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The role of sustainable investment practices in maintaining efficient working capital management

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Abstract. This study provides a theoretical argument supported by empirical evidence regarding the impact of sustainable investment practices on the working capital management of small- and medium-sized enterprises (SMEs). The study utilizes panel data on SMEs from 2014 to 2022. Cluster regression methodology is employed to assess the influence of sustainable investment practices on a firm's working capital, with green finance (GF) as a moderating variable. Results revealed that a firm's sustainable investment practices significantly and negatively affect its working capital. Additionally, the study identified GF as a moderator in the relation between sustainability and working capital. The findings indicated

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that firms actively engaging in sustainable investment practices are more efficient in managing working capital for their business operations' long-term sustainability.

Keywords: working capital, sustainability index, green finance, SMEs

JEL Classification: G11, O44, Q01, Q56

1. INTRODUCTION

Sustainability is an important issue for corporate investment, especially when studied in the context of environmental, social, and governance (ESG) perspectives. It is imperative for a firm to satisfy its numerous stakeholders to prevent them from forming negative perceptions about its business operations (Arvidsson, 2010). The intensifying international conferences and seminars on sustainability issues highlight the importance of ESG disclosures in assessing a firm's sustainability level (Baah et al., 2021). An increasing number of studies have analyzed the impact of ESG disclosures on firm investment, financing, and dividend policy for long-term sustainability (Ellili, 2022; Naomi and Akbar, 2021; Abdimomynova et al., 2021). In terms of ESG, the emerging trend of sustainability is associated with a firm's business operation and market performance. However, few studies have examined the effect of sustainability on a firm's working capital (Chang et al., 2022). Working capital is used to finance the current business operations of a firm, constituting a significant percentage of the balance sheet of many industries (Lefebvre, 2022; Linhartova, 2021; Czerwonka and Jaworski, 2023).

The literature on working capital management (WCM) has had significant findings. In large companies, effective WCM helps improve firm performance and positively influences firm value. Recently, Chambers and Cifter (2022) explained that the cash conversion cycle (CCC) is the most suitable measure of WCM. A large CCC helps firms increase sales and earn profit by not only introducing more lenient credit policies and acquiring discounts from vendors (Tarkom, 2022) but also reducing material supply costs and production interruptions (Aldubhani et al., 2022). However, allocating funds for longer CCC capital expenditures may increase a firm's financing cost. Moreover, the profitability of firms reduces when they fail to pay suppliers on time and are desperate to avail benefits of trade discounts (Zeidan & Shapir, 2017). Alternatively, Baños-Caballero et al. (2012) argued that firms maintain a shorter CCC for generating profit by maintaining lower inventory and reducing the days of account receivable. Furthermore, studies have found mixed results and explained that the relation between working capital and firm performance depends on the nature of the business (Kayani et al., 2020).

Zhang (2022) argued that financially constrained firms maintain a shorter CCC to meet operational requirements and for long-term sustainability. Conversely, a longer CCC reflects that a firm has an adequate amount of cash flow for business operations. Veltri et al. (2023) found that a firm's ESG investment strategy can function as a risk management tool, permitting firms to indicate lower sensitivity to risk in the market (Habib et al., 2022). This enables the firm to operate businesses with a lower level of working capital without jeopardizing profit (Sciarelli et al., 2023). Therefore, does a firm's ESG investment practice reflect its alignment with long-term sustainability and enable it to design an efficient WCM plan? Does a higher ESG investment practice help reduce CCC? Does sustainability enable firms to run business operations with a minimum cash requirement and manage working capital more efficiently? Further, studies indicate that green finance (GF) and working capital are directly or indirectly associated with each other and aligned with a firm's long-term sustainability. Jiakui et al. (2023) explained that firms that pursue GF can not only manage their working capital more efficiently but also maintain it at a lower level. Khalil and Nimmanunta (2023) argued that firms integrate GF with ESG investment strategies, thereby affecting the cost of financing.

Kouwenberg and Zheng (2023) explained that GF is a way of financing the growth and sustainability of a firm.

This study assesses whether firms that engage in ESG investment practices manage their day-to-day business operations with a lower level of working capital. We use working capital rate and CCC to measure the performance of WCM. A sustainability index is created using the ESG score to evaluate the sustainability level of each firm. We incorporate GF as a moderator to test whether it intervenes in the relationship between working capital and sustainability. We also added control variables that may impact the relation between working capital and firm sustainability.

