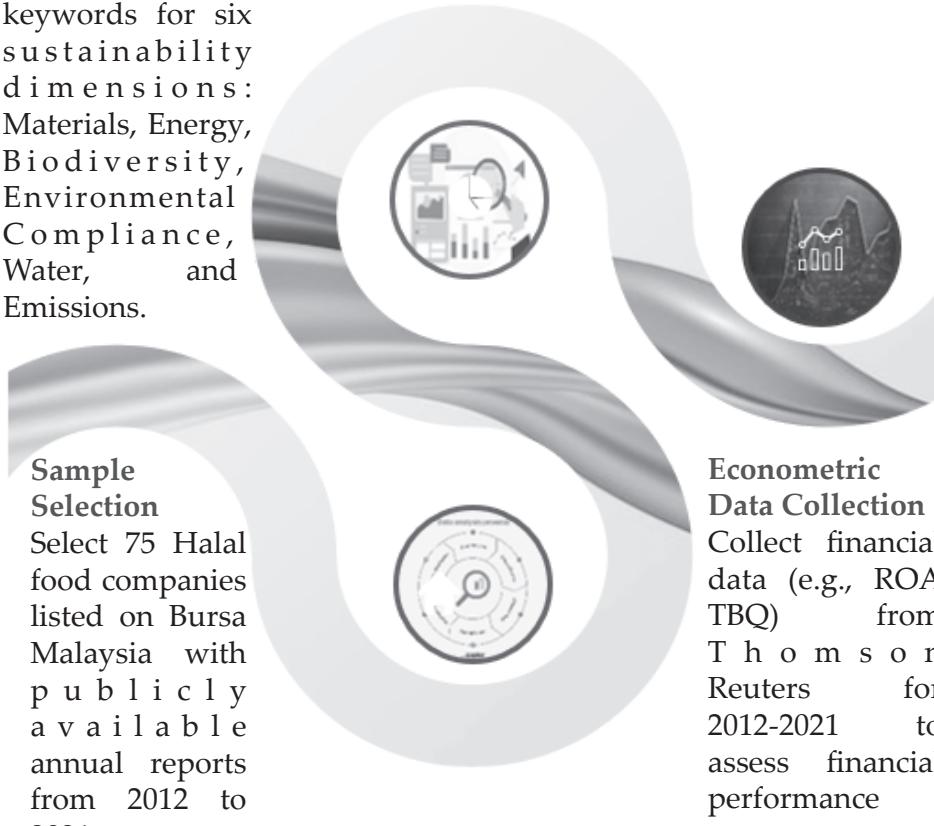


Figure 2.

Flowchart of the Sample Selection and Data Collection Process for Content Analysis and Econometric Data of Halal Food Companies in Malaysia

Keyword

Relevant keywords associated with each of the six sustainability dimensions are identified based on a thorough review of existing literature and established sustainability frameworks. The identified keywords, which serve as direct representations of the sustainability dimensions under analysis, are detailed in Table 1. For example, keywords like "Materials," "Energy," "Biodiversity," "Environmental Compliance," "Water," and "Emissions" are selected to capture the scope of each sustainability dimension.

Content Analysis Process

A structured content analysis is conducted on the collected annual reports. This process involves systematically scanning the reports to identify and count sentences containing the six primary keywords detailed in Table 1, which correspond to each of the sustainability dimensions: Materials, Energy, Biodiversity, Environmental Compliance, Water, and Emissions. Each sentence is analyzed based on the keyword in the context of the themes associated with the respective sustainability dimension:

Materials Dimension: Sentences containing the keyword "Materials" are identified and counted based on the theme of responsible management and utilization of materials in the production and operations of Halal food companies. This theme focuses on how materials are sourced, processed, and utilized in a way that aligns with sustainable practices.

Energy Dimension: The keyword "Energy" is used to identify sentences related to the efficient and responsible use of energy resources within the Halal food industry. The theme focuses on the companies' practices in energy conservation, the use of renewable energy sources, and overall energy efficiency in their operations.

Biodiversity Dimension: Sentences with the keyword "Biodiversity" are analyzed based on the theme of preserving and protecting local flora and fauna. This theme emphasizes sustainable land use practices and minimizing the ecosystem impact of the companies' operations.

