



Sustainability in Malaysian Sukuk Issuers: Financial vs. Non-financial Firms via Machine Learning

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Abstract: Drawing upon Resource Dependency and Resource-Based theories, corporate social sustainability (CS) is understood as a method of stakeholder management critically influenced by a firm's resources. Firms possessing more long-term resources are positioned to exhibit better CS performance. These theories further suggest that differences in available resources lead to differentiated CS performance between financial institutions (FI) and non-financial institutions (NFI). Sukuk, a prime long-term tool in Islamic finance, aligns with Islamic principles. Hence, Sukuk issuance (SI) may thus serve as an instrument to enhance CS.

This study aims to provide empirical findings demonstrating sukuk as an instrument of CS and to compare the CS performance between financial and non-financial sukuk issuers in Malaysia.

The study focused on Malaysian sukuk issuers, recognized as global sukuk hubs, using long-term data from 2010 to 2022. Data on CS performance were gathered through content analysis of annual reports. To compare FI and NFI in terms of CS, the study employed Logit regression, K-Means clustering (with Dendrograms), and Random Forest techniques, enabling a comprehensive, multi-dimensional examination of the data.

The results indicate that while sukuk issuers enhance their efforts to report CS performance, the scope of this effort remains limited, often omitting approximately three-fourths of the Global Reporting Initiative (GRI) variables for CS. Non-financial issuers were found to perform moderately better in overall CS activities. The CS component appeared more appropriate for the business strategy of sukuk issuers. In the comparison between firm types, financial issuers performed better in the economic dimension of CS, whereas non-financial issuer's demonstrated better performance in social CS. Machine learning analysis suggested that high CS performance was more strongly associated with quantitative descriptions of indicators than qualitative ones.

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The study provides empirical support for the potential of sukuk as an instrument facilitating CS efforts among issuers, although the current extent and focus of CS reporting are restricted. Significant distinctions in CS performance and reporting exist between financial and non-financial sukuk issuers, highlighting the varied approaches to sustainability integration influenced by firm type and strategy.

Keywords: Resource dependency theory, resource-based view, corporate social sustainability, Mursala, Sukuk, Maslaha.

Introduction

Businesses in the modern age face new types of challenges. The business sector recognizes that failing to comply with stakeholder expectations can lead to controversies and negative publicity (Bailey et al., 2016). In this context, Corporate Social Sustainability (CS) serves as an effective tool for managing stakeholder relationships, promoting overall well-being (Bailey et al., 2016). As a result, it is expected to enhance both performance and financial health (Flammer & Luo, 2017; Wang et al., 2016).

The metanalysis of the business's return showed that CS generates positive profitability (Orlitzky et al., 2003; Wang et al., 2016) and ideal financial well-being (Rafi et al., 2016; Taleb, 2012) because CS enhances customer loyalty and increases the element of risk sharing among the stakeholders. International policymakers such as the World Bank have provided a comprehensive set of criteria for assessing risk through the performance of corporate sustainable responsibility (CS) (Weber et al., 2008; Carroll & Shabana, 2010). Due to these factors, CS has become essential to the modern business world.

However, CS does not immediately yield financial gains (Stoian, 2013); it makes businesses more robust and effective over time (Bansal et al., 2015; Placier, 2011). Under such circumstances, as per resource dependence theory, firms require long-run funding resources. Sukuk is a financial tool in the universe of Islamic finance through which long-term capital can be achieved. According to (Damak & Volland, 2018) Sukuk has a market capitalization of 97.9 billion US dollars, and it is an alternative to conventional bonds. With almost 750 verses on the subject in the Quran, Islam places a strong emphasis on acting responsibly and modestly to protect the environment (Ibrahim, 2016). Since social justice and transparency are required by Islamic law (Arslan & Ozturk, 2021; Islam & Hossain 2020), companies that issue sukuk rather than traditional bonds may incorporate Islamic principles of social justice into their business plans.

The idea of Sukuk and other responsible investing is related (Bennett & Iqbal, 2013). According to theorists, sukuk issuance should be highly responsible for the social and environmentally conscious investing activities, which infers the

true spirit of Islamic commercial practices. They emphasize this notion to the extent that they argue sukuk may not be called sukuk in true senses, if it fails investing in any CS activities (Piotrowski, 2020). However, in order to make the Sukuk more efficient, working for the CS also has managerial ramifications. Due to their involvement in CS-related projects, Sukuk and other related bonds are anticipated to have minimal regulatory and legal costs.

Bauer and Hann(2010) argued that they may be offered at low coupon rates and lower bond spreads. By becoming involved in CS projects and appropriately disclosing them, issuers can reduce investor uncertainty, improve information transparency, and be perceived as less hazardous (Alam & Nizamuddin, 2013). The current literature is, however, silent on sukuk issuers' intensity of CS disclosures over an extended period despite the topic's importance, as previously stated. The relationship between Sukuk and social spheres and sustainable development goals is mostly missing from the literature, according to thorough reviews of the literature on Sukuk that are devoted to all theoretical and empirical investigations. Future research is encouraged to concentrate on this topic (Paltrinieri et al., 2023; Rahman et al., 2020; Zulkhibri, 2015). Sobhani et al. (2012) and Suryomurti (2018) stated that in CS studies, Islamic banks are focused, but hardly on the Sukuk. However, sukuk is highly associated with CS due to its long-term time periods. Previous studies did not examine the number of CS disclosures that sukuk issuers adhere to and the distinctions between FI and NFI in this respect. This makes CS study from the perspective of sukuk an essential field for scholars because of these facts.

Since the beginning of the literature on CS, a large number of scholars have emphasized this viewpoint (Amor-Esteban et al., 2018; Cottrill, 1990; Moore, 2001; Sturdivant & Ginter, 1977). Using a similar reasoning, this study separates the different sukuk issuers into two industrial categories: non-financial issuers (NFI) and financial issuers (FI). This binary comparison makes the outcomes more easily understandable since more extended comparisons make results difficult to understand. Likewise, no such research has been available that has compared the CS behavior of FI and NFI. A research gap, hence, exists analyzing CS disclosures among sukuk issuers, particularly comparing FI and NFI. While studies have discovered the role of Islamic finance in promoting sustainability (Piotrowski, 2020), none have empirically analyzed the differences in CS performance between FIs and NFIs issuing Sukuk. Additionally, although resource dependency theory and the resource-based view provide understandings to the influence of external pressures and internal resources on CS practices, research on the long-term sustainability of sukuk issuers remains limited under these theories (Paltrinieri

et al., 2023; Rahman et al., 2020). This study hence addresses this gap by comparing CS disclosures across these sectors.

In addition to addressing the gap in the existing literature related to the topic, this study also makes significant theoretical contributions. This study pioneers the application of resource dependence theory and the resource-based view to the concept of Sukuk. Furthermore, it is the first paper to examine these theories from the unique perspective of Sukuk issuers. From the perspective of resource dependence theory, Sukuk issuers involved in Corporate Sustainability (CS) must actively consider and strive to meet the needs of their stakeholders. This is essential because these stakeholders are the primary providers of crucial resources for the firm, such as its workforce. In contrast, the resource-based view asserts that a firm's internal resources and unique capabilities are intrinsically linked to variations in its CS behavior and performance. The current study has observed that the CS behavior of the sukuk issues can be examined by applying both theories. Firms reveal their CS workings to appease the stakeholders, whereas internal resources and capabilities can be responsible for variations in their CS behaviors. It was also observed that there was little adherence to CS problems, necessitating managerial action. The industry sukuk practitioners must enhance their focus to increase the level of CS disclosures because these activities safeguard their ethical and positive identity among stakeholders. Investors in Sukuk have moral reasons for doing so, but if CS is not followed, their confidence may be shaken. As a result, this unique feature of the Sukuk sector warrants concern for managers and regulators.