This study focuses on Malaysian firms to examine the significance of sustainability in determining their working capital. Said et al. (2009) indicated that Malaysian firms started implementing ESG practices in 2006. This notion was reinforced by the mandatory corporate social responsibility (CSR) reporting framework in 2007, which encompassed all Malaysian firms. Furthermore, a firm's long-term sustainability framework was reintroduced in 2015, requiring ESG practices for all firms (Mohammad & Wasiuzzaman, 2021). The Malaysian government consistently struggles to align ESG investment practices with its Eleventh National Plan for the endorsement and success of ESG practices for firm sustainability (Joseph et al., 2016). Further, the introduction of the FTSE4Good Bursa Malaysia Index in 2014 and Sustainable Development Goals in 2016 in Malaysia highlight the government's commitment to attain the desired objectives of ESG disclosures by minimizing agency conflict and improving financial reporting quality for both stockholders and stakeholders (Hamad et al., 2023). Recently, Malaysia has been ranked as a top pioneer in CSR reporting internationally, with approximately 96% of its top 100 companies reporting their sustainability performance (Alam et al., 2022). In 2014, the government also introduced the Malaysian code for investors, which assists in developing policies to integrate sustainability issues into their investment analysis portfolios (Wahab & Mohamed Naim, 2019). The latest recommendations of MCCG (Page 12) highlight the role of directors in adopting ESG disclosures for long-term sustainability (Mohammad & Wasiuzzaman, 2021).

2. LITERATURE REVIEW

2.1. Working capital and firm sustainability

The components of working capital are accounts payable, accounts receivable, inventory, and cash, which result from a firm's interactions with different stakeholders and contribute to its growth and long-term sustainability (Habib et al., 2022). For instance, accounts payable can be adjusted by strengthening relationships with suppliers. Ethical practices foster enduring relationships between suppliers and a firm, thereby establishing resilient supply chains, even in challenging circumstances (Ukaegbu, 2014). Similarly, accounts receivable stem from credit sales to customers. Enterprises that integrate ESG disclosures into their operations seamlessly are strategically positioned to nurture lasting relationships with valued customers and increase sales growth (Enqvist et al., 2014).

Furthermore, Chang et al. (2022) argued that capital providers are gradually integrating ESG practices into their investment decisions. Firms engaging in ESG investment may find accessing capital easier as they are perceived as more appealing to investors who prioritize sustainable growth (Oliinyk et al., 2023; Veltri et al., 2023). Firms' contributes to an increase in value creation and responsible business practices, promoting business longevity and growth (Li et al., 2023; Cayón and Gutierrez, 2021). Bahadori et al. (2021) argued that firms prioritizing ESG investment are in a better position to create value, build strong relationships with stakeholders, and target sustainable growth over the long term (Bahadori et al., 2021).

Such firms clearly understand the potential long-term challenges and good risk management practices. Sciarelli et al. (2023) argued that ESG practices contribute to designing the optimal allocation of resources,

reduce wastage, and improve operational efficiency. This may help reduce operational costs, which can positively affect working capital through the efficient utilization of funds that would have otherwise been used in inefficient business operations (Aldubhani et al., 2022; Liaqat et al., 2021). Jaworski and Czerwonka (2022) revealed that firms engaging in ESG investment activities attract numerous stakeholders, thereby leading to more stable access to funds and reducing the urgency to allocate extra funds for working capital during financial difficulties (Oláh et al., 2023). Effective firm management can positively contribute to stakeholder engagement via the implementation of ESG practices (Knežević et al., 2023; Mishchuk et al., 2023). Therefore, firms' ESG consideration is associated with the aggressive working capital approach, which aims to drive profitability and efficiency over the long term.