Environmental Compliance Dimension: The keyword "Environmental Compliance" guides the identification of sentences that reflect adherence to relevant environmental laws, regulations, and standards. The theme focuses on how well companies comply with environmental regulations and their efforts to obtain and maintain certifications.

Water Dimension: Sentences containing the keyword "Water" are analyzed to evaluate sustainable water management practices. The theme includes efficient water usage, conservation measures, and the overall management of water resources to minimize waste and environmental impact.

Emissions Dimension: The keyword “Emissions” is used to identify sentences related to the reduction of greenhouse gas emissions and pollution from the companies’ operations. The theme focuses on strategies and measures taken by the companies to reduce their carbon footprint and mitigate environmental pollution.

Content Analysis Data Collection

The frequency of each keyword’s occurrence is recorded, providing a quantitative measure of the emphasis placed on each sustainability dimension by the companies. This method allows for the quantification of the degree to which companies focus on various aspects of sustainability in their operations and reporting.

3.1.3. Econometric Data Collection

In addition to the content analysis, financial data for the selected companies are collected from Thomson Reuters for the same period (2012-2021). These data include key financial metrics such as return on assets (ROA) and Tobin’s Q (TBQ), which are used to capture the companies’ financial performance.

Figure 2 outlines the three-step process used for data collection and analysis in studying the sustainability practices and financial performance of 75 Halal food companies listed on Bursa Malaysia. The process includes selecting companies, conducting content analysis by collecting and reviewing annual reports, identifying relevant keywords, counting the sentences based on keywords, recording data, and finally, collecting financial data for econometric analysis.

3.2. Variables and Measures

3.2.1. Green Sustainability

This section presents the variables considered in evaluating the green sustainability of Halal food companies in Malaysia (Table 1). The study employs six key dimensions: materials, energy, biodiversity, environmental compliance, water, and emissions (Table 1). These dimensions encapsulate critical aspects of environmental impact, emphasizing responsible resource management and sustainable practices within the Halal food industry.

Materials refer to the responsible management and utilization of resources in the production and operations of Halal food companies. This includes the careful selection of eco-friendly and biodegradable materials, as well as initiatives to reduce waste generation and promote recycling practices (Ali & Suleiman, 2016). Proper material management not only reduces environmental impact but also contributes to cost-efficiency and resource conservation.

Energy pertains to the efficient and responsible use of energy resources within the Halal food industry. This involves adopting energy-saving technologies, optimizing energy consumption during production, and transitioning towards renewable energy sources. These practices not only mitigate the industry’s environmental footprint but also lead to operational cost savings and promote long-term sustainability (Bux et al., 2022).

Biodiversity Conservation assumes paramount significance, particularly in the Halal sector. This dimension involves preserving and protecting local flora

and fauna, adhering to sustainable land use practices, and minimizing negative impacts on ecosystems. By integrating biodiversity conservation efforts into their operations, Halal food companies contribute to the preservation of natural habitats and the overall health of the environment (Junejo et al., 2023).

Environmental Compliance measures the extent to which Halal food companies adhere to pertinent environmental laws, regulations, and standards. This encompasses measures to ensure that operations align with all environmental requisites and operate within legally acceptable environmental limits. Maintaining a high level of environmental compliance not only fosters a positive relationship with regulatory authorities but also safeguards the company's reputation and minimizes legal risks (Abdullah et al., 2018).

Water Management focuses on instituting sustainable practices within the Halal food industry. This encompasses efficient water usage, minimizing water waste, and implementing conservation measures (Junejo et al., 2023). By addressing water scarcity and safeguarding this vital resource, Halal food companies contribute to sustainable water management practices and ensure the availability of clean water for future generations (Abdullah et al., 2018).

Emissions Reduction deals with mitigating greenhouse gas emissions and curtailing pollution arising from the operations of Halal food companies. This includes adopting technologies and practices that reduce the release of harmful pollutants into the environment. By prioritizing emissions reduction, companies not only contribute to mitigating climate change but also improve air quality and public health (Junejo et al., 2023).