Literature Review

Corporate social sustainability and sukuk issuers

Sukuku are Sharia-compliant fixed-income instruments that serve as financial products facilitating and controlling capital movements (Jobst et al., 2008; Paltrinieri et al., 2023). Given that CS is an industry-specific phenomenon, this study operates on the assumption that Sukuk issuers are inherently involved in and accountable for CS operations. Investors are highly interested in Sukuku, and they have quite often too many subscribers (SCM, 2015). Sukuk holders are important stakeholders for the companies because they provide a huge amount of financial support to the firms (Artiach, Lee, Nelson & Walker, 2010; Rashid, et al., 2025). Furthermore, when choosing to invest in Islamic assets, sukuk holders are thought to have moral and responsible considerations. In Islamic finance, Maslaha Mursalah is one of the key principles to emphasize ensuring public wellbeing and societal benefits in strategic decisions. When making a choice, Maslaha Mursalah requires that the impact of transactions be examined. According to Moghul (2017), any

transaction that endangers society or the environment must be discontinued, even if it is legally permissible. Moreover, the issuers must pay proper attention to CS projects; failure may cause mistrust among the Sukuk holders or investors (Alshelfan, 2014). According to Bennett and Iqbal (2013); Jindal (2024), the successful issuance of SRI suggests that CS concerns are a major worry for sukuk holders. Therefore, according to the resource dependence theory, it can be claimed that enterprises' external financing from sukuk holders may cause problems if they fail to handle CS issues.

On the other hand, the resource-based view suggests that the availability of financial resources is connected to the technique used to manage CS operations. CS requires long-term financing resources because they are long-term in their time horizon. Sukuks fulfill that long term financial need of the firms to perform CS. Specially in Malaysian Islamic financing industry, where regulators have banned short term sukuks (Bouyamourn, 2015). Hence, it is anticipated that sukuk issuers with long-term financing can be attentive to CS-related concerns.

Corporate social sustainability behavior of financial and non-financial firms

According to resource dependency theory, the extrinsic aspects, such as the corporate environment, alongside the existence of domestic and foreign industrial actors (Setthasakko, 2007; Collevocchio, et al., 2025) and the societal conditions, such as pressure from the stakeholders (Wolf, 2014), have a significant influence on the design of the CS strategy. However, the dynamics of decision-making are also responsible for CS strategy. In light of the resource-based view, CS depends upon a number of different firm-specific attributes, such as size, funding, and growth prospects (Artiach et al., 2010). Combining the strengths of both theories can make a strategic approach more dynamic (Nemati et al., 2010) and provide a solid foundation for decision-making (Findikoglu et al., 2020). The firms' intrinsic and extrinsic heterogeneity either aligns with or deviates from the CS performance.

Extant literature has highlighted the importance of taking these theoretical standpoints to enhance strategic dynamism. Li et al. (2020) highlighted how internal factors correlated with resource availability align with external pressures to strategize effective green development behaviors and performance in industrial sector, supporting the resource-based perspective. Similarly, Nguyen et al. (2021) illustrate that governance mechanism is inherently connected to performance, signifying that firms leveraging both resource dependency and resource-based theories can enhance corporate governance and thereby optimizing environmental CS behaviors.

Additionally, effective internal resources can facilitate better environmental performance.

Previous studies have highlighted that the industry's nature significantly influences CS practices (Amran & Haniffa, 2011; Sobhani et al., 2012). As old as CS literature itself (Sturdivant & Ginter, 1977), industry-specific distinctions in CS behavior have persisted, and researchers have found this to be the case up to this point (Amor-Esteban et al., 2018; Jung et al., 2018). It was said that the research would be "fatally deficient" if they did not consider the variations in industrial types regarding economic nature (Cottrill, 1990, p. 723). The philosopher has identified the weak point in the analysis of large-scale industry, which is that such examination lacks strong theoretical underpinnings (Moore, 2001). In light of this mindset, the researchers have argued that they should limit their sample to particular industry types, neither too large to oversaturate the results nor too small to combine all diverse businesses into one. Stated differently, the firms' business model variations may result in variations in their CS behavior. It is a relatively challenging task to reach conclusions while examining multiple industries at the same time, and it can also be fatal to analyze their conflicting features. Moving forward, this study has restricted its examination of CS behavior for all sukuk issuers and only compared FI and NFI. Ex ante, their relative CS performance between FI and NFI is dubious. According to the reasoning outlined below, the financial sector is expected to perform better, worse, or on par with its non-financial counterparts.

The performance of FI in terms of CS is better than that of NFI because NFIS works to satisfy customers' needs with better products, whereas FIS develops the element of trust. One only develops strong relationships, while the other delivers value. FI, in this regard, has achieved a bigger milestone by successfully developing the element of trust in matters related to (Santiago, 2018).

Thus, the FIs are considered socially responsible institutions as they have a more substantial and trustworthy relationship with customers. The obligations of CS were enhanced after the credit crisis of 2008. Trust in the financial industry has dropped by 45–56% (Ernst & Young, 2010) since the FIS are primarily blamed for the pervasive ills of the crisis (Eichengreen et al., 2012). Thus, to stay victorious, FI should work for CS on better terms. Additionally, as service quality is crucial to customer happiness, loyalty, and retention, it is one of the marketing techniques that has market participants' attention (Gong & Yi, 2018). These aspects provide additional points to enhance the profitability of the market players. However, the financial services industry finds it more challenging to envision and implement the area of service quality because of its abstract character (Lone & Rehman, 2017; Taap et al., 2011;

Awan et al., 2011; Sangeetha & Mahalingam, 2011; Kumar et al., 2010). Given that it is a service-based industry, the FI should perform better in the CS field to gain its clients' trust and provide higher-quality services. FI can make use of the CS to counteract unfavorable opinions about them, particularly in the aftermath of the crisis. Because of this, FI would be more careful to keep its clients happy using a variety of strategies, including CS.

On the contrary, FI may lag behind NFI in some respects, such as the demand of different parties associated with the firm to decide the CS performance (Tee, 2009). Reporting is done to the public's demand, irrespective of FI or NFI. Businesses might advertise their CS operations to make up for their wrongdoings in the environment and public goods (Boulouta & Pitelis, 2013). As a result, companies that are under more pressure or are thought to be causing more environmental harm are anticipated to be more involved in CS projects. The chemical and tobacco industries initiated the CS reporting to wipe out their negative image that industrialization is dangerous for social and environmental aspects (Amor-Esteban et al., 2018).

To conclude, CS can be considered one of the essential tools to change the perception of the public (Cabanillas et al., 2013; Remišová & Lašáková, 2014). Since banks are generally seen as not responsible for harm to the environment and society, they logically rarely need to coerce CS disclosures (Kunhibava et al., 2018). However, academicians advise them to pursue sustainable financing practices and disclose them appropriately as part of their catalytic role as project financiers (Sobhani et al., 2012). The prime focus of banks is to deal with loans, deposits, credits, and investments. Moreover, banks are more prone to risk in the shape of non-performing loans. Such loans weaken the financial health of financial firms because central banks and regulators set out a reserve policy in case of non-performing loans (Powell, 2017; ECB, 2017). It makes sense that risk management in the financial sector primarily emphasizes financial risk management via larger lenses than non-financial ones, such as CS. According to the resource-based view, FI has to invest more in risk management than NFI after allocating a sizeable chunk of its resources to the financial component of risk management.

Another critical argument can be made that although banks and NFI both work for CS, they do so because of their own operational needs. Employees of the financial industry directly connect with their customers. This kind of practice, however, is not followed in NFI's tangible products due to a lack of desire from the customers. Thus, employee training, which is a social pillar of CS, may improve financial services. On the contrary, non-financial firms are more concerned about manufacturing, which is an environmental pillar of CS. This depicts different aspects of CS that can be achieved depending on the operations of the industry.

In conclusion to the discussion in this section it can be stated that resource dependency theory suggests that firms have to rely on external resources, and firm are under pressure to meet stakeholder expectations henceforth. FI are often under more scrutiny from external stakeholders, including investors, regulators, and government bodies. This heightened external pressure drives them to adopt robust CS practices, particularly around risk management, transparency, and accountability, to maintain legitimacy and trust. While NFI however, may face stronger public demand for social and environmental responsibility, particularly if their operations directly impact society or the environment (e.g., manufacturing, energy, and other industrial sectors). They may be more motivated to focus on the social and environmental dimensions of CS as these are directly related to their business activities. NFIs are expected as more responsive to societal pressures for ethical practices, leading to potentially stronger engagement with social sustainability. In hypothesis form it be stated as:

H1: Financial Institutions will exhibit better overall Corporate Social Sustainability (CS) performance than Non-Financial Institutions.

Based on the resource dependency theory and resource-based view, FIs are expected to focus more on economic sustainability due to financial sector operations they worki in. While NFI emphasize more on social and environmental aspects, which align more directly with their own core operations and business strategies as compared to FI.

H2: Financial Institutions (FIs) and Non-Financial Institutions (NFIs) will perform better in CS activities that are better suited to their business models, with FIs excelling in economic dimensions and NFIs excelling in social and environmental dimensions.

Methodology

Sample

The sample of this study is Malaysian corporations that issued sukuk with maturity on or after 2010. The IMF and World Bank unanimously stated that Malaysia had achieved the well-deserved status of a worldwide sukuk investment hub, which drew the attention of Malaysian corporate issuers (BNM, 2011; Nikkei, 2015; Sy, 2007). Malaysia has a record of being the issuer of more than 25 % of global sukuk assets and 84% of short-term sukuk in 2015. Recognized by various financial institutions around the globe, Malaysia has now become a significant player with a substantial proportion of the global sukuk assets around 53% (Mahomed & Mahbot, 2024).

After designating Malaysia as the focus country for sukuk issuers, the study selected data for corporate issuers only. Because of inherent differences in the resources, the sovereign issuers are not part of the study. This scope of study by focusing on corporate issuers is purposeful, to exclude sovereign issuers due to their distinct resource compositions and operational dynamics. Second filter was used to select the issuers that have issued sukuk before 2010 and their sukuk have maturity after 2022, so that their sukuk remain active for the sampled time period. Sampling sukuk with maturities after 2010 helps to avoid bias from pre-issuance and post-issuance financials, impacting their CS. Sukuk issuances can meaningfully change issuers' financial position, and analyzing active sukuk only, assures that the sample reflects the current and homogenies consistencies in sustainability efforts. By excluding sukuk issued before 2010, the study controls for historical financial data that might not accurately represent the issuer's ongoing CS initiatives and their alignment with sustainability practices. Because CS is relatively a new phenomenon taking bigger momentum after the global financial crises of 2007, before 2010 scarce corporations report their CS. This criteria brought us a sample size of 29 sukuk issuers, out of which 21 are NFI and 8 are FI. Twelve years of data was collected from 2010 to 2022. The total number of observations that are part of this study is 359 issuers, of which 252 are NFI and 107 are FI.

Variables and data

This study considered the most common framework for CS disclosures: the Global Reporting Initiative (GRI) (Levy et al., 2010); which has established itself as a benchmark for sustainability reporting (Almaskati, 2023). Its respect has spread to practitioners like the S&P-100 (Levy & Scully, 2007), policy officials like the UN (Bair, 2007), and theorists like (Levy et al., 2010). Malaysian policymakers have also favoured the GRI, which has adopted a rule requiring listed businesses to select CS reporting standards specified by Bursa Malaysia or GRI. Apart from that, the GRI list was found to be more purposeful after consulting with two scholars of relevant areas and high-level policymakers from the Ministry of Finance, Government of Malaysia. By eradicating the double-barrel error from the GRI variables, and splitting them in more than one GRI variables, the number of sub-variables naturally increased. It was leading to improved accuracy and quality in the analysis of CS practices. The latent structure of CS, including its constructs, variables, and sub-variables, is compiled in Table 1. The variables contained 97 items.

On the presumption that the firms' social performance aligns with their esteemed disclosures, the social performance was derived using secondary data revealed in the annual reports. Given the CS business model, it is undeniable that no rational explanation can account for the failure to reveal the actual social performance, particularly after legislation compels businesses to perform and disclose. According to Sobhani et al. (2012), annual reports were selected as the data source since they are considered authentic, and studies have shown that they are a more popular medium for CS disclosures enabling companies to communicate their social performances effectively (Agustina et al., 2021).

Table 1*Latent structure of CS variables*

	Pillars	Constructs	Number of variables
Overall CS	Economic CS		5
		1) Environmental risk	5
		2) Retirement benefits	4
		3) Assistance by the government	4
		4) Wage by Gender	4
		5) Investments in social benefits	4
		6) Dealings with local suppliers	3
		7) Anti-corruption behavior	7
		8) Competitive behavior	3
	Environmental CS		
		1) Materials recycling	4
		2) Energy consumption	5
		3) Water consumption	3
		4) Biodiversity conservation	4
		5) Gaseous emissions	7
		6) Effluents and waste	8
	Social CS	7) Noncompliance with environmental laws	3
		1) Employee retention and turnover	4
		2) Benefits provided to full-time employees	7
		3) Occupational health and safety	3
		4) Trainings	2
		5) Social Impact of products and services	5
		6) Labor rights	3
Total	3	21	92

Analytical Techniques

The qualitative information of CS disclosures was converted into quantitative information via content analysis. The process of creating thematic settings for textual information is called content analysis. Because of its natural fit for the subject, it has been widely used in CS research (Sahinidis et al., 2018; Orlitzky et al., 2003; Kavoura & Sahinidis, 2015). Either 0 or 1 was used to encode the data. In the quantity matrix, 1 was entered if the pertinent disclosure was provided and 0 otherwise. The economic, environmental, and social pillars formed the foundation of CS's latent structure. They combined the particular factors to create their constructs for each of these three. This method was modified for CS disclosures from the GRI framework.

The first two reliability components were attained using the internally recognized GRI framework. Thematic categories, decision rules, and cross-ratings are the foundation of the content analysis's dependability (Milne & Adler, 1999). Previous studies have also examined how using the GRI framework can increase data reliability (Antonini & Larrinaga, 2017). The multi-coding method was used to assess the cross-rating dependability. Three coders conducted the content analysis exam to prevent personal biases in coding. However, the Krippendorff Alpha test was used to analyze the matching between several coders. When it comes to data discrepancies and missing values, this test works well (Bolognesi et al., 2017). The Krippendorff Alpha test yielded a value of 0.831, indicating a reasonable degree of agreement between various pieces of content analysis.

Logit regressions were utilized to investigate the distinctions in the CS reporting practices of FI and NFI. In accordance with Olson & Zoubi's (2008) research approach, the stepwise logit was chosen to choose the factors that best describe this difference. They have demonstrated that the logit model may be used to estimate the factors that separate firms of different types. Furthermore, compared to linear t-test methods, its utilization is more effective. Logit models were run independently for each pillar's variables and constructs to prevent multicollinearity. Two subsamples of the sample were created, one for firms with a higher median CS score and the other for those with a lower CS score. For every median, a different regression was performed.

To add further methodological rigor, K-Means clustering was run. An unsupervised machine learning method groups data based on feature similarities by defining kkk centroids, representing cluster centers, and assigning data points to the nearest centroid until clusters stabilize (Jain, 2010; MacQueen, 1967). This approach is ideal for uncovering natural groupings without labels, making it suitable for our study on CS (Xu & Wunsch, 2005). We applied K-Means to classify FI and NFI based on their CS performance,

identifying distinct patterns in economic, social, and environmental sustainability (Zhang & Wang, 2020). This method is widely used in sustainability research for firm segmentation and comparative analysis (Liu, Xie, & Yu, 2021). Clustering was further re-affirmed by the hierarchical clustering method to group firms using Ward's method to minimize variance within clusters and produce the most homogenous groupings (Murtagh & Contreras, 2012). The resulting dendrogram visually represents the similarity between firms, with branch heights indicating the degree of relatedness in sustainability practices (Hastie, Tibshirani, & Friedman, 2009). The use of both the K-Means technique and hierarchical clustering (Ward's method) ensures a comprehensive analysis of the data by leveraging the strengths of each method. K-Means is used to identify distinct clusters based on their distances in CS performance, while Ward's method curtails the variance within clusters, representing an accurate and detailed grouping of sukuk issuers based on their performance.

The Random Forest Regressor was used to predict CS based on all features in economic, social, and environmental CS. Given a long list of features, this machine-learning tool was chosen. Feature importance, termed Predictive Power, was calculated by measuring how much each feature reduced variance in CS. A hybrid approach retained the top 20% of features with high predictive power and standard deviation. This ensured that only the most impactful variables were used in the model, reducing overfitting and improving prediction accuracy (Breiman, 2001; Strobl et al., 2009).

This study employed a combination of Logit regression, K-Means clustering with Dendrograms, and Random Forest to compare FI and NFI in terms of CS. Each method contributed uniquely to the analysis. Logit regression was used to estimate the probability of firms falling into FI or NFI categories based on key CS variables, providing insight into the significance and direction of specific factors. K-Means clustering and Dendrograms helped group firms with similar sustainability profiles, revealing natural clusters in CS practices across sectors. It was drawn to graphically illustrate the differences in CS practices by firms' grouping. Finally, Random Forest offered a robust feature selection method, identifying the most critical drivers of CS for both FI and NFI, adding depth to the comparison by highlighting key differences in sustainability priorities. Given the length of varied indicators used for CS, as given in Table 1, the random forest model was a feasible approach to classify features by machine learning. These diverse methods allowed for a comprehensive, multi-dimensional analysis of CS, combining predictive accuracy, pattern recognition, and interpretability.

Results and Discussion

CS performance of all sukuk issuers

Malaysian corporations that issue sukuk have been observed to make an effort to publish their CS performance, albeit in a relatively small amount. This is demonstrated by the aggregate CS 0.183, a modest magnitude. The sample corporates discuss only a quarter of the GRI sustainability indicators, with the maximum mean being 1. This means that the mean in percentage terms was 18.3%. According to Table 2, which provides specifics, the issuers gave the social CS the most consideration among the pillars and the environmental CS the least, with the economic CS falling in between. Corporations performed the worst among the sub-variables in terms of anti-corruption behavior in the field of economic CS, whereas the most concentrated sectors were investments for social benefits and fund management against retirement liabilities.

It specifies a need for better-quality of governance mechanisms and ethical practices within the sukuk issuing sector. Ivaşcu et al. (2022) also highlight the significance of integrating robust anti-corruption measures into CS frameworks. Remarkably, social investments were more prominently reported, while the lack of consideration given to environmental initiatives reflects a gap in the general approach to sustainability. The CS reports establish the performance without a proper stress on the field, as suggested by the literature that environmental stewardship is intrinsic to long-term corporate performance (Abukari et al., 2022). In the light of these findings, it is crucial for Malaysian Sukuk issuers to extend their engagement with GRI sustainability indicators, particularly in environmental practices. Doing so not only nurtures compliance with Bursa Malaysia regulatory frameworks but also fosters positive reputation the market increasingly driven by stakeholders' demand of sustainability (Costa & Angelo, 2020).

Table 2: CS performance of overall sukuk issuers

Variables	Mean	SD
Overall CS	0.183	0.129
Economic CS	0.211	0.187
Investment in social benefits	0.438	0.296
Funds management for retirement benefits	0.350	0.287
Competitive behavior	0.335	0.135
Climate risk management	0.189	0.331
Government assistance	0.166	0.251
Wage by Gender	0.128	0.260
Spending on local suppliers	0.064	0.199
Anti-corruption behavior	0.053	0.099
Environmental CS	0.102	0.107
Energy consumption	0.250	0.302
Materials recycling	0.163	0.187
Compliance with environmental laws	0.107	0.191
Gaseous emissions	0.099	0.150
Effluents and waste management	0.052	0.140
Biodiversity	0.023	0.080
Water withdrawal	0.018	0.076
Social CS	0.257	0.143
Social impact of business operations	0.386	0.276
HR trainings	0.376	0.246
Labor rights	0.261	0.308
Employee benefit schemes	0.246	0.168
Health and security of personnel	0.178	0.279
Employee retention	0.110	0.228

Under the economic CS construct, the variables show that the sukuk issuers paid the least amount of attention to managing water extraction and the most attention to energy consumption. It unambiguously indicates the economic importance of the expense resulting from the resources that the issuers rely on. Water-related convergence initiatives, such as recycling, are more expensive than beneficial in Malaysia's geoeconomic context, which has a plentiful water supply and limited energy supply (Damin, 2012). It may, therefore, be rather common for Malaysian corporates to focus more on energy conservation than water reuse. In the field of social CS, the issuers were far more concerned with

the social effects that their operations and products were having than with staff retention. The marketing technique to gain favorable fame is interpreted as social performance. Issuers must be mindful of societal perceptions of their products by the CS business model. The disclosures on staff retention may receive less attention for several reasons. Since the actions done by this set of external stakeholders can immediately affect sales, the issuers under study are more attentive to buyers than to employees. Jobless prevalence exacerbates the situation; Malaysia's jobless rate is 3.5%, rising 1.9% annually (Mahidin, 2019). Furthermore, a number of factors influence employee retention, which is a complicated phenomenon. Even while the corporates in our sample pay some attention to the GRI variables for employee perks, it is not enough to win over employees. To put it another way, the GRI list of benefits for employees—which includes health insurance, disability and invalidity coverage, parental leave, retirement savings, and stock ownership—is not all-inclusive when it comes to keeping employees on board.

Differential analysis of FI and NFI

Economic CS

Logit models were conducted independently for each CS pillar to compare the CS performance of FI and NFI. The statistics for the logit model for economic CS performance are shown in Table 3.

Table 3: Differential Analysis of Economic CS					
Constructs	β	Exp(β)	S.E.	Wald	Sig.
Spending on local suppliers	7.485	1781.2	1.626	21.198	0.000
Wage by Gender	4.081	59.182	1.361	8.992	0.003
Funds management for retirement benefits	3.907	49.774	1.039	14.131	0.000
Assistance received from the government	-3.617	0.027	1.133	10.184	0.001
Anti-corruption behavior	-4.782	0.008	1.978	5.844	0.016
Competitive behavior	-5.421	0.004	0.878	38.133	0.000
Climate risk management	-5.892	0.003	1.534	14.760	0.000
Variables					
General measures against anti-corruption	8.915	7441.5	2.316	14.813	0.000
Minimum wage rule for employees	8.507	4950	2.383	12.744	0.000
Investments in social projects relating to tangible infrastructure	3.796	44.54	0.961	15.611	0.000
Estimate of liabilities from pension fund met by the general resources of the organization	3.635	37.890	1.090	11.113	0.001
General measures to access the investments in social projects and their impact	2.477	11.908	1.066	5.404	0.020
Risks related to corruption identified through a separate risk assessment	-1.407	0.245	0.458	9.434	0.002
Defined contribution by employer in the pension fund	-1.926	0.146	0.954	4.081	0.043
Monetary assistance from the government	-1.983	0.138	0.678	8.540	0.003
General measures for the fund management against pension liabilities	-4.993	0.007	2.139	5.446	0.020
General measures to improve competitive behavior	-7.547	0.001	1.388	29.571	0.000

It was discovered that NFI defined the employer and employee contributions and frequently managed a separate fund to handle the obligations resulting from the pensions ($\beta = -4.993$, $\text{Exp}(\beta)=0.007$). In contrast, the FI, who possessed superior investment management skills, mostly managed their pension obligations by using their general resources ($\beta = 3.635$, $\text{Exp}(\beta) = 37.89$). FI retains a more accurate accounting assessment of its liabilities since it meets its retirement obligations with its general resources. As a result, both were fulfilling their retirement commitments, but their operationalization differed. Because of the inherent variations in their resources to deal with a similar problem, this variation is normal. Considering the economic relationship between an employer and employee from a different angle, the FI is more concerned with their employees' compensation in connection with the minimum wage regulation. A positive beta of magnitude 8.507 indicates that the difference is highly significant. The FI's staff members are sophisticated and increasingly aware of the reference value of their compensation packages. The FI is more likely than the NFI to reveal the implementation of the minimum wage rule in order to soothe employees and internal stakeholders. This enhances the gender-based pay concept, which is higher for FI than NFI. In the instance of FI, relationships with local suppliers were also thought to be better managed. Local depositors make up the majority of the fund suppliers in Malaysian banks. Research has praised the importance of banks' geographic proximity in attracting and keeping consumers because it facilitates bank visits. This fact helps the FI manage its relationships with local fund suppliers more effectively (Cabanillas et al., 2013). Second, industrial companies require a far greater variety and quantity of raw materials, but financial institutions only require documentation and other minor items to operate their financial services. Therefore, whereas the NFI may engage in frequent imports, an FI is more comfortable managing its purchases from local vendors. In terms of CS relationships with suppliers, the geographical nearness and local engagement strategies of FIs may provide them an advantage in managing supplier interactions. FI as a whole sector is generally more regularized and standardized than NFI, which also stresses them to draw closer relations with local stakeholders. This scenario further emphasizes the importance of contextual factors in CS practices (Kuo et al. 2023).

The governments gave the NFI greater resources to accept aid, particularly financial aid. Institutions in Malaysia, such as the Malaysian Exporters Association and Yayasan Bursa Malaysia, are actively working to provide financial support for rural CS education (MEXPA, 2018; UNICEF, 2012). FI has failed to establish a strong presence in the populace's lives, particularly in impoverished rural communities where banks have even stopped operating (Pew Forum, 2009; Marshall, 2006). As a result, they can be best used to

support social initiatives like education, with NFI taking the lead. Furthermore, education primarily affects NFI because it has to deal with laborers who are typically less educated than FI staff. In the CS element of anti-corruption, NFI conduct differed in order to handle corruption risk separately. Since FIs—banks in particular—deal with credits and investments, they need to manage risk more aggressively than NFIs. As a result, risk management is integral to FI's operations. Instead of focusing on corruption specifically, the FI would probably include their risk assessment under the broader heading of financial risk management. A negative beta of -4.782 in the constructions indicates that the NFI is better at managing its anti-corruption behavior as a result of the particular efforts to address the associated risks.

The construct and variable of generic measures to increase competitive behavior both had a negative beta. In the area of managing relationships with competing stakeholders, the NFI was discovered at a relatively higher ebb of social performance. When it comes to competitive behavior, NFI does better. NFI's business model is more adaptable than FI's. There is more rivalry in this kind of market since it makes entry easier. In this situation, the NFI is performing better economically in terms of CS under competitive behavior. Notably, the exponential beta is negligible in this case at 0.001, indicating that the NFI is performing marginally better in terms of competitive behavior. When NFIs engage in environmental pollution and forest destruction to produce things or build projects, they should be more mindful of climate risk in order to atone for their wrongdoings (Amor-Esteban et al., 2018).

Additional disparities were discovered between the variables of general measures to access social project investments and their impact, as well as between social project investments related to tangible infrastructure, which had positive betas of size 2.477 and 3.796, respectively. The FI is superior in these CS domains, as indicated by the positive beta. While they tend to choose concrete projects like infrastructure over intangible ones, FI maintains better records and disclosures of their financial involvement in social benefit projects. Most of the intangible projects deal with counseling, training, and education. In terms of soft skills, the working class largely lags. Therefore, the NFI should focus more on capacity-building initiatives when interacting with them.

Environmental CS

Results from the logit model ran to distinguish between FI and NFI's CS behavior in environmental CS are displayed in Table 4. Compliance with environmental regulations was the only construct under environmental CS that had exponential betas of zero, despite the fact that all of the other constructs were extremely important. In this case, the beta was a positive 16.156 and the

exponential beta was a powerful 10E5. It suggests that the FI is outperforming the NFI in terms of reporting and adhering to environmental regulations. This characteristic alone accounts for the vast differences in environmental CS constructs.

Table 4: Differential Analysis of Environmental CS

Constructs	β	Exp(β)	S.E.	Wal d	Sig.
Materials recycling	-11.075	0	1.959	31.948	0.000
Gaseous emissions	-39.823	0	9.156	18.919	0.000
Compliance with environmental laws	16.156	10E5	2.901	31.024	0.000
Variables					
General measures for materials recycling	-4.62	0.01	1.068	18.716	0.000
General measures for responsible energy consumption	-4.032	0.018	1.024	15.5	0.000
General measures to conserve biodiversity directly or indirectly	3.702	40.531	1.483	6.232	0.013
General measures for responsible waste management	4.636	103.18	1.373	11.406	0.001
General measures for compliance with environmental laws	7.164	1292	1.449	24.454	0.000

The factors of ambient CS were subjected to another logit regression in order to gain a deeper understanding. The variables of general measures for responsible energy usage and general measures for recycling materials showed negative betas of -4.032 and -4.62, respectively. It makes the assumption that the NFI uses less energy and recycles more materials. The management of the energy required to transform these inputs into the final form of output and the available stock of input materials are challenges that manufacturing enterprises must deal with. As a result, they must recycle inputs and use energy sparingly for their own fitness.

With values of 3.702, 4.636, and 7.164, respectively, the positive betas were obtained for the differential analysis of general measures for responsible waste management, general measures for biodiversity conservation directly or indirectly, and the variable of general measures for environmental law compliance. In comparison to NFI, FI exhibits healthier behavior than the CS-mentioned factors. The idea of paperless banking is connected to waste management. Under the "key role" directions of Malaysia's central bank, Bank

Nagara, this trend is proving its mettle in the country. According to a study cited in this directive, the use of paperless banking can promote financial inclusion and the efficiency of the banking industry, which can lead to a 1% increase in the GDP overall. (BNM, 2013, p. 1; BIS, 2013). Another creative difference in FI's social CS performance has to do with biodiversity conservation. The 40.531 magnitude of exponential beta is substantial to demonstrate that FI is significantly superior to NFI in this aspect of CS, even though the FI is only using general measurements. Given that only a tiny percentage of FI incorporate biodiversity into their business plans, this endeavor is commendable (Mulder, 2007; Cuckston, 2013). IUCN According to the World Conservation Union, the banking industry's reputation is 70% damaged and can be improved by working to preserve biodiversity because it is a pressing issue that can bring attention to FI. Here, FI can have a direct or indirect role (Mulder, 2007). Conservation of biodiversity is an expensive phenomenon that needs USD 0.875–1.23 billion in resources per year, although only 12% of that amount has been allocated thus far. Stakeholder pressure is required to persuade the FI to support biodiversity financing (McCarthy et al., 2012). Going forward, the FI must at least adhere to the stakeholders' general caution regarding the presence of biodiversity if they lack enormous financial resources.

Remarkably, FI excel in their compliance to environmental laws, suggesting a strong commitment to adhering to these standards compared to NFI showing lesser performance in areas such as recycling and responsible energy consumption. This performance highlights Fis' stance for integrating sustainability into their operational frameworks. Additionally, their initiatives, including advancements towards paperless banking also indicate an emerging trend to enhance their sustainability profiles. As the environmental challenges continue to grow, FIs must prioritize innovative sustainable financial practices to strengthen their contributions to ecological conservation (Kashi & Rasid, 2023; Siddik et al., 2023).