An (2023) explained that such firms are also innovative and more effectively address the changing environment and social issues for long-term sustainability. This helps them design an efficient WCM, where firms seek innovative methods for optimal allocation of funds, improve cash flows, and tackle short-term obligations more effectively (Lefebvre, 2022). Mohammad and Wasiuzzaman (2021) stated that firms that adopt ESG disclosure more effectively address environmental and social risks, thereby reducing the probability of lawsuits, reputational damage, and fines (Mohammad & Wasiuzzaman, 2021). This directly or indirectly contributes to developing a more stable financial position and reducing the necessity for excessive working capital to cover precautionary motives (Hamad et al., 2023). Firms engaging in ESG practices often establish strong relationships with suppliers and partners that share similar values (Said et al., 2009). These consequences are typical also for nonprofitable organizations (Németh et al., 2023). This can translate into preferential treatment, better negotiation power, and a reliable source of supply at a very reasonable cost, without any disruptions during challenging times. Therefore, we propose our first hypothesis (H1) as follows:

H1: Firms that incorporate ESG practices into their business operations have a negative relationship between sustainability and WCM.

2.2. Green finance

GF is a new approach to employ financial resources and investment policies to assist environmentally sustainable projects and initiatives. It aims to direct financial funds toward ESG projects and initiatives, creating value for stakeholders. Jiakui et al. (2023) explained that GF plays an active role in the implementation of ESG practices for long-term sustainability. Firms with high ESG scores tend to attract more GF, enabling them to generate funds at a lower cost for sustainability (Khalil & Nimmanunta, 2023). GF is prominent in firms that highlight their environmental and social impacts, which can influence their access to the capital market and increase their reputation among capital providers. Studies have revealed that GF plays a direct and an indirect role in facilitating the implementation of aggressive working capital practices, which in turn optimizes financial resources (Chang et al., 2022; Hamad et al., 2023). Ye and Dela (2023) argued that integrating GF with ESG practices contributes to the improvement of a firm's financial position and aids in the implementation of an aggressive WCM. Fatemi and Fooladi (2013) revealed that GF firms encourage environmentally sustainable practices, which assist in the reduction of holding excessive inventory and require additional funds for short-term investment. Firms involved in GF practices strategically focus on ESG practices by maintaining lower working capital to enhance operational efficiently and optimization of resources (Zhang et al., 2022). Therefore, firms are carefully analyzing current assets and liabilities to effectively utilize financial resources.

Further, Du et al. (2022) found that GF firms deliberately maintain lower working capital by reducing additional funds invested in inventories and accounts receivables. The available funds can be spared for ESG practices to attain long-term sustainability objectives (Kouwenberg & Zheng, 2023). This indicates

that firms' ESG practices potentially contribute to the smooth functioning of business operation activities and assist in designing working capital (Sciarelli et al., 2023). Therefore, we propose that firms engaged in GF practices are encouraged to invest in ESG practices, which lead to more efficient WCM. Thus, we propose the second hypothesis (H2) as follows:

H2: Firms that align GF with ESG practices in their business operations manage their working capital more efficiently.

3. DATA AND METHODOLOGY

3.1. Variables measurement

This study seeks to find answers to the following research questions: Does a higher level of a firm's sustainability lead to lower working capital requirements? Does GF accelerate the influence of sustainability on WCM? To investigate the answers to our research questions, we employ working capital as a dependent variable. It captures a firm's short-term investment and is measured as current assets minus current liabilities divided by sales (Ukaegbu, 2014). This net working capital measure reflects the liquidity and short-term solvency position of a firm. Studies also commonly utilize the CCC, calculated as inventories and accounts receivable minus accounts payable as a percentage of sales. CCC is regarded as a more comprehensive gauge of working capital and is widely utilized in meta-analyses (Chambers & Cifter, 2022). This dynamic measure assesses a firm's operational performance by integrating data from both the balance sheet and income statement.

This study introduces a novel model for a sustainable investment index, designed to assess firm sustainability. The index considers both the weight of a firm's investments and the scores it achieves in relation to these investments. Finally, we construct the following mathematical model to calculate firm sustainability:

$$\mathrm{SI_i} = \mathrm{W_{F-i}} \times (\mathrm{F_i}) + (\mathrm{W_{E-i}} \times \mathrm{E_i}).$$

SI represents the sustainability index of a firm for investment *i*. W_{F-i} represents the weight assigned to the normalized financial value of investment *i*, and F_i is the normalized financial value of investment *i*. Similarly, W_{E-i} represents the weight assigned to the normalized ESG value (E_i) of investment *i*, and E_i represents the normalized ESG value of investment *i*. Further, the moderating variable GF is measured by the value of green bonds issued by a firm to investment *i* (Jiakui et al., 2023). This study also adds control variables such as firm size, leverage, operating cashflow (OCF), and gross domestic product to find the most robust results (Aldubhani et al., 2022).

Furthermore, the reliability of each variable in the equation is assessed using the redundant variable test. All independent variables are statistically significant and included in our regression equation (Alam et al., 2022). Moreover, we evaluate the presence of multicollinearity among the independent variables using tolerance (Toler) and variance inflation factor (VIF). The Toler and VIF values for each explanatory variable are >0.50 and <2, respectively, indicating that there is no serious multicollinearity issue in our regression model (Chambers & Cifter, 2022). Table 1 presents the measurement of variables and the corresponding Toler and VIF values for the explanatory variables.

Table 1

Variables selection and measurement

Variable	Agronomy	Measurement	Multicollinearity	
			Toler	VIF
Working capital	WC	Current assets/Current liabilities		
Working capital	CCC	Cash conversion cycle		
Sustainability	SI	Sustainability index score	0.67	1.65
GF	GF	Green bonds/Fixed assets	0.82	1.42
Independent director	INDEP	Dummy variable 1 for independent director in a board and 0 otherwise	0.66	1.23
Sales growth	Growth	Percent growth in sales	0.87	1.54
Firm size	FS	Log of total assets	0.76	1.76
Cash flow	CF	Operation cash flows/Fixed assets	0.74	1.87
Leverage	LEV	Long-term debt/Total assets	0.83	1.53

Source: own calculation

3.2. Sample selection

The study uses the Bloomberg databases to extract firm-level data from 2014 to 2022, focusing on small- and medium-sized enterprises (SMEs) operating in Malaysia. The commencement of the sample period in 2014 is due to the prevalence of compliance at that time (Sciarelli et al., 2023). The data extraction process sources ESG compliance information from both the Bloomberg Terminal and Sustainalytics databases (Chang et al., 2022). Following a meticulous selection process, the dataset comprises 880 firms, excluding those with incomplete information. Specifically, the investigation focuses on industries with pronounced environmental influence in Malaysia. Table 2 presents data on the environmentally sensitive industries considered in this study.

Table 2

Data sampling

Industry	Environmental Concerns	No. of Firms	Total Observations	Percentage of Sample
Palm Oil	Deforestation, air and water pollution	196	1764	22.27
Logging and Timber	Deforestation, ecosystem disruption	75	675	8.52
Mining	Water pollution, habitat destruction	60	540	6.82
Aquaculture	Water pollution, habitat destruction, disease outbreaks	70	630	7.95
Construction and Real Estate	Habitat loss, energy consumption, waste generation	87	783	9.89
Air Transportation	Greenhouse gas emissions, air pollution	8	72	0.91
Water and Wastewater Management	Water pollution, sanitation issues	40	360	4.55
Chemical and Petrochemical	Air and water pollution, chemical risks	33	297	3.75
Textile and Apparel	Wastewater pollution, chemical usage	85	765	9.66
Energy Generation	Air pollution, greenhouse gas emissions	44	396	5.00
Waste Management	Land, water, and air pollution	35	315	3.98

Transportation	Air pollution, traffic congestion	43	387	4.89
Agriculture	Soil and water contamination, pesticide usage	86	774	9.77
Healthcare Waste	Medical waste hazards, improper disposal	18	162	2.05
Total		880	7920	100

Source: own calculation

3.3. Research methodology

To examine the impact of sustainability on a firm's working capital, this study uses cluster regression analysis, an approach used to mitigate correlation errors and unbiased coefficients, which are unachievable in traditional regression analysis due to omission errors (Wahab & Mohamed Naim, 2019). We employed the Breusch–Pagan test to assess heteroskedasticity in our model and identify its presence in our analysis. A two-stage least squares regression is also used to test for endogeneity, revealing no endogeneity problem in our model. The VIF is less than 2, which indicates no multicollinearity in our analysis (Ellili, 2022). Upon examining the residual errors, we find that these errors can be correlated across years for specific firms and across time. This observation helped us identify the source of data dependence. If a firm effect is present, clustering by firm can result in unbiased standard errors (Lefebvre, 2022). When implementing clustering for both year and firm, the standard error is calculated by considering two dimensions within the cluster, that is, firm and time identifiers (Enqvist et al., 2014). Therefore, to consider both dimensions, we perform clustering of observations based on industry and year effects. We formulate the following econometric model to achieve the study objectives:

Model 1 (without interaction effect)

$$\mathrm{WC} = \mathrm{C} + \beta_1 \mathrm{SI}_{it} + \beta_2(\mathrm{GF}_{it}) + \mathrm{INDEP}_{,it} + \mathrm{Growth}_{,it} + \mathrm{FS}_{,t} + + \beta_5 \mathrm{CF}_{it} + \beta_7 \mathrm{LEV}_{it} + \mu_{it}$$

Model 2 (with interaction effect)

$$\mathrm{WC} = \mathrm{C} + \beta_1 \mathrm{SI}_{it} + \beta_2(\mathrm{SI}_{it} * \mathrm{GF}_{it}) + \mathrm{INDEP}_{,it} + \mathrm{Growth}_{,it} + \mathrm{FS}_{,t} + + \beta_5 \mathrm{CF}_{it} + \beta_7 \mathrm{LEV}_{it} + \mu_{it}$$

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Descriptive statistics

Table 3 presents the descriptive statistics of the variables. The mean value of WC is 1.56, with a median of 0.483, minimum and maximum values of 0.862 and 2.36, respectively. The data reveal that on average, Malaysian firms maintain a satisfactory level of working capital, enabling them to smoothly operate their businesses (Aldubhani et al., 2022). The mean (1.435) and median (0.741) values of SI, along with the maximum score (1.954), indicate that most Malaysian firms are implementing ESG disclosures to fulfill their legal and social requirements (Jaworski & Czerwonka, 2022).

The mean value of GF is 0.043, with a median of 0.014 and a maximum value of 0.087 (Bhutta et al., 2022), implying that only a small percentage of the total investment is financed by green bonds. Furthermore, the mean value of INDEP (4.675) indicates that most firms have appointed a satisfactory number of independent directors to safeguard the rights of various stakeholders (Said et al., 2009). Similarly, the descriptive statistics of the control variables such as Growth (0.153), FS (0.139), and CF (0.193) imply that numerous firms are actively implementing sustainable business practices. The mean values of the control variables—Growth (0.096), ROA (0.13), and CF (0.19)—indicate a large number of firms are

involved in the implementation of sustainable business policies (Mohammad & Wasiuzzaman, 2021). However, the mean value of LEV (0.187) indicates that firms with ESG disclosures have lower equity capital and higher debt financing.

Table 3

Descriptive statistics of the variables

Variables	Mean	Median	Maximum	Minimum	Observations
WC	1.563	0.645	2.364	0.862	7920
CCC	0.032	0.231	0.054	0.001	7920
SI	1.435	0.741	1.954	0.576	7920
GF	0.043	0.014	0.087	0.003	7920
INDEP	4.765	2.632	8.942	1.00	7920
Growth	0.153	0.098	0.316	0.053	7920
FS	0.139	0.071	0.34	0.001	7920
CF	0.193	0.054	0.264	0.054	7920
LEV	0.187	0.097	0.287	0.043	7920

Source: own calculation

4.2. Correlation analysis

Table 4 presents the correlation among the dependent and independent variables. A significant negative correlation of −0.443 was found between working capital and sustainability.

Table 4

Correlation statistics of the variables

Variables	WC	SI	GF	INDEP	Growth	FS	CF	LEV
WC	1.00							
SI	−0.443 (0.000)	1						
GF	0.285 (0.000)	−0.432 (0.000)	1					
INDEP	0.332 (0.001)	0.376 (0.000)	−0.223 (0.000)	1				
Growth	0.543 (0.000)	0.298 (0.002)	−0.242 (0.000)	0.286 (0.003)	1			
FS	−0.327 (0.000)	0.254 (0.000)	0.253 (0.001)	0.197 (0.000)	0.198 (0.000)	1		
CF	−0.342 (0.023)	−0.437 (0.000)	−0.362 (0.000)	0.023 (0.000)	−0.212 (0.021)	−0.435 (0.000)	1	
LEV	−0.437 (0.000)	−0.362 (0.000)	0.023 (0.000)	−0.212 (0.021)	−0.435 (0.000)	−0.224 (0.002)	−0.232 (0.002)	1

Source: own calculation

The findings indicate that investing in sustainable indicators helps increase finance externally at a lower cost and develops a good relationship with suppliers, thereby reducing the need for more working capital (Alam et al., 2022; Sciarelli et al., 2023). The moderating variables GF and WC (0.285) are positively correlated with each other. The findings reveal that firms pursuing GF need more capital to run their

business operations and improve social networks (Ye & Dela, 2023). The governance variable INDEP is significantly and positively correlated with WC (0.332) and SI (−0.443). The correlation between WC and control variables such as Growth (0.543), FS (−0.327), CF (−0.324), and LEV (0.437) are significantly correlated with each other (Zhang et al., 2022). The findings reveal that the right variables have been chosen to investigate the impact of SI on WCM.

4.3. Cluster regression analysis of WC and SI

Table 5 presents the results of a cluster regression analysis aimed at investigating the impact of SI on firm working capital in both Models 1 and 2. In Model 1, the findings indicate a significant negative relationship between SI and working capital, considering both the year (β = −0.031; p-value = 1%) and industry (β = −0.032; p-value = 1%) effects (Lefebvre, 2022). Similarly, in Model 2, SI also exhibits a significant negative relationship with working capital, accounting for both the year (β = −0.022; p-value = 1%) and industry (β = −0.021; p-value = 1%) effects (Zhang, 2022). This trend remains consistent across different years and industries, as indicated by the significant p-values. The findings explain that firms that engage in more sustainable investment practices might be better positioned to raise finance at lower costs and reduce the need for holding more working capital (Chang et al., 2022). The negative relationship between SI and working capital implies that firms should prioritize and invest more in sustainable practices (Ellili, 2022), which might be perceived more favorably by investors and lenders (Jaworski & Czerwonka, 2022).

Table 5

Cluster regression analysis of WC and SI

	WC (Model 1)						**CCC (Model 2)**					
	Panel A (Yearly Effect)			**Panel B (Industry Effect)**			**Panel C (Yearly Effect)**			**Panel D (Industry Effect)**		
	Coff	T	VIF	Coff	T	VIF	Coff	T	VIF	Coff	T	VIF
SI	0.031a	2.19	1.84	0.032a	2.16	1.83	0.022	2.15	1.76	0.021	2.17	1.72
GF	0.002 a	2.48	1.64	0.001 a	2.47	1.75	0.003 a	2.57	1.56	0.003 a	2.29	1.45
INDEP	0.003 b	2.47	1.57	0.003 b	2.51	1.46	0.002 b	2.61	1.49	0.002b	2.27	1.53
Growth	0.023 a	2.12	1.63	0.024 a	2.11	1.67	0.031 a	2.23	1.48	0.034 a	2.37	1.47
FS	0.003c	2.70	1.78	0.002 c	2.48	1.75	0.003 c	2.49	1.55	0.001 c	2.16	1.54
LEV	0.002 a	2.85	1.19	0.003 b	2.81	1.53	0.002 a	2.54	1.73	0.002 b	2.57	1.97
CF	0.021 a	2.87	1.20	0.023 b	2.87	1.38	0.034 a	2.54	1.38	0.022 b	2.34	1.67
Year	0.004 a	2.54	1.45	0.043 a	2.29	1.22	0.003 a	2.83	1.44	0.012 a	2.63	1.74
Industry	0.004a	2.57	1.56	0.005	2.38	1.27	0.003	2.84	1.45	0.004	2.64	1.78

Notes: a, b, and c denote significance at the 1%, 5%, and 10% levels, respectively.
Source: own calculation

The findings indicate that firms involved in sustainable investment practices are likely to experience reduced financing costs, efficient resource utilization, favorable procurement conditions, improved risk management, and enhanced long-term planning (Veltri et al., 2023). These factors collectively contribute to maintaining a stable financial position and enable firms to operate with lower working capital requirements (Sciarelli et al., 2023). Therefore, this forward-looking approach to sustainable investment practices can lead to improved financial planning and resource optimization, potentially resulting in a reduced need for excess working capital. In Model 1, GF has a significant negative relationship with working capital, as evidenced by both the year (β = −0.002; p-value = 1%) and industry (β = −0.001; p-value = 1%) effects (Li et al., 2023).

Similarly, in Model 2, GF is also significantly and negatively associated with working capital when both the year (β = −0.003; p-value = 1%) and industry (β = −0.003; p-value = 1%) effects are considered (Kouwenberg & Zheng, 2023). The findings imply that firms committed to GF practices allocate their

resources and channel funds toward sustainable investment initiatives. This allocation may reduce the need for holding excess capital (Kayani et al., 2020). Firms focusing on GF may intentionally design their capital structure to allocate more funds to sustainable investment projects and GF initiatives (Jiakui et al., 2023). Although these actions can lead to long-term efficiencies, they might also temporarily decrease working capital availability. This negative relationship holds across different periods (year effect) and various industries (industry effect), as supported by the significant p-values (Aldubhani et al., 2022). The control variables, namely, INDEP, Growth, FS, LEV, and CF, also have significant relationships with working capital (Baah et al., 2021), indicating that these factors also influence the management of a firm's working capital (Chambers & Cifter, 2022).

4.4. Moderation analysis

Table 6 presents the outcomes of a cluster regression analysis to investigate the moderating role of GF in the relationship between sustainability and working capital in Models 1 and 2. The moderating variable GF significantly and negatively affects working capital across the year (β = −0.001; p-value = 1%) and industry (β = −0.001; p-value = 1%) effects (Bhutta et al., 2022). Similarly, the moderating variable GF significantly and negatively affects the working capital in both the year (β = −0.002; p-value = 1%) and industry (β = −0.002; p-value = 1%) effects (Du et al., 2022). This implies that the utilization of GF mechanisms might contribute to the efficient allocation of financial resources, leading to a potential decrease in working capital for sustainable initiatives (Fatemi & Fooladi, 2013). Sustainable firms focus on maintaining the optimal balance between current assets and current liabilities to reduce the cost of financing (Ye & Dela, 2023). The purpose is ensuring that a firm has sufficient liquidity to cover its operational needs while avoiding excess idle capital (An, 2023).

Table 6

Moderation analysis of the effect of GF and SI on firm working capital

	WC (Model 1)						**CCC (Model 2)**					
	Panel A (Yearly Effect)			**Panel B (Industry Effect)**			**Panel C (Yearly Effect)**			**Panel D (Industry Effect)**		
	Coff	T	VIF	Coff	T	VIF	Coff	T	VIF	Coff	T	VIF
SI	0.030a	2.18	1.85	0.031a	2.17	1.84	0.023	2.17	1.77	0.023	2.18	1.76
GF	0.001 a	2.49	1.65	0.001 a	2.49	1.76	0.002 a	2.58	1.59	0.002 a	2.39	1.46
SI*GF	0.043 a	2.42	1.69	0.043 a	2.52	1.77	0.042 a	2.59	1.65	0.042 a	2.49	1.48
INDEP	0.003 b	2.54	1.58	0.003 b	2.57	1.49	0.002 b	2.67	1.52	0.002b	2.28	1.55
Growth	0.021 a	2.13	1.64	0.023 a	2.14	1.67	0.032 a	2.33	1.58	0.031 a	2.39	1.47
FS	0.002c	2.74	1.79	0.002 c	2.49	1.77	0.002 c	2.45	1.57	0.002 c	2.26	1.59
LEV	0.002 a	2.87	1.20	0.002 b	2.89	1.57	0.002 a	2.55	1.74	0.002 b	2.59	1.95
CF	0.023 a	2.89	1.23	0.022 b	2.88	1.39	0.035 a	2.58	1.39	0.021 b	2.44	1.69
Year	0.004 a	2.55	1.55	0.041 a	2.31	1.24	0.002 a	2.85	1.46	0.013 a	2.64	1.76
Industry	0.003a	2.58	1.58	0.003	2.39	1.28	0.003	2.85	1.49	0.003	2.65	1.82

Notes: a, b, and c denote significance at the 1%, 5%, and 10% levels, respectively.
Source: own calculation

Similarly, in Model 1, the moderating effect of SI × GF significantly and negatively affects both the year (β = −0.043; p-value = 1%) and industry (β = −0.042; p-value = 1%) effects (Alam et al., 2022). Further, in Model 2, the moderating effect of SI × GF significantly and negatively affects both the year (β = −0.042; p-value = 1%) and industry (β = −0.042; p-value = 1%) effects (Veltri et al., 2023). The moderating effect of SI × GF is more pronounced than the individual effect of SI on working capital. This indicates that GF accelerates the influence of sustainable investment on working capital (Sciarelli et al., 2023). This implies that firms involved in both sustainable practices and GF mechanisms experience a heightened effect on working capital, which can significantly improve financial sustainability through synergistic effects (Hamad

et al., 2023). Therefore, sustainable investment firms ensure effective WCM to cover their operational expenses (Aldubhani et al., 2022) and short-term liabilities while maximizing returns and reducing costs associated with maintaining excessive inventory or idle cash (Chang et al., 2022).

5. CONCLUSION

This study is conducted to evaluate the influence of sustainability on firms' WCM. To achieve the objectives, we design a sustainability index that not only measures firm sustainability but also examines its social engagement. This approach is more reliable than the traditional way of using ESG scores to evaluate firm sustainability (Veltri et al., 2023). The study examines whether firm sustainability significantly and negatively affects working capital, as proposed in H1(Veltri et al., 2023). The findings indicate that firms engaging in ESG investment practices can more efficiently manage their working capital to sustain their business operations over the long term (Kayani et al., 2020). The result indicates that the ESG investment practices of firms tend to have shorter CCC and lower cost of financing, enabling them to adopt an aggressive WCM strategy to reduce the cost of financing (Fatemi & Fooladi, 2013). Additionally, we reveal that GF moderates the relationship between working capital and sustainability, as proposed in H2 (Ye & Dela, 2023). The findings imply that GF is a modern way of financing to address societal issues and manage working capital more efficiently (Bhutta et al., 2022). The analysis explains that sustainable investment practices enable firms to manage their resources more efficiently and assist them in running their business operations more effectively while addressing societal issues promptly (Ye & Dela, 2023).

In contrast to existing literature (Kayani et al., 2020), this study finds that the Malaysian government places more value on sustainable investment practices by both stockholders and various stakeholders (Wahab & Mohamed Naim, 2019). In line with the stakeholder's theory, the findings reveal that sustainable business practices assist firms in achieving their targets efficiently (Alam et al., 2022). Thus, firms that ethically and socially address societal issues can more effectively contribute to the improvement of firm value and performance (An, 2023). Furthermore, the findings indicate that GF assists firms in adopting ESG investment practices, encouraging their long-term sustainability and growth.

The study reveals that a firm's sustainable investment practices lead to ESG disclosures, thereby improving the firm's financial position for targeting long-term sustainability (Hamad et al., 2023). Firms that align the ESG factors with their business operation tend to generate higher shareholders return and greater market acceptance (Alam et al., 2022). Similarly, when fund providers have great trust in management, integrating ESG practices into a firm's long-term investment tends to generate efficient and effective WCM (Ye & Dela, 2023).

Future studies can be conducted into various aspects of ESG indicators such as climate change and investigate the diversity, health, and welfare of employees and their impact on firm performance (Bahadori et al., 2021). Studies can also investigate how these indicators contribute to reducing financing costs, especially for firms in weak financial positions, to achieve long-term sustainability (Zhang et al., 2022). Additionally, future research may concentrate on SMEs, investigating the unique challenges they face in adopting and implementing ESG investment practices for long-term sustainability (Ye & Dela, 2023). This may include exploring how securing resources and fundamental expertise impacts their ability to align ESG disclosures effectively (Sciarelli et al., 2023). Future research can contribute to a comprehensive understanding of the relationship between working capital, long-term sustainability, and firm performance, ultimately supporting firms in achieving their objectives in an emerging ESG-conscious landscape.

5.1. Managerial implication

This study has both theoretical and managerial implications for industries sensitive to environmental issues. Theoretically, the study uncovers a significant negative relationship between firms' ESG investment practices and working capital (Zhang, 2022). An important finding is the role of GF, which acts as a moderator in the relationship between working capital and sustainability (Mohammad & Wasiