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Green Products and Shariah-Compliant Firms in Indonesia & Malaysia: The Role of Board Gender Diversity

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Abstract: The issue of sustainable development is one of the most critical issues globally, covering almost all human activities. The design of sustainable development was developed by the United Nations (UN) in 2015, and 17 goals are targeted to be achieved by 2030. If grouped, the 17 goals are divided into three issues, including environmental, social, and governance issues. This study aims to analyze the effect of green-labeled products on firm performance and risk. It focuses on Shariah-compliant firms by adding a moderation analysis of gender diversity in the firm's board structure. The scope of this study is companies in Indonesia and Malaysia. This study examined 130 companies from various industries from the period 2014-2022, employing a panel data approach. Utilizing Generalized Least Squares (GLS) regression for panel data estimation, the finding indicated that green products positively affect firm performance proxied by ROA and ROE. Furthermore, our findings indicated that green products positively affect ZSCORE, suggesting a lower firm risk. The presence of female board members was observed to have a negative effect on risk. The findings of this study provide new insights into companies' implementation of green products. They are expected to be taken into consideration in decision-making for companies and regulators.

Introduction

Currently, the impact of sustainability implementation on the competitive and economic success of companies remains a subject of ongoing debate, particularly since the formation of the Climate Disclosure Standards Board (CDSB) in 2007 and the subsequent adoption of the Sustainable Development Goals (SDGs) in 2015, emphasizing the integration of sustainability principles across all sectors, including corporate operations. The issue of sustainability is the primary concern of entrepreneurs in serving market demand related to green products (Raut et al., 2017). At present, the issue of sustainable development is one of the most significant issues globally, covering almost all human activities (Arner et al., 2020). The SDGs issue is a sustainable development plan developed by the United Nations (UN) in 2015 (Carè et al., 2023). Seventeen goals are targeted to be achieved by 2030 (United Nations, 2014). When grouped, the 17 goals are divided into three issues, including environmental, social, and governance issues.

In support of realizing and achieving the 17 goals, one avenue is through company activities. Companies play a crucial role in the ongoing economic activity (Dangelico, 2016). One innovation that can significantly contribute to sustainability is the production and innovation of green products. Its

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implementation is part of the company's social responsibility to related parties (Meles et al., 2023). In addition, it is also an obligation arising from increasingly stringent regulations. Porter (1991) explains that companies implementing environmentally friendly product strategies tend to reduce operating costs.

However, compared to social and governance difficulties, environmental challenges are receiving greater attention in the modern era (Gallastegui, 2002; Xie et al., 2022) because the social focus has been applied extensively in the past, as seen by the development of Corporate Social Responsibility (CSR), focusing on issues related to stakeholders and corporate social responsibility. Numerous studies have elucidated the relationship between corporate environmental responsibility and business operations. Meles et al. (2023), for instance, found that green innovation in corporate environmental performance can mitigate corporate risk. Furthermore, Amacher et al. (2004) demonstrated that capital structure and available costs are significant factors for businesses investing in sustainability initiatives.

This study aims to examine the effect of green-labeled items on risk and business performance. Shariah-compliant businesses are the subject of this study. A connection exists between Shariah-compliant businesses and green products. Shariah-compliant businesses adhere to the *maqashid* of Shariah, including safeguarding the soul or concealed *an-nafs* (Mukhtar et al., 2018). Producing environmentally friendly products constitutes a form of 'safeguarding the soul' as it contributes to sustainability and environmental protection. This is achieved by mitigating the impact of environmental damage, such as carbon emissions, food waste, and non-standardized processes.

For companies, committing to supporting sustainability issues can affect their operations in terms of profit and risk. The connection between green products and firm performance is complex (Siedschlag & Yan, 2023). Companies producing green products can improve company performance, one mechanism being strengthening employee morale and engagement. Employees working for a company that prioritizes sustainability often experience increased job satisfaction, which can impact productivity and reduce employee turnover (Lun, 2011). From the buyer’s perspective, companies will attract buyers aligning with the company's vision and are committed to sustainability issues (Xie et al., 2019; Zhang et al., 2020). An increase in such environmentally conscious buyers can positively impact product performance and drive sales growth.

In terms of corporate risk, green products can prevent risks related to corporate reputation. The existence of regulations requiring companies to support sustainability also impacts increased buyer awareness of green products (Deng et al., 2024). Companies not committed to green products may experience reputational problems (Amores-Salvadó et al., 2014). In addition, financial risks can be prevented with green products. The production process of green products involves cost savings (Porter, 1991; Siedschlag & Yan, 2023) through increased efficiency and reduced waste and energy consumption.

Commitment to green products is a strategic decision for companies. The proportion of women in the company's board structure was more effective in making strategic decisions than the male board (Shakil, 2021). Gender diversity in the composition of the company's board members is believed to provide a broader range of views on corporate strategy (Bigelli et al., 2023). Women tend to exercise greater caution when assessing risk limits (Aabo & Giorici, 2023; Setiyono & Tarazi, 2018). Furthermore, women are often found to be more active and socially and environmentally responsible (Aabo & Giorici, 2023) and tend to be more long-term oriented than men (Alkhawaja et al., 2023).

Studies on the impact of green products on the performance and risk of Shariah-compliant companies in Indonesia and Malaysia are crucial because these two countries are the center of the Islamic economy in Southeast Asia with great potential in the development of sustainable products that comply with Shariah principles. In an increasingly demanding global context, the adoption of green products can be an innovative strategy for Shariah-compliant firms to enhance competitiveness, address market demands, and support sustainability posterity. This study contributes to developing theories regarding green products, particularly their impact on company performance and risk. The theories that are the focus of this study include legitimacy theory and stakeholder theory. On the other hand, this study provides novel insights into the role of gender diversity within company operations, particularly in maximizing green products.

Literature Review

Legitimacy Theory

Legitimacy theory is a framework that explains how an organization adjusts its operations, values, and organizational behavior to the norms and values expected by key stakeholders in the organizational environment (Dowling & Pfeffer, 1975). In this role, the company's orientation is not merely profit but also focuses on social, environmental, and business ethics. Legitimacy encourages companies to gain support and trust from the stakeholders. Thus, recognition from these stakeholders is crucial to facilitating the company's access to resources, ensuring stable operating conditions, and reducing concerns from interested parties.

Legitimacy theory can explain the effect of green product implementation on company performance and risk. Companies committed to green products demonstrate an adaptation to the concerns of stakeholders regarding the company's environmental impact (Li et al., 2017). By producing green products, companies inform stakeholders, such as consumers, investors, regulators, and related communities, that the company is committed to supporting sustainability. The adjustment between social values and norms in the company's operations can increase the trust and loyalty of the company and indirectly lead the company to profit and avoid risks such as reputational risk, regulatory violations, and pressure from various stakeholders.

Previous studies used legitimacy theory to test the relationship between green products and firm performance. Maryati et al. (2024) found that green product innovation in companies has no impact on the company's financial performance. Further study by Mousa et al.(2015) describes that legitimacy theory is suitable for explaining the environmental performance of a company and is associated with the company's goal of gaining legitimacy from stakeholders. Recently, Aziz Al Hakim & Tri Wahyuningtyas (2024) explained the relationship between environmental costs and firm performance. They found that the costs incurred by companies to participate in preserving the environment can reduce the company's financial performance.

Stakeholder Theory

Stakeholder theory examines how managers in organizational contexts strive to maximize stakeholders' interests (Freeman et al., 2004). According to Freeman (1994), stakeholder theory should be able to explain two questions. First, what is the primary goal of the company? This question provides clues to company managers on creating and maximizing this value for the benefit of relevant parties. Second, what exactly is the managerial responsibility towards stakeholders? This question emphasizes to managers what they will do with the business being run. With the above question, stakeholder theory emphasizes that managers establish relationships and communication with interested parties to provide and share the values that are the purpose and basis of the company they manage (Mahajan et al., 2023).

In green product implementation, every decision cannot be separated from planning regarding its impact on all relevant parties. Stakeholders are significant parties in helping companies generate maximum profits. Every step decided by the company needs to consider their interests. The decision to produce green products typically elicits positive reactions from stakeholders with the same vision and vice versa. Producing green products means reassuring stakeholders that the company is on a sustainable path and adds to the potential longevity of the company (Kitsis & Chen, 2021).

Furthermore, green products also indicate that the company operates efficiently and adheres to relevant regulatory standards. Thus, it can attract investors to invest, creditors to provide credit, consumers to purchase products, and other stakeholders. The positive response of these stakeholders enhances company performance, improves the company's image, and prevents risks that could potentially arise if the company does not implement sustainability (Baah et al., 2021).

Hypothesis Development

Green Product and Firm Performance

In essence, green products are those manufactured using environmentally friendly equipment and processes that minimize waste and environmental harm By producing green products, companies can

improve their performance. The relationship between green products and company performance can be seen in many aspects. Green products help companies adapt to growing consumer demand for social and environmental responsibility and support for sustainability. This adaptation can enhance sales and market expansion, particularly among consumers prioritizing environmentally friendly products.

Green products enhance the company's standing and perception. According to stakeholder theory and legitimacy, a positive reputation and image can boost the trust and loyalty of parties with an interest in the organization. The business gains a competitive advantage as a result. According to previous studies, implementing green initiatives, such as environmentally conscious management and green innovation can boost sales and improve a company's standing with related parties (Hull & Rothenberg, 2008; Lun, 2011; Siedschlag & Yan, 2023; Zhang et al., 2020). However, other studies suggest that making investments in green initiatives comes with a hefty price tag and may cause financial disruptions for businesses (Lankoski, 2009; Porter, 1991).

H1: Green product has a positive effect on company performance

Green Product and Firm Risk

Companies producing green products can reduce or even increase corporate risk. Risk arises when the actual circumstances deviate from anticipated expectations. For example, companies produce green products to attract buyers and increase sales (Xie et al., 2022). However, the success of such initiatives cannot be guaranteed, presenting potential risks. If successful, the company will experience an increase in sales, and vice versa.

Producing green products requires high investment. Overall, companies with green products demonstrate that the company focuses on sustainability issues and is concerned with stakeholders' interests (Kitsis & Chen, 2021). By adopting green products, companies can reduce risks through regulatory compliance and focus on social and environmental impacts. On the other hand, green products indicate the company's responsibility to the surrounding environment, preventing the company from reputational risk and a negative image. A previous study found that companies focusing on green innovation can prevent the risk of bankruptcy (Meles et al., 2023).

H2: Green product negatively affects firm risk

Green Product and Board Gender Diversity

In recent years, gender diversity in corporate board structures has become an increasingly significant concern (Alkhawaja et al., 2023). Gender diversity in the composition of corporate boards can lead to a broader range of perspectives on corporate strategy, including in measuring corporate risk (Bigelli et al., 2023), due to pressure from the authorities in the form of regulations to increase gender diversity on corporate boards (Shakil, 2021). In general, Liu et al. (2022) demonstrated that female executives' leadership styles and organizational strategies differ from their male counterparts. Female board members typically prioritize environmental and social welfare, whereas male board members tend to emphasize profit maximization.

In corporate sustainability and operations, gender diversity has been a significant focus of several previous studies. Previous study indicates that gender diversity is a significant issue and is positively associated with developing and implementing sustainable strategies in the company (Shakil, 2021). Several other studies found that the presence of women on corporate boards can negatively impact corporate sustainability activities. Several factors contribute to this, including discrimination against female board members (Abdelkader et al., 2024), thus the role of women in deciding strategic matters tends to be limited (Nielsen & Huse, 2010; Sidhu et al., 2021). Gender issues in developed and developing countries have also been found to differ. In developed countries, the proportion of women on corporate boards positively affects the company's involvement in carrying out sustainability strategies (Jizi, 2017; Yarram & Adapa, 2021). Gender issues in developing countries often perpetuate negative stereotypes that remain unresolved (Zaid et al., 2020). These stereotypes can cause companies to fail to maximize the implementation of sustainability, and the positive impact resulting from sustainable implementation becomes ineffective.

H3a: Board gender diversity strengthens the positive effect of green products on firm performance

H3b: Board gender diversity strengthens the negative effect of green products on firm risk

Research Methods

Data and Samples

The scope of this study is to examine the effect of green product production on the performance and risk of shariah-compliant firms in Indonesia and Malaysia. The period of this study is from 2014 to 2022. The data used is sourced from the Refinitiv Thomson Reuters database. Companies excluded from the sample are financial and manufacturing industry companies. The financial industry has different financial ratios from other industries, while manufacturing is an industry with high sensitivity compared to other industries. In this study, we employ dummy variables as a proxy for green product variables. The selection of dummies is not based on the researcher's views but rather on data from Refinitiv Thomson Reuters, which is measured by whether the sample companies produce green products or not.

Table 1. Operational Definition of Variables

Variables	Operational Definition	References
Panel A: Dependent Variables		
Return on Asset (ROA_{it})	$ROAit = \frac{Net\ Incomeit}{Total\ Assetsit}$.	(Kitsis & Chen, 2021; Ullah et al., 2023)
Return on Equity (ROE_{it})		(Kitsis & Chen, 2021)
Enterprise Risk ($ZSCORE_{it}$)	$ZSCOREit = \frac{ROAit + ETAit}{\sigma ROAit\ \ rolling - window\ 3\ years}$.	(Meles et al., 2023)
Panel B: Independent Variables		
Green Products (GP_{it})	Dummy variable, 1 if the company is categorized as producing environmentally friendly products and 0 otherwise.	Thomson Reuters Calculation
Panel C: Moderating Variables		
Board Gender Diversity (GEN_{it})	Percentage of female board members in the company's board structure	(Bigelli et al., 2023; Shakil, 2021)
Panel D: Control Variables		
Debt to Equity Ratio (DER_{it})	$DERit = \frac{Total\ Debtit}{Total\ Equityit}$	(Kong, 2023; Ullah et al., 2023)
Company Size ($SIZE_{it}$)	Natural logarithm of total assets	(Brammer & Millington, 2006; Fernández et al., 2019)
Capital Expenditures to Total Assets ($CAPEX_{it}$)	$CAPEXit = \frac{Total\ Capital\ Expendituresit}{Total\ Assetsit}$	(Ullah et al., 2023)
Liquidity Ratio $(LIQ_{it})_i$	$LIQit = \frac{Current\ Assetsit}{Current\ Liabilitiesit}$	(Kong, 2023)

Empirical Model

The methodology in this study focuses on two tests. First, it uses base model regression to determine the effect of green products on performance and risk (hypotheses 1 and 2). This analysis involves all samples in both Indonesia and Malaysia. Second, this study regresses the moderating model of the role of gender diversity on corporate boards on the effect of green products on firm performance and risk (testing hypotheses 3a and 3b). Third, this study adds a sub-sample analysis between large and small firms. This study uses the following equation:

Baseline model

$$ROA_{it} = \beta_0 + \beta_1 GP_{it} + \beta_2 DER_{it} + \beta_3 SIZE_{it} + \beta_4 CAPEX_{it} + \beta_5 LIQ_{it} + e_{it} \quad (1)$$

$$ROE_{it} = \beta_0 + \beta_1 GP_{it} + \beta_2 DER_{it} + \beta_3 SIZE_{it} + \beta_4 CAPEX_{it} + \beta_5 LIQ_{it} + e_{it} \quad (2)$$

$$ZSCORE_{it} = \beta_0 + \beta_1 GP_{it} + \beta_2 DER_{it} + \beta_3 SIZE_{it} + \beta_4 CAPEX_{it} + \beta_5 LIQ_{it} + e_{it} \quad (3)$$

Moderating model

$$ROA_{it} = \beta_0 + \beta_1 GP_{it} + \beta_2 GEN_{it} + \beta_3 GP_{it} * GEN_{it} + \beta_4 DER_{it} + \beta_5 SIZE_{,it} + \beta_6 CAPEX_{,it} + \beta_7 LIQ_{it} + e_{it} \quad (4)$$

$$ROA_{it} = \beta_0 + \beta_1 GP_{it} + \beta_2 GEN_{it} + \beta_3 GP_{it} * GEN_{it} + \beta_4 DER_{it} + \beta_5 SIZE_{,it} + \beta_6 CAPEX_{,it} + \beta_7 LIQ_{it} + e_{it} \quad (5)$$

$$ZSCORE_{it} = \beta_0 + \beta_1 GP_{it} + \beta_2 BGD_{it} + \beta_3 GP_{it} * GEN_{it} + \beta_4 DER_{it} + \beta_5 SIZE_{,it} + \beta_6 CAPEX_{,it} + \beta_7 LIQ_{it} + e_{it} \quad (6)$$

The dependent variables are company performance proxied by the ratio of net income divided by total assets (ROA_{it}) and the ratio of net income divided by total equity (ROE_{it}). In comparison, the risk is proxied by using the total value of ROA_{it} plus the ratio of equity divided by total assets (ETA_{it}) divided by the standard deviation of ROA_{it} with a 3-year rolling window ($ZSCORE_{it}$). The leading independent variable in this study is green products (GP_{it}), using a dummy variable of 1 for companies whose products are categorized as environmentally friendly and 0 otherwise. This study uses one moderating variable, which is the percentage of female board members in the company (GEN_{it}). This study incorporates several control variables, including the ratio of total debt to equity (DER_{it}), company size using the natural logarithm of total assets ($SIZE_{it}$), the ratio of capital expenditure divided by total assets ($CAPEX_{it}$), and total current assets divided by total current liabilities (LIQ_{it}) and eit are errors. In addition, this study also includes year, industry, and country controls. Table 1 displays the definition of each variable used in this study.

This study involves panel data regression using total sample and sub-sample data. Based on the data used, this study cannot use the fixed-effects model (FEM) method, given that the independent variables used are dummy variables. FEM estimation eliminates the GP_{it}. Therefore, this study uses the random-effects model generalized least squares (GLS) estimation to overcome the problem of heteroscedasticity and autocorrelation (Wooldridge, 2018).

Table 2. Descriptive Statistics

	Obs.	Mean	SD	Min	Max
ROA_{it}	1110	4.911	6.212	-5.871	19.931
ROE_{it}	1109	9.872	12.397	-12.414	40.830
$ZSCORE_{it}$	778	4.576	5.832	-1.201	22.340
GP_{it}	1214	0.277	0.448	0	1
GEN_{it}	435	18.046	14.278	0	50
DER_{it}	1134	1.422	1.393	0.154	6.088
$SIZE_{it}$	1134	22.567	3.853	17.624	33.628
$CAPEX_{it}$	1124	0.041	0.040	0.001	0.139
LIQ_{it}	1041	2.060	1.331	0.523	6.149

Notes: ROA_{it}: ratio of net income divided by total assets; ROE_{it}: ratio of net income divided by total equity; $ZSCORE_{it}$: ratio of ROA plus ETA ratio divided by standard deviation of ROA_{it} rolling window of 3 years; GP_{it}: green product dummy variable where 1 is for firms with green products and 0 otherwise; GEN_{it}: percentage of female board members in board structure; DER_{it}: ratio of total debt divided by total equity; $SIZE_{it}$: natural logarithm of total assets; $CAPEX_{it}$ ratio of total capital expenditures divided by total assets; LIQ_{it}: ratio of current assets divided by current liabilities.

Source: Author Estimation (2024)

Analysis and Discussion

Descriptive Statistics

Table 2 presents the descriptive statistics. The average ROAit and ROEit as performance ratios are 4.9% and 9.8%, respectively. These figures indicate relatively strong financial performance, suggesting the companies in this research sample have demonstrated an effective ability to generate profits. The average value of ZSCOREit in Table 2 is 4.57, indicating that the company does not have a high risk during the study period. Based on the percentage of female board members (GENit), the average female board members in the board structure is 18.04%. Furthermore, the companies included in this study exhibit relatively high levels of debt (DERit), large size (SIZEit), relatively small capital expenditure (CAPEXit), and strong liquidity (LIQit).

Correlation Matrix

The correlation matrix between the exogenous variables—including endogenous factors—used in this investigation is presented in Table 3. Given that both ROAit and ROEit assess the same performance—that is, the net profit the company generates—they have a high connection. According to other findings, there is no problem with multicollinearity because there is not a significant correlation between the variables (less than 0.80) (Gujarati, 2004). ZSCOREit demonstrates a positive and significant relationship between ROAit and ROEit, respectively, suggesting that profitable enterprises are less risky. Conversely, GPit exhibits no correlation with ROAit and ROEit while displaying a significant and positive relationship with ZSCOREit.

Regression Results

Main Findings

Table 4 presents the regression results to test each hypothesis of this study. The estimation method used is GLS. Based on the regression results, Several key observations can be made from the regression analysis. First, the regression results for the baseline model for each dependent variable of performance and risk are presented in Table 4, columns (1), (3), and (5). The primary variable, GP_{it}, positively affects firm performance proxied by ROA_{it} and ROE_{it}. In addition, GP_{it} positively affects $ZSCORE_{it}$, indicating that companies producing green products increase $ZSCORE_{it}$. A higher $ZSCORE_{it}$ indicates a lower corporate risk. Thus, based on the regression results, producing green products can enhance performance and reduce corporate risk. Therefore, these findings support hypotheses 1 and 2.

Overall, the findings of GP_{it} on ROA_{it} and ROE_{it} are consistent with the findings of (Siedschlag & Yan, 2023). These results support the legitimacy theory. In simple terms, this finding implies that companies producing green products will attract buyers with the same orientation toward environmental sustainability. Green products produced by companies increase legitimacy or recognition from stakeholders, thereby influencing increased loyalty. Conversely, green products can reduce the company's risk, a finding consistent with (Meles et al., 2023). Green products constitute a form of corporate responsibility to stakeholders. Producing green products indicates that the company complies with the regulations and adapts its operations to environmental and social concerns.

Table 3. Correlation Matrix

	ROA_{it}	ROE_{it}	$ZSCORE_{it}$	GP_{it}	GEN_{it}	DER_{it}	$SIZE_{it}$	$CAPEX_{it}$	LIQ_{it}
ROA_{it}	1								
ROE_{it}	0.868***	1							
$ZSCORE_{it}$	0.434***	0.450***	1						
GP_{it}	0.0147	0.0459	0.0747*	1					
GEN_{it}	-0.0243	-0.0445	-0.0554	-0.0202	1				
DER_{it}	-0.230***	0.0455	0.0890*	0.186***	-0.0180	1			
$SIZE_{it}$	-0.0640*	0.0537	0.130***	0.193***	-0.343***	0.424***	1		
$CAPEX_{it}$	0.292***	0.232***	0.0981**	-0.0825**	-0.0122	-0.131***	-0.00880	1	
LIQ_{it}	0.223***	0.0391	0.00911	-0.0309	-0.0296	-0.423***	-0.128***	-0.0304	1

Notes: This table is a correlation matrix between the variables involved in this study. The correlation matrix used is a correlation matrix to determine if there is a correlation between variables in the study. The *, **, and *** indicate the level of significance at the 5%, 1%, and 0.1% levels respectively.

Source: Author Estimation (2024)

Furthermore, Table 5, columns (2), (4), and (6), presents an analysis of the effect of board gender diversity (GEN_{it}) and the interaction between green products and GEN_{it} (GP_{it}_GEN_{it}) on each dependent variable. The results indicate that GEN_{it} does not affect firm performance individually (ROA_{it} and ROE_{it}). On the other hand, GEN_{it} was found to positively affect $ZSCORE_{it}$, meaning that the composition of female board members can reduce corporate risk. There is no moderation effect on firm performance. On the other hand, the interaction between GP_{it}_and GEN_{it} reduces the positive effect of GP_{it} on $ZSCORE_{it}$. These findings suggest that, in order to fulfill the company's commitment to producing green products, female board representation needs to be maximized. In the context of the green product mission, the overall regression results of GEN_{it} and the interaction between GP_{it}_and GEN_{it} indicate no significant effect on risk and firm performance. As a result, hypotheses 3a and 3b are rejected.

The findings of the effect of GEN_{it} on firm performance and risk and the interaction between GP_{it}_and GEN_{it} corroborate the study of (Sidhu et al., 2021). In certain contexts, female board members in many companies are not granted the freedom to decide on strategic programs. This is a result of discrimination against female board members. However, developing countries such as Malaysia and Indonesia present a contrasting picture to industrialized nations. Zaid et al. (2020) elucidated that, in contrast to industrialized nations prioritizing the involvement of women in business decision-making, gender issues remain stigmatized in developing nations.

Conversely, DER_{it} suggests that a higher level of outstanding debt has a negative effect on a company's performance and increases its risk. ROA_{it}, ROE_{it}, and $ZSCORE_{it}$ are all positively affected by $SIZE_{it}$. The greater the company's size, the more successful it is and the lesser the risk. Furthermore, the CAPEX ratio of the organizations in this study indicates that a company's expenditure on working capital increases performance and lowers risk. The liquidity ratio (LIQ_{it}) indicates the same finding.

Regression by Firm Size

This study conducted GP_{it} regression on firm performance and risk based on firm size as an additional supplement. Firm size is divided into two categories: large and small. The regression results are presented in Table 5. Panels A and B present the coefficients of large and small firms, respectively. A disparity emerges in the effect of green products on large and small firms. Based on the results in panel A, green products in large firms are found to provide benefits to the firm, such as increased performance (ROA_{it} and ROE_{it}) and decreased risk (increases $ZSCORE_{it}$). Meanwhile, in small firms, the results in panel B indicate that green product implementation (GP_{it}) decreases ROA_{it} and ROEit and has no effect on firm risk ($ZSCORE_{it}$).

Table 4. Regression Results

	Panel A: Firm Performance				**Panel B: Firm Risk**	
	(1) ROA_{it}	(2) ROA_{it}	(3) ROE_{it}	(4) ROE_{it}	(5) $ZSCORE_{it}$	(6) $ZSCORE_{it}$
GP_{it}	1.474***	3.622***	1.737**	5.063***	0.946***	2.556***
	(4.217)	(5.269)	(2.445)	(3.935)	(2.621)	(4.805)
GEN_{it}		-0.012		-0.027		0.039***
		(-0.656)		(-0.733)		(3.153)
GP_GEN_{it}		0.036		0.106**		-0.059***
		(1.346)		(2.074)		(-3.120)
DER_{it}	-0.892***	-1.470***	0.325	-0.472	-0.219	0.295*
	(-6.207)	(-7.601)	(0.904)	(-1.003)	(-1.579)	(1.943)
$SIZE_{it}$	0.258***	0.247***	0.541***	0.116	0.347***	0.109
	(4.343)	(3.194)	(4.477)	(0.589)	(5.257)	(1.376)
$CAPEX_{it}$	34.612***	39.611***	58.140***	66.812***	9.448**	18.162***
	(10.840)	(7.720)	(9.172)	(6.243)	(2.385)	(4.880)
LIQ_{it}	1.257***	0.446***	1.530***	0.412		
	(10.392)	(3.256)	(7.308)	(1.431)		
Date	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes

C	5.720*	13.124***	13.955**	37.224***	-4.072	-2.827
	(1.822)	(3.044)	(2.164)	(4.124)	(-1.166)	(-1.268)
Obs.	1011	367	1011	367	771	340
Firm	130	120	130	120	138	123
Wald-chi2	930.730	2005.008	619.379	2996.234	190.581	488.645

Notes: This table presents the generalized least square (GLS) regression results. Panel A presents the coefficients of regression results with the dependent variable of firm performance proxied by ROA_{it} and ROE_{it}. Panel B presents the regression results on firm risk proxied by $ZSCORE_{it}$. The *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.
Source: Author Estimation (2024)

Significant disparities exist in implementing green products in large and small companies. Large companies have easier access to economies of scale, such as capital and employment, and operate with greater efficiency (Brammer & Millington, 2006). Conversely, regulatory pressures tend to create new challenges and require adaptation for small firms. The decision to commit to green products can present significant risks for firms. Large firms have better risk control due to the diversification methods (Fernández et al., 2019). Furthermore, large companies have a strong image and reputation, leading regulators to prioritize scrutiny of their activities. In contrast, smaller companies tend to encounter challenges in securing capital due to limited experience and less diversified portfolios, which can deter potential investors.

Thus, further analysis based on company size corroborates the legitimacy theory. The theory posits that companies must do their best to integrate social and environmental considerations into all operations. Large companies tend to face greater scrutiny compared to small companies. In complying with green product regulations, large companies have easier access to the necessary resources (Johnson & Greening, 1999).

Robustness Test

This study conducted a robustness test to ensure the findings are consistent despite using different data and methods. First, this study re-analyzes each hypothesis using the Ordinary Least Square (OLS) method. The OLS method can be used to analyze the data of this study. OLS is a more straightforward and widely applicable method than GLS. The regression results using OLS are presented in Table 6. Overall, the findings presented in Table 6 are consistent with those presented in Table 4, summarizing the main findings of this study. The key distinction lies in the moderation of GP_{it}_GEN_{it} on $ZSCORE_{it}$, which has no effect. Thus, the results of the OLS method support the idea that the role of women on corporate boards should be maximized to effectively implement green products within companies in Indonesia and Malaysia, as elaborated in the previous section.

Second, this study enhances the robustness of the findings by conducting regression analyses based on the period. The period is divided into two categories: during and before the Covid-19 period. The Covid-19 pandemic presented significant challenges for companies in almost all industries. Restrictions on social interactions, public gatherings, and travel have disrupted economic activities globally. Therefore, this period is categorized as a period of difficulty for companies to carry out normal activities. In Indonesia, Covid-19 was first detected in March 2020, while in Malaysia, it was identified in January 2020. Thus, the Covid-19 period in this study commences from 2020 to 2022 (3 years).

Table 5. Green Product on Firm Performance and Risk Based on Firm Size

	Panel A: Large Size			**Panel B: Small Size**		
	(1) ROA_{it}	(2) ROE_{it}	(3) $ZSCORE_{it}$	(4) ROA_{it}	(5) ROE_{it}	(6) $ZSCORE_{it}$
GP_{it}	5.694***	8.245***	1.617***	-1.503***	-3.559***	-0.111
	(11.648)	(7.678)	(2.606)	(-2.975)	(-3.487)	(-0.189)
DER_{it}	-1.375***	-0.128	0.248	-1.361***	-0.147	-0.746***
	(-7.034)	(-0.269)	(1.497)	(-4.988)	(-0.206)	(-4.463)
$SIZE_{it}$	0.274***	-0.112	0.144*	-0.415	-0.583	-0.295
	(3.058)	(-0.503)	(1.795)	(-1.396)	(-1.024)	(-0.999)
$CAPEX_{it}$	34.586***	49.640***	20.136***	21.312***	42.461***	1.612
	(8.238)	(6.053)	(3.722)	(4.350)	(4.525)	(0.403)
LIQ_{it}	0.786***	1.082***		1.027***	0.931***	

	(5.190)	(3.542)		(5.470)	(2.631)	
Date	Yes	Yes	No.	Yes	Yes	No.
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
C	-6.800***	1.038	-2.987	25.302***	43.517***	13.364*
	(-3.067)	(0.194)	(-1.435)	(3.630)	(3.227)	(1.804)
Obs.	487	487	413	524	524	358
Firm	70	70	76	81	81	74
Wald-chi2	1106.266	713.204	713.129	755.547	522.777	931.160

Notes: This Table presents the generalized least square (GLS) regression results. This study presents regression results based on firm size. Firm size is categorized as large if it is greater than the median, and vice versa. Panel A presents the coefficients of the regression results for large firms. Panel B presents the regression results for small firms. The *, **, and *** indicate the level of significance at the 10%, 5%, and 1% levels, respectively.

Source: Author Estimation (2024)

Meanwhile, the six-year period before the Covid-19 encompasses the years 2014–2019. Table 7 presents the regression results based on the Covid-19 and pre-Covid-19 periods. The findings indicate no discernible variation in the regression's outcomes between the time frame before and during COVID-19. The conclusions drawn in Table 7 validate the findings presented in Table 4. As a result, despite examining the research findings through multiple perspectives and across various time periods, their reliability remains substantiated.

Conclusion

This study aims to analyze the effect of green product implementation on performance and risk in Shariah-compliant firms in Indonesia and Malaysia. This study adds an analysis with an interaction variable, namely gender diversity, on the company's board. The period in this study covers 2014 to 2022. The period was selected because the SDGs were designed and implemented in 2014. The estimation method used is GLS panel data regression. The findings indicate that companies committed to producing green products have a positive impact on the companies. The positive impacts include enhanced financial performance and diminished company risk. Furthermore, the findings indicate that the presence of female board members also contributes to improved performance and reduced risk. However, the finding of the interaction between gender diversity and green products has no effect on firm performance and risk. These findings corroborate the legitimacy and stakeholder theories.

This study presents several limitations. First, this study uses a dummy variable to measure green products. Due to limitations in data accessibility, researchers encountered difficulties in obtaining more robust measures such as green product scores and other relevant metrics. Second, this study is limited to shariah-compliant firms in Indonesia and Malaysia. Both countries have demonstrated more significant development of the Shariah industry than other countries. In addition, both countries have similar characteristics owing to their geographical proximity within the same region. Future studies could explore this area by using different measures of green products. Furthermore, future studies could compare the quality of green products in Shariah-compliant and non-shariah-compliant firms and their impact on performance and risk. Re-analyzing the role of female board members in the context of green implementation presents a compelling area for future study.

Table 6. Robustness Test with Ordinary Least Square

	Panel A: Firm Performance				**Panel B: Firm Risk**	
	(1)	(2)	(3)	(4)	(5)	(6)
	ROA_{it}	ROA_{it}	ROE_{it}	ROE_{it}	$ZSCORE_{it}$	$ZSCORE_{it}$
GP_{it}	2.101***	2.915**	4.009***	5.439**	1.154**	3.498**
	(3.828)	(2.404)	(3.484)	(2.287)	(1.981)	(2.072)
GEN_{it}		-0.026		-0.048		0.036
		(-0.684)		(-0.604)		(0.972)
GP_{it} _GEN_{itit}		0.034		0.057		-0.083
		(0.641)		(0.530)		(-1.282)
DER_{it}	-0.887***	-1.615***	0.683	-0.140	0.153	0.449
	(-3.824)	(-4.148)	(1.131)	(-0.142)	(0.672)	(1.294)
$SIZE_{it}$	0.125	0.043	0.283	-0.238	0.408***	0.029

	(1.563)	(0.227)	(1.576)	(-0.561)	(4.026)	(0.176)
$CAPEX_{it}$	41.314***	52.698***	71.267***	93.960***	19.635***	18.984*
	(8.118)	(5.108)	(6.746)	(4.481)	(3.254)	(1.909)
LIQ_{it}	1.159***	0.465*	1.374***	0.407		
	(7.007)	(1.686)	(4.050)	(0.703)		
Date	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
C	-3.065	0.792	-18.652***	7.403	-5.452	10.257**
	(-1.024)	(0.147)	(-2.757)	(0.609)	(-1.132)	(2.297)
Obs.	1011	367	1011	367	771	340

Notes: This table presents the ordinary least square (OLS) regression results. OLS estimation is used to perform robustness checks using different methods. Panel A presents the coefficients of regression results with the dependent variable of firm performance proxied by ROA_{it} and ROE_{it}. Panel B presents the regression results on firm risk proxied by $ZSCORE_{it}$. The *, **, and *** indicate the level of significance at 10%, 5%, and 1% respectively.

Source: Author Estimation (2024)

Analyzing the impact of green products on firm performance and risk provides several theoretical and practical implications. The findings of this study have implications for the development of literature related to green product analysis and legitimacy and stakeholder theories. In addition, the findings of this study can serve as a foundation for practitioners and regulators to carry out their respective roles. Practitioners need to maximize the role of female board members in implementing green product strategies to strengthen the positive impact on company operations. Conversely, regulators need to establish regulations to strengthen the green product ecosystem in company operations.

Table 7. Regression Results Based on The Period

	Panel A: During Covid-19			**Panel B: Before Covid-19**		
	(1)	(2)	(3)	(4)	(5)	(6)
	ROA_{it}	ROE_{it}	$ZSCORE_{it}$	ROA_{it}	ROE_{it}	$ZSCORE_{it}$
GP_{it}	1.468***	2.002**	0.759**	1.365***	2.597***	1.163**
	(3.126)	(2.049)	(2.060)	(3.396)	(3.112)	(2.391)
DER_{it}	-0.901***	0.426	-0.590***	-0.881***	0.566	0.866***
	(-5.907)	(1.474)	(-4.494)	(-4.697)	(1.356)	(4.800)
$SIZE_{it}$	0.230***	-0.033	0.330***	0.207***	0.475***	0.361***
	(2.603)	(-0.157)	(4.549)	(3.123)	(3.847)	(4.256)
$CAPEX_{it}$	59.958***	88.183***	19.358***	32.092***	51.812***	13.312***
	(17.236)	(9.126)	(4.866)	(9.040)	(7.680)	(2.995)
LIQ_{it}	1.074***			1.417***	1.771***	
	(6.729)			(10.413)	(7.906)	
Date	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
C	4.993	32.476***	-6.625***	3.760	6.983	-1.005
	(1.582)	(4.233)	(-3.382)	(0.735)	(0.690)	(-0.204)
Obs.	351	382	350	660	660	421
Firm	126	138	132	129	129	130
Wald-chi2	8252.386	831.692	371.433	734.426	476.640	1153.602

Notes: This table presents the generalized least square (GLS) regression results. This study presents the regression results based on the period during and before Covid-19. The COVID-19 period is categorized from 2020-2022. While the period before COVID-19 is 2014-2019. Panel A presents the coefficient of regression results during the COVID-19 period, and Panel B before the COVID-19 period. The *, **, and *** indicate the level of significance at 10%, 5%, and 1%, respectively.

Source: Author Estimation (2024)

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