Social CS**Table 5: Differential Analysis of Social CS**

Constructs	β	Exp(β)	S.E.	Wald	Sig.
Employee retention	4.581	97.6	0.995	21.199	0.000
Employee benefits	-10.53	0.000	1.488	50.174	0.000
Training of employees	1.370	3.936	0.816	2.822	0.093
Social impact of products and operations	2.558	12.914	0.738	12.017	0.001
Labor rights	-5.379	0.005	0.896	36.051	0.000
Variables					
General measures to manage the economic benefits to a full-time employee	4.228	68.57	0.566	55.879	0.000
Healthcare for full-time employees	-2.664	0.07	0.572	21.681	0.000
Stock ownership for full-time employees	-3.875	0.021	0.592	42.858	0.000
Operations and or suppliers considered to have significant risk for incidents of child labor	-3.051	0.047	0.512	35.482	0.000

Labor rights were the only factor in the logit model for social CS performance that had an exponential beta greater than zero and a substantial negative beta (Exp β =0.005). Since labor is NFI's primary focus, their business model requires them to be more efficient in this area of CS; hence, this point is not surprising. The NFI is significantly better in this area, as evidenced by the highly significant beta of magnitude -3.051 for child labor. Even if they don't have to spend staffing costs, the FI can better serve their staff, which can provide them with an advantage in keeping their workers loyal and unswitched. With an exponential beta of 97.6 and a substantial positive beta of 4.581, this is discernible under the employee retention variable. The variable of the social impact of activities and products shows another positive beta of 2.558. In terms of responsible product creation, the FI is superior. This improvement results from the fact that the FI must have a dedicated product development department as part of its business model. It is the only duty of this department to ensure that FI's operations and products are innovative and viable. In light of current business trends, this feasibility also applies to CS. Therefore, it is only standard for the FI to have a relatively higher CS performance in terms of the social impact of their operations and products.

The FI is making broad efforts to ensure that their full-time employees obtain economic advantages, according to the differential analysis conducted using the logit model for the variables in the social CS (β =4.228, Exp(β)=68.57). NFI is planning this endeavor to concentrate on providing healthcare benefits and ownership sharing to its employees. The rationale is that NFIs are destined

to have lower staff retention rates, even if they focus more on healthcare and employee stock ownership. To put it another way, NFIs cannot ensure employee retention if they solely concentrate on healthcare and stock distribution to staff. The phenomena of employee retention are complicated and, of course, depend on a number of other factors.

Pillars to CS

Table 6: Differential analysis of the pillars of CS

CS Pillars	β	Exp(β)	S.E.	Wald	Sig.
Economic CS	2.399	11.016	1.117	4.618	0.032
Environmental CS	-2.386	0.092	2.084	1.311	0.252
Social CS	-4.991	0.007	0.851	34.435	0.000

Environmental CS became minor among the CS pillars (Sig=0.252). While the NFI performed better in social CS, the economic CS was at a higher ebb among the FI. Similar to the earlier logit models, a positive beta coefficient was linked to a higher exponential beta and vice versa. It strengthens the perception that the FI is providing NFI with a fair fight. With a highly significant -4.777 beta and 0.008 exponential beta, NFI had the best overall CS performance.

Since FI is an economic middleman, it must be financially stable. Financial corporations are seen to be actively pursuing this fact among Malaysian sukuk issuers to outperform the NFI in economic CS. However, when it comes to labor rights and the financial and non-financial benefits that their employees receive, the NFI is more consistent in its thinking. The FI in social CS is now repelled by the NFI. In contrast, both competitors' efforts in environmental CS are negligible and about equal. In order to improve an organization's performance in high-tech areas such as material recycling, biodiversity protection, measurement and management of gaseous emissions, etc., environmental CS requires a more significant allocation of resources. As a result, the company avoids their more expensive endeavors and instead integrates its operations into the CS domain, which is less costly (Mitnick, 2000; Tugrul & Gocer, 2017). This decision-making process is best explained by extrinsic motivation. The findings closely resemble those of another study conducted for Turkey's expanding market. It was shown that Turkish enterprises perform the worst in terms of environmental and social performance when compared to offshore firms. When it came to economic CS, Turkish financial firms outperformed others. The companies don't reveal inefficiencies; they only reveal their CS performance. Furthermore, only the most accessible CS domains are disclosed (Tugrul & Gocer, 2017). The reasoning behind the similarities is that both Malaysia and Turkey are

developing markets, and CS is a relatively recent development compared to developed countries.

With an exponential beta of 0.008 and a magnitude of -4.777, the beta was negative and very significant after the logit was performed to distinguish between FI and NFI in overall CS behavior. Although the difference is relatively moderate, it is evident that the NFI has performed better in CS behavior.

Differential analysis of the organizations at higher and lower CS levels

The regression fitness stood at 389.644, 0.26, and 0.346 for -2 Log-likelihood, Cox & Snell R Square, and Nagelkerke R Square, respectively, for the entire market of sukuk issuing corporations. Every regression coefficient had an elevated level of significance. The exponential beta was 269 for Economic CS and mighty for Environmental CS, but it was zero for Social CS. It indicates that while there are no such differences based on social CS, organizations with greater median CS performance and those with lower CS performance can be differentiated based on their economic CS performance. The performance of the corporations in the field of environmental CS shows a difference at its peak. Only businesses who are extremely or indeed concerned with CS performance would worry about environmental issues, as the organization's focus moves from social to economic to environmental CS as it moves from lower to higher CS performance. If not, they limit their competition to social and economic achievement.

Table 7: Differential analysis of the organizations at higher and lower CS level

Variables	β	Exp(β)	S.E.	Wald	Sig.
All issuers					
Economic CS	5.596	269.3	1.439	15.115	0.000
Environmental CS	14.43	1849553	2.606	30.672	0.000
Social CS	-7.711	0.000	1.248	38.189	0.000
Non-financial Issuers					
Economic CS	4.149	63.34	1.474	7.919	0.005
Environmental CS	9.488	13196	2.537	13.981	0.000
Social CS	-4.414	0.012	1.229	12.903	0.000
Financial Issuers					
Economic CS	103.45	85E45	32.631	10.052	0.002
Environmental CS	18.341	92E6	38.967	0.222	0.638
Social CS	-94.98	0.000	30.105	9.955	0.002

As previously mentioned, environmental CS is a costly field of CS that can serve as the focus of larger, more intrinsically driven businesses. A cross-

country investigation revealed similar results: Companies with greater resources and greater stakeholder pressure perform better when it comes to environmental CS (Amor-Esteban et al., 2018).

Organizations that perform well in CS are more aware of these new developments and are probably going to adjust their strategies accordingly. The NFI was the sole subject of a separate regression. Under the fitness test for -2 Log likelihood, Cox & Snell R Square, and Nagelkerke R Square, respectively, 292.277a, 0.203, and 0.27 were produced. With a small magnitude of 0.012 for exponential beta, the beta coefficient for social CS was negative. Stating that the NFI tends to decrease its operations in the social CS at higher ebbs of CS. The resources that are saved in this manner are used for environmental and economic purposes. The NFI's emphasis on environmental CS increases with CS performance, as evidenced by the environmental CS's high exponential beta magnitude.

FI's logit model produced intriguing findings. While social CS's exponential beta was zero, environmental CS's variable became negligible. The only one with a substantial value of exponential beta was the economic CS. Despite being an economic intermediary, the FI's endeavors are focused on the economic CS. In contrast to the other issues, the FI with the best CS performance is superior in terms of economics. Resource reliance: in order to succeed entirely in the economic component of computer science, FI must refrain from investing its resources in other parts of the field.

Clustering Analysis

The K-Means clustering analysis revealed distinct groupings within both the FI and NFI datasets, indicating significant variability in their sustainability practices (Tilt, 2016). In the case of NFI, the clustering results showed greater diversity, with firms spread across different clusters, reflecting the varied nature of their industries and the various challenges they face in implementing CS practices (Sariyer & Taşkın, 2022). The K-Means clustering chart, given in Figure 1, visually represents the three distinct groups of firms using blue, yellow, and purple based on their CS performance. The blue cluster primarily includes firms, especially FI, which score high in economic sustainability. These firms tend to focus on governance and financial stability, with relatively consistent CS practices. The yellow cluster represents firms with more balanced sustainability efforts across economic, social, and environmental dimensions, including both FI and NFI, indicating moderate CS performance.

Finally, the purple cluster mainly consists of NFI, which emphasizes social and environmental sustainability. These firms excel in areas like social responsibility and environmental initiatives, though they place less focus on economic factors.

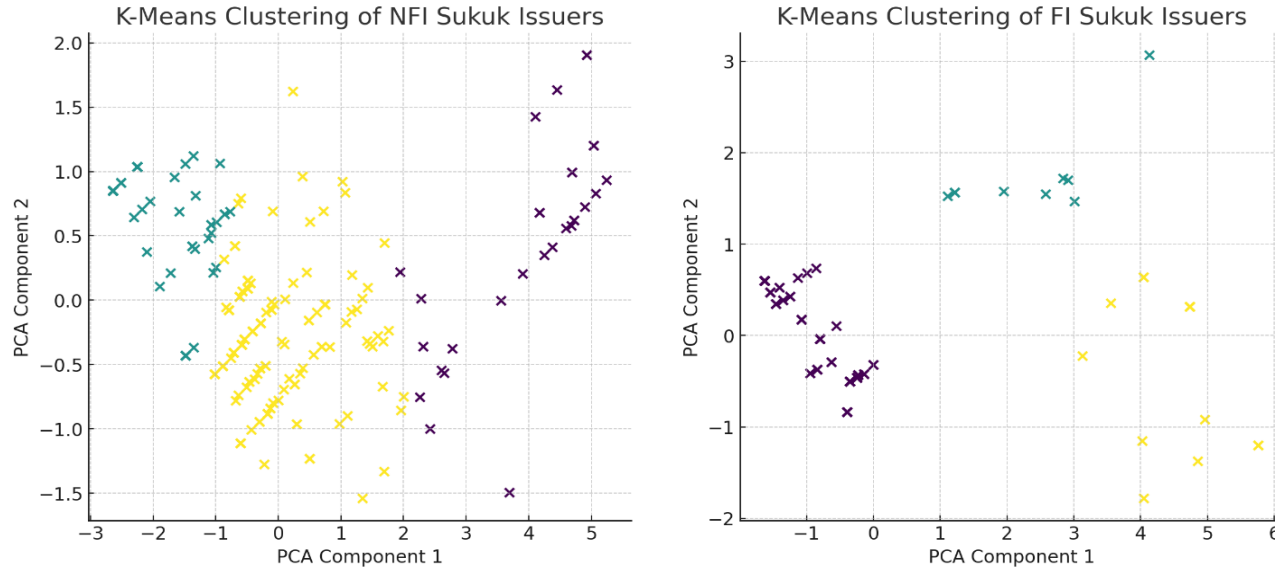


Figure 1: K Mean Clustering

Notes: Clusters on the left were drawn for NFI, and the other clusters were drawn for FI. The figure highlights three distinct groups of firms based on CS performance: blue for FI with strong economic sustainability, yellow for firms with balanced sustainability across economic, social, and environmental dimensions, and purple for NFI emphasizing social and environmental sustainability. The emergence of three clusters was driven by the natural grouping patterns in the data guided by the elbow method optimization technique in clustering. This grouping reveals that FI prioritizes economic factors, while NFI often focuses more on social and environmental initiatives. These distinctions suggest that tailored strategies are necessary for improving sustainability practices across sectors.

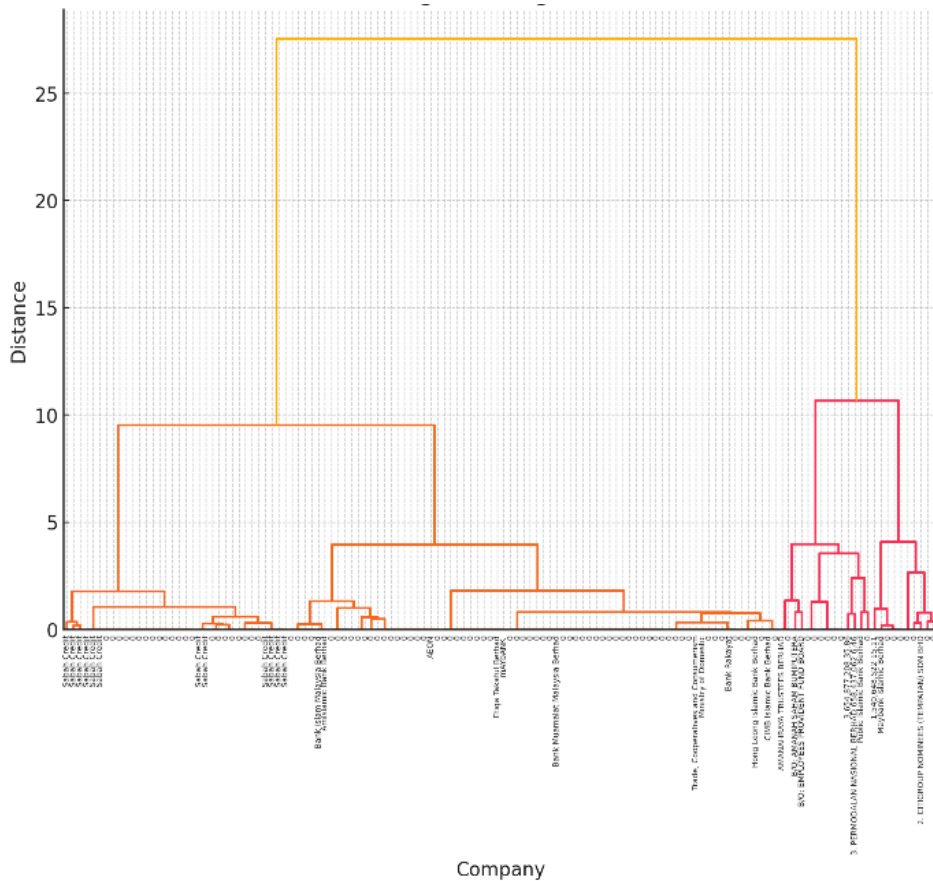


Figure 3: Hierarchical Clustering Dendrogram for FI

Notes: These dendrograms illustrate the distinct approaches between NFI and FI in addressing CS, with NFI exhibiting greater diversity and FI maintaining more standardized practices across firms. This reinforces the need for sector-specific sustainability strategies, aligning with the unique challenges and priorities of each sector.

The results were re-affirmed by hierarchical clustering dendrograms for NFI and FI issuers, visually presenting the firm groupings based on their CS metrics. In both dendrograms, the height of the branches reflects the degree of similarity between firms, with lower heights indicating more closely related sustainability practices. In the NFI dendrogram, the branches are more diverse and extend across various distances, indicating the variability in the social and environmental focus of these firms. This suggests that NFI, operating in different sectors, adopts a range of CS strategies, particularly in social and environmental domains, in alignment with their respective industries (Sariyer & Taşkın, 2022). In contrast, the FI dendrogram shows more concentrated groupings with shorter distances, reflecting the relative uniformity of CS practices within the financial sector, which tends to prioritize economic

sustainability and governance (Weber & Feltnate, 2016). This tighter grouping suggests that FI adopt more consistent sustainability strategies driven by regulatory and financial risk considerations (Scholtens, 2009).

Comparison of Sustainability Features

The Random Forest model was used to compare the CS features between FI and NFI. The model identified key features driving CS performance in each category. The scores were reported for feature importance until they became absolute zero to 0.0000. For FI, features like potential risk and biodiversity were highly significant, indicating that risk management and environmental sustainability play central roles in FI sustainability practices. This aligns with the literature emphasizing the importance of risk mitigation in financial firms (De la Torre et al., 2010). In contrast, for NFI, a broader range of environmental variables, such as energy consumption (ec3) and water withdrawal (WW2), were significant. This suggests that NFI entities focus more on operational sustainability, driven by resource management and environmental performance (Campbell, 2007).

Another critical point revealed by the random forest model is that many of the significant features driving CS were quantitative in nature. For example, metrics like the total number and rate of new employee hires by age group, gender, and region, energy intensity ratio, GHG emissions reduced through initiatives, and the impact on species listed in the IUCN red list are key indicators. Additionally, product and service labelling information reflects firms' genuine commitment to sustainability. These quantitative indicators suggest that firms providing such detailed data are more likely to be genuinely invested in corporate sustainability rather than engaging in greenwashing (Delmas & Burbano, 2011; Lyon & Montgomery, 2015). Quantitative metrics provide transparency and measurable benchmarks, which help investors, regulators, and stakeholders assess a company's genuine sustainability performance. Organizations that track and report such indicators are also better positioned to meet the growing demand for ESG (Environmental, Social, and Governance) accountability from stakeholders.

Table 8: Feature Importance Score for CS Indicators	Score	SD
Best features for all sample		
Risks and opportunities posed by climate change that have the potential to generate substantive changes in operations, revenue, or expenditure	0.9927	0.1128
Financial implications of the risk or opportunity before action is taken;	0.0030	0.1225
IUCN Red List species and National Conservation List species with habitats in areas affected by the operations of the organization	0.0007	0.2443
Energy intensity ratio for the organization	0.0006	0.3804
Operations and suppliers are considered to have significant risk for incidents of child labor	0.0003	0.3465
General Discussion about competitive behavior	0.0002	0.1727
Total number and rate of new employee hires during the reporting period by age group, gender and region	0.0002	0.2886
Description of the impact associated with the risk or opportunity;	0.0002	0.3423
Percentage of significant product and service categories for which health and safety impacts are assessed for improvement	0.0001	0.2769
information required by the organization's procedures for product and service information and labeling	0.0001	0.4926
Water bodies and related habitats that are significantly affected by water discharges	0.0001	0.2769
significant direct and indirect impacts on biodiversity	0.0001	0.1397
GHG emissions reduced as a direct result of reduction initiatives	0.0001	0.2708
rate of employee turnover	0.0001	0.4953
Best features for NFI		
Risks and opportunities posed by climate change that have the potential to generate substantive changes in operations, revenue, or expenditure	0.9250	0.1099
Financial implications of the risk or opportunity before action is taken;	0.0547	0.1212
General Discussion about competitive behavior	0.0069	0.1724
Description of the impact associated with the risk or opportunity;	0.0004	0.3271
significant direct and indirect effects on biodiversity	0.0002	0.0928
Operations and suppliers are considered to have significant risk for incidents of child labor	0.0001	0.3321

Description of the impact associated with the risk or opportunity	0.0001	0.1297
Percentage of significant product and service categories for which health and safety impacts are assessed for improvement	0.0001	0.2391
Water bodies and related habitats that are significantly affected by water discharges	0.0001	0.2617
Best features for FI		
Risks and opportunities posed by climate change that have the potential to generate substantive changes in operations, revenue, or expenditure	0.6655	0.1239
Financial implications of the risk or opportunity before action is taken;	0.1419	0.1259
Description of the impact associated with the risk or opportunity;	0.0135	0.1333
Water bodies and related habitats that are significantly affected by water discharges	0.0100	0.4024
General Discussion about competitive behavior	0.0096	0.1746
Energy intensity ratio for the organization	0.0075	0.4629
The sourcing of components substances that might produce an environmental or social impact	0.0024	0.5118
Information required by the organization's procedures for product and service information and labeling	0.0017	0.5118
GHG emissions reduced as a direct result of reduction initiatives	0.0017	0.4024
IUCN Red List species and national conservation list species with habitats in areas affected by the operations of the organization	0.0016	0.3008
Total number and rate of new employee hires during the reporting period by age group, gender and region	0.0016	0.3586
Percentage of significant product and service categories for which health and safety impacts are assessed for improvement	0.0010	0.4830
Operations and suppliers considered to have significant risk for incidents of child labor	0.0005	0.4629
significant direct and indirect impacts on biodiversity	0.0004	0.3586
Description of the impact associated with the risk or opportunity	0.0001	0.4629

By applying a standard deviation (SD) cut-off to assess feature volatility, it was found that NFI exhibited greater variability in sustainability practices compared to FI, reflecting their diverse business models and environmental impacts. These results highlight that while both FI and NFI value sustainability, their approaches differ significantly, with FI prioritizing risk-related factors and NFI focusing on environmental resource use.

This analysis underscores the need for tailored CS strategies that reflect sector-specific priorities. Firms in the financial sector may benefit from enhanced risk frameworks, while non-financial firms could focus on improving resource efficiency and environmental impact, aligning with broader sustainability objectives (Freeman et al., 2010).

Conclusion

It has been discovered that Malaysian sukuk issuing corporations make an effort to publish their CS performance, albeit in a minimal way. This is clear from the tiny magnitude of the overall CS of 0.183. Based on the analysis for GRI sustainability variables, it was found that only a small portion, approximately one-third, of these variables are being discussed by sukuk issuers. The residual ratio as two-thirds of the GRI factors receive little to no attention. These two-third of variables were often rated as zero with scarce to no performance under these GRI variables. The issuers focus more on the aspects that are more practical and convenient among the variables being examined under CS performance. The organization's business model serves as the foundation for the answer to the feasibility question. Financial and non-financial institutions made up the sample for empirical purposes. The findings suggested that the resource-based perspective and resource dependency theory are valid for interpreting the empirical data. Because NFIs require a lot of labor, for instance, their reliance on resources enables them to better support labor rights, which in turn improves social CS and overall CS performance. However, from a resource-based point of view, the FI should be skilled in risk and investment management. FI uses a general funds method to manage its pension liabilities, and it uses a general risk management framework to manage its anti-corruption risk. Rather than creating a distinct fund for risk management alone, their risk management techniques are implemented throughout all of the portfolios. However, these operations must be managed by the NFI through risk analysis and the creation of distinct investment funds. As the economic centers for financial intermediation, financial institutions (FIs) outperform other pillars of CS in economic CS. Only those with higher levels of CS are able to provide better care for environmental challenges. In order to achieve this, the NFI spends its resources on environmental CS rather than social CS. The FI tends to devote more resources to economic CS as they advance from lower to higher levels of CS.

Originality

The conduct of sukuk issuers in declaring CS activities and the pertinent distinctions between FI and NFI were examined for the first time in this study. Furthermore, the concepts of resource reliance and resource-based view have not been applied to the sukuk issuers. In this respect, this study was the first to address the CS behavior of sukuk issuers.

Managerial implications

Since sukuk issuers must adhere to both local and Islamic rules, they must exercise greater caution than issuers of conventional bonds (Busari et al., 2019). A higher level of investigation is necessary because many sukuk issuers have a history of default. If they don't care about CS concerns, skunks aren't what they seem (Piotrowski, 2020). Islam calls on people and organizations to adopt more sustainable practices, but in reality, sukuk issuers have been shown to be careless with these matters, which has damaged public confidence (Alshelfan, 2014). Considering this, the study advises managers to increase their CS activities in the hopes that the management of CS will improve firm profitability (Bauer & Hann, 2010) and riskiness (Alam & Nizamuddin, 2013). Because sukuk holders are particularly sensitive to CS issues, the companies risk losing the trust of investors if they don't (Alshelfan, 2014). Because they offer a reliable supply of cash, their happiness is crucial for businesses (Artiach et al., 2010).

Directions for future research

The study is valuable because it fills a gap in the existing literature by being the first to distinguish between FI and NFI CS behavior. The research was once more the first to provide academic findings on the CS behavior of sukuk issuers. Twelve years' worth of data from Malaysian corporates made up the sample. Future research may be limited to a cross-national analysis or a comparison of bond and sukuk issuers. The paradigm for defining CS variables under the economic, environmental, and social CS pillars is unique to Islamic ethics. These factors can be taken from the vast body of literature, and the sukuk issuers can be observed empirically through the differential analysis of CS for Islamic ethics and GRI.

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