Table 1.
Green Sustainability Variables

Variables	Description	References
Materials	Responsible management and utilization of materials in production and operations of Halal food companies	Ali & Suleiman, 2016; Rejeb et al., 2021
Energy	Efficient and responsible use of energy resources within the Halal food industry	Ali & Suleiman, 2016; Bux et al., 2022; Gillani et al., 2017.
Biodiversity	Preservation and protection of local flora and fauna, sustainable land use practices, minimizing ecosystem impact	Azam et al., 2019; Junejo et al., 2023, Mathenge et al., 2022
Environmental Compliance	Adherence to relevant environmental laws, regulations, and standards	Abdullah et al., 2018; Junejo et al., 2023
Water	Sustainable water management practices, efficient water usage, conservation measures	Abdullah et al., 2018, Fageh, 2022, Junejo et al., 2023
Emissions	Reduction of greenhouse gas emissions and pollution from operations of Halal food companies	Bux et al, 2022, Junejo et al., 2023

3.2.2. Financial Performance

Return on assets (ROA) is a standard accounting measure of a firm's profitability to the total set of resources (Karagiorgos, 2010). It is the earnings before interest divided by total assets. ROA demonstrates how efficiently a firm generates profit per production unit (Delmas et al., 2015). ROA has widely been used as a proxy for profitability (Delmas et al. 2015). Pre-tax ROA avoids distortions introduced by differences in financial leverage and tax laws (Kupiec & Lee, 2012).

Tobin's Q is a financial performance measure that has been used in various studies to assess the performance of firms. Tobin's Q provides a framework to compare how firm (stock) market evaluation changes with added products and markets (Hejazi et al., 2016). It can assess the efficiency of a company's investment decisions (Mysaka & Derun, 2021). Furthermore, Tobin's Q can be used to measure the market value of a company relative to its assets, which can provide insights into the company's financial performance (Lo & Liao, 2021). Thus, in this current study we use the Tobin's Q for the Halal food company's financial performance analysis.

3.2.3. Control Variables

When selecting control variables, we take lead from Haque & Ntim (2018). GDP growth serves as a control variable in this study because it reflects the overall economic environment in which firms operate. A growing GDP typically signals a robust economy, characterized by increased consumer spending, higher demand for goods and services, and improved business conditions. By controlling GDP growth, researchers can isolate the effects of firm-specific variables on financial performance, ensuring that observed relationships are not confounded by broader economic trends (Mankiw, 2013). CPI, on the other hand, measures inflation and reflects changes in the cost of living. High inflation, indicated by a rising CPI, erodes purchasing power and increases input costs, which can adversely affect corporate profitability and investor confidence (Fama & Schwert, 1977). Controlling for CPI allows researchers to account for the impact of inflation on financial performance metrics, such as return on assets (ROA) and Tobin's Q (TBQ), ensuring that the effects of inflation are not mistaken for the impact of other variables.

Firm size and number of years since establishment are also included. Using financial variables allows for the control of various firm-level sources of variability (Elsayed & Paton, 2005; Gatimbu et al., 2018). Firm size accounts for economies of scale and the potential for contamination. Firm size is a desirable control variable because, in contrast to smaller enterprises, larger firms are likely to possess greater resources for social investments and be subject to greater pressure to participate in CSP (Gatimbu et al., 2018). The natural log of the total number of employees is used as the metric for this measurement. Differences in the production experience of halal foods can be attributed, in part, to the ages of the companies involved.

3.3. Model Specification and Analytical Techniques

The study aims to examine how green sustainability affects the financial performance of Halal food companies in Malaysia. The study specifies the following dynamic panel models:

$$\text{ROA}_{it} = \alpha_0 + \beta_1 \text{ROA}_{it-1} + \beta_2 \text{MATERIALS}_{it} + \beta_3 \text{ENERGY}_{it} + \beta_4 \text{BIODIVERSITY}_{it} + \beta_5 \text{EMISSIONS}_{it} + \beta_6 \text{ENV COMPLIANCE}_{it} + \beta_7 \text{WATER}_{it} + \beta_8 \text{GDP}_{it} + \beta_9 \text{CPI}_{it} + \beta_{10} \text{LSIZE}_{it} + \beta_{11} \text{AGE}_{it} + \mu_{it}$$

$$\text{TBQ}_{it} = \alpha_0 + \beta_1 \text{TBQ}_{it-1} + \beta_2 \text{MATERIALS}_{it} + \beta_3 \text{ENERGY}_{it} + \beta_4 \text{BIODIVERSITY}_{it} + \beta_5 \text{EMISSIONS}_{it} + \beta_6 \text{ENV COMPLIANCE}_{it} + \beta_7 \text{WATER}_{it} + \beta_8 \text{GDP}_{it} + \beta_9 \text{CPI}_{it} + \beta_{10} \text{LSIZE}_{it} + \beta_{11} \text{AGE}_{it} + \mu_{it}$$

where all variables are as explained above.

Estimation of the above models may encounter three sources of endogeneity: simultaneity, arising when the independent variables operate both as functions and as the expected values of the dependent variable; unobservable heterogeneity, where factors not directly observable influence both the dependent and explanatory variables; and the values of current environmental factors, which derive from past financial performance—a frequently overlooked source of endogeneity. To address these challenges, the Generalized Method of Moments (GMM) estimator is employed, following the approach outlined by Blundell & Bond (1998).

IV. RESULTS

For empirical analysis, the study uses panel data modelling estimated via the GMM methods to examine the impacts of green environmental factors on financial performance. Furthermore, statistical assessments with a theoretical and conceptual discussion of the results are adopted to respond to the research hypothesis. Alongside the empirical results, the study presents descriptive statistics of the variables employed.

Table 2.
Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
ROA	750	4.841	13.228	-104.43	212.22
TBQ	750	1.289	1.415	.19	12.98
LSIZE	750	13.395	1.472	9.016	17.209
AGE	750	19.7	9.103	1	38
GDP	750	2.561	3.086	-6.584	4.373
CPI	750	113.538	6.557	103.174	121.463
MATERIALS	750	4.717	2.833	0	17
ENERGY	750	11.553	6.184	1	34
BIODIVERSITY	750	1.232	1.044	0	5
EMISSIONS	750	1.417	.907	0	4
ENV COMPLIANCE	750	1.951	1.32	0	6
WATER	750	2.072	1.35	0	7

The descriptive statistics in Table 2 for the variables under the study reveal insightful details about the dataset. The return on assets (ROA) has an average value of 4.841, with a substantial standard deviation of 13.228, indicating significant variability among observations, ranging from -104.43 to 212.22. Tobin's Q (TBQ) shows a mean of 1.289 and a standard deviation of 1.415, with values spanning from 0.19 to 12.98. The average Log Size (LSIZE) is 13.395, with a standard deviation of 1.472, and its values range from 9.016 to 17.209. The age of the firms (AGE) averages at 19.7 years, exhibiting a standard deviation of 9.103, with the minimum and maximum ages being 1 and 38 years, respectively.

Gross Domestic Product (GDP) displays a mean of 2.561 and a standard deviation of 3.086, with a range from -6.584 to 4.373. The Consumer Price Index (CPI) has an average value of 113.538, a standard deviation of 6.557, and ranges from 103.174 to 121.463. Environmental metrics reveal that Materials (MATERIALS) have a mean of 4.717 and a standard deviation of 2.833, with values spanning from 0 to 17. The Energy (ENERGY) variable shows a mean of 11.553 and a standard deviation of 6.184, ranging from 1 to 34. Biodiversity (BIODIVERSITY) records a mean of 1.232 and a standard deviation of 1.044, with values between 0 and 5. Emissions (EMISSIONS) average at 1.417 with a standard deviation of 0.907, ranging from 0 to 4. Environmental Compliance (ENV COMPLIANCE) shows a mean of 1.951 and a standard deviation of 1.32, with values ranging from 0 to 6. Lastly, Water (WATER) has a mean of 2.072, a standard deviation of 1.35, and values ranging from 0 to 7.

Table 3.
Matrix of Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) MATERIALS	1.000					
(2) ENERGY	0.230	1.000				
(3) BIODIVERSITY	0.108	0.008	1.000			
(4) ENVCOMPLIANCE	0.048	0.275	0.233	1.000		
(5) WATER	0.225	0.099	0.144	0.203	1.000	
(6) EMISSIONS	0.024	0.011	-0.046	0.015	0.212	1.000

The correlation matrix in Table 3 for the environmental variables provides insights into the relationships among these factors. The Materials variable shows a moderate positive correlation with Energy and Water, indicating that firms with higher material usage tend to have higher energy consumption and water usage. Biodiversity has a low positive correlation with Materials and a negligible correlation with Energy. Environmental Compliance exhibits a moderate positive correlation with Energy and Biodiversity, suggesting that firms with higher energy use and biodiversity considerations are more likely to comply with environmental regulations. Water shows a low to moderate positive correlation with Materials, Biodiversity, and Environmental Compliance, indicating interconnectedness among these environmental aspects. Emissions display a very low positive correlation with Water and negligible correlations with other variables, suggesting that emissions are relatively independent of other environmental measures.

Table 4.
Estimation Results of GMM

VARIABLES	ROA	TBQ
L _{t-1}	0.192*** (0.00461)	1.013*** (0.00438)
MATERIALS	0.399*** (0.0455)	0.00981*** (0.00333)
ENERGY	-0.254*** (0.0278)	-0.00849*** (0.00150)
BIODIVERSITY	-0.0693 (0.0850)	0.0437*** (0.00622)
EMISSIONS	0.476*** (0.0798)	0.0121 (0.00797)
ENV-COMPLIANCE	-0.131** (0.0572)	0.0190*** (0.00349)
WATER	-0.204*** (0.0557)	-0.0163*** (0.00420)
GDP	0.0160 (0.0290)	0.117*** (0.0396)
CPI	-0.943*** (0.0555)	-1.156*** (0.00406)
LSIZE	7.089*** (0.145)	8.574*** (0.234)
AGE	0.615*** (0.0285)	0.0147*** (0.00153)
Sargan	0.1128	0.1133
AR (1)	-2.3321 (0.0197)	-3.1849 (0.0014)
AR (2)	1.2465 (0.2126)	-1.0391 0.2987
Number of Instrument	52	52
Observations	675	675
Number of Company	75	75

The GMM estimation in Table 4 provides positive results for the sustainability factors and their impact on return on assets (ROA). The lagged dependent variable, ROA and TBQ exhibit a positive coefficient of 0.192 and 1.013 respectively, indicating that past ROA and TBQ significantly influence current ROA and TBQ highlighting the persistence of financial performance over time.

Empirical result shows that sustainable practices related to Material usage positively impact both return on assets (ROA) and Tobin's Q (TBQ). Companies that efficiently manage their materials tend to reduce costs, enhance operational efficiency, and innovate, leading to improved profitability and market valuation. This is supported by previous research indicating that sustainable material practices can lead to cost savings and revenue growth through enhanced product quality and customer satisfaction (Eccles, Ioannou, & Serafeim, 2014).

The negative impact of Energy-related sustainability factors on ROA and TBQ can be attributed to the high costs associated with energy efficiency initiatives and the implementation of renewable energy sources. These investments often require significant upfront capital, which may not yield immediate financial returns, thereby affecting short-term profitability and market valuation (Porter & Linde, 1995).

Biodiversity initiatives show a negative impact on ROA but a positive impact on TBQ. The negative effect on ROA can be due to the immediate costs of implementing biodiversity conservation measures, which do not directly contribute to short-term profitability. However, the positive impact on TBQ suggests that investors value biodiversity efforts, potentially due to the long-term benefits of ecosystem services and the enhancement of corporate reputation (Bansal & Clelland, 2004).

The management of Emissions has shown a positive impact on both ROA and TBQ. Firms that invest in reducing emissions often experience lower regulatory costs and benefit from incentives, while also improving their public image and market position. Studies suggest that proactive emission reduction strategies can lead to competitive advantages and increased firm value (Hart & Ahuja, 1996; Clarkson et al., 2011).

Environmental compliance shows a negative impact on ROA but a positive impact on TBQ. Compliance with environmental regulations often involves significant costs, which can reduce short-term profitability. However, adherence to these regulations can enhance a firm's reputation and market valuation, reflecting positively on TBQ. Studies have shown that firms with strong environmental compliance records are often viewed more favorably by investors, leading to higher market valuations (Dowell, Hart, & Yeung, 2000).

Similarly, Water management initiatives tend to have a negative impact on both ROA and TBQ. The costs associated with water conservation and pollution control can be substantial, and the benefits, while significant in the long term, may not be immediately reflected in financial performance (King & Lenox, 2002).

The result also shows in Table 4 that GDP growth positively impacts both return on assets (ROA) and Tobin's Q (TBQ). A growing GDP indicates a healthy economy, leading to increased consumer spending, higher demand for goods and services, and improved business conditions. These factors collectively enhance corporate profitability and market valuation. For instance, Mankiw (2013) suggests that economic growth drives firm performance by expanding market opportunities and fostering favorable investment environments.

Conversely, the Consumer Price Index (CPI), a measure of inflation, has a negative impact on both ROA and TBQ. High inflation erodes purchasing power, increases input costs, and creates economic uncertainty, which can adversely affect corporate profitability and investor confidence. Studies by Fama & Schwert (1977) indicate that inflation imposes additional costs on firms, such as higher interest rates and reduced real returns, thereby diminishing financial performance and market valuation.

The size and age of companies are also positively correlated with ROA and TBQ. Larger and older firms often benefit from economies of scale, established market presence, and accumulated experience, which contribute to higher efficiency and profitability. Research by Hall & Weiss (1967) supports this view,

indicating that larger firms tend to have better access to resources and capabilities that drive superior financial performance. Similarly, older firms benefit from their longer operational histories, which translate into accumulated knowledge and stability, enhancing their market valuation and financial returns (Coad, Segarra, & Teruel, 2013).

V. DISCUSSION

The empirical results from Malaysian Halal food companies indicate that sustainable practices related to material usage positively impact both return on assets (ROA) and Tobin's Q (TBQ). This finding aligns with previous research suggesting that efficient material management reduces costs, enhances operational efficiency, and fosters innovation, ultimately leading to improved profitability and market valuation. Eccles, Ioannou, & Serafeim (2014) highlight that sustainable material practices not only yield cost savings but also drive revenue growth through enhanced product quality and customer satisfaction. In the context of the Halal food industry, efficient material usage may include the optimization of raw materials, reduction of waste, and utilization of environmentally friendly packaging, all of which contribute to improved financial performance and market perceptions.

Conversely, the study reveals a negative impact of energy-related sustainability factors on both ROA and TBQ. This can be attributed to the high costs associated with energy efficiency initiatives and the implementation of renewable energy sources. Porter & Linde (1995) argue that these investments often require substantial upfront capital, which may not yield immediate financial returns, thereby adversely affecting short-term profitability and market valuation. For Malaysian Halal food companies, transitioning to renewable energy or implementing energy-saving technologies involves significant financial outlays. While these initiatives are crucial for long-term sustainability, the immediate financial burden can outweigh the benefits, negatively impacting current financial metrics.

Biodiversity initiatives show a negative effect on ROA but a positive impact on TBQ. The immediate costs of implementing biodiversity conservation measures can reduce short-term profitability, as these measures do not directly contribute to financial returns. However, Bansal & Clelland (2004) suggest that the positive impact on TBQ reflects investors' appreciation for biodiversity efforts, valuing the long-term benefits of ecosystem services and enhanced corporate reputation. For Halal food companies, investing in biodiversity may involve practices such as sustainable sourcing and habitat conservation, which incur initial costs but are perceived positively by investors for their long-term ecological and reputational benefits.

The management of emissions had a positive impact on both ROA and TBQ. Firms that invest in reducing emissions often experience lower regulatory costs and benefit from various incentives, while also improving their public image and market position. Studies by Hart & Ahuja (1996) and Clarkson et al. (2011) indicate that proactive emission reduction strategies can lead to competitive advantages and increased firm value. For Malaysian Halal food companies, reducing emissions

through cleaner production processes and adherence to stringent environmental standards can enhance both financial performance and investor confidence.

Environmental compliance has a negative impact on ROA but a positive impact on TBQ. Compliance with environmental regulations often involves significant costs, which can reduce short-term profitability. However, adherence to these regulations can enhance a firm's reputation and market valuation, reflecting positively on TBQ. Dowell, Hart, & Yeung (2000) note that firms with strong environmental compliance records are often viewed more favorably by investors, leading to higher market valuations. In the Halal food sector, strict compliance with environmental standards can be costly but ultimately enhances brand reputation and investor trust.

Water management initiatives tend to have a negative impact on both ROA and TBQ. The costs associated with water conservation and pollution control are substantial, and the financial benefits, while significant in the long term, may not be immediately reflected in financial performance. King & Lenox (2002) suggest that these initiatives, though essential for sustainable operations, impose considerable financial burdens that can negatively impact short-term profitability and market valuation. For Halal food companies in Malaysia, investments in water management technologies and practices are crucial for sustainability but pose significant financial challenges that affect immediate financial metrics.

The empirical results also highlighted that GDP growth has a positive impact on both return on assets (ROA) and Tobin's Q (TBQ) for Malaysian Halal food companies. This finding is consistent with existing literature, which suggests that a growing GDP signifies a robust economy characterized by increased consumer spending, higher demand for goods and services, and improved business conditions. These favorable economic conditions enhance corporate profitability and market valuation. Mankiw (2013) posits that economic growth expands market opportunities and fosters a conducive investment environment, thereby driving firm performance. In the context of Malaysian Halal food companies, GDP growth likely stimulates demand for Halal products, improves market confidence, and attracts investments, collectively boosting financial performance and valuation.

Conversely, the Consumer Price Index (CPI), a measure of inflation, negatively impacts both ROA and TBQ. High inflation erodes purchasing power, increases input costs, and generates economic uncertainty, which can detrimentally affect corporate profitability and investor confidence. Fama & Schwert (1977) indicate that inflation imposes additional costs on firms, such as higher interest rates and reduced real returns, thereby diminishing financial performance and market valuation. For Malaysian Halal food companies, inflationary pressures may increase the costs of raw materials, production, and distribution, while also reducing consumers' purchasing power, leading to decreased sales and profitability.

The size and age of companies are also positively correlated with ROA and TBQ. Larger firms benefit from economies of scale, established market presence, and accumulated experience, all of which contribute to higher efficiency and profitability. Hall & Weiss (1967) support this view, indicating that larger firms tend to have better access to resources and capabilities that drive superior financial performance. Similarly, older firms benefit from their longer operational histories, translating into accumulated knowledge and stability, which enhances

their market valuation and financial returns (Coad, Segarra, & Teruel, 2013). For Malaysian Halal food companies, larger size and longer operational history can provide competitive advantages such as better supplier relationships, brand recognition, and efficient production processes, leading to improved financial metrics and market perceptions.

VI. CONCLUSION AND RECOMMENDATIONS

This study investigates the relationship between green environmental sustainability practices and the financial performance of Halal food companies in Malaysia. Applying a dynamic panel modelling to a dataset spanning 10 years between 2012-2021 of 75 companies, we find that sustainable practices in Malaysian Halal food companies have varying impacts on financial performance. Efficient material usage positively influences both ROA and TBQ, enhancing profitability and market valuation. Conversely, energy-related initiatives negatively affect both metrics due to high upfront costs. Biodiversity initiatives, while costly in the short term, enhance long-term market valuation. Emission management positively impacts both ROA and TBQ through cost savings and improved public image. Environmental compliance, despite reducing short-term profitability, boosts market valuation. However, water management initiatives tend to negatively impact both ROA and TBQ due to substantial costs.

This study highlights the need to support efficient material usage and resource management to enhance industry profitability and valuation. Incentives or subsidies for energy efficiency can offset initial costs and promote adoption. Policies that provide financial assistance for biodiversity and environmental compliance initiatives can help manage short-term expenses while boosting long-term value. Encouraging effective emission management and optimizing water use through targeted incentives can improve both environmental and financial outcomes. Additionally, crafting policies to stabilize macroeconomic factors and support both large and growing firms can foster a more resilient and sustainable business environment.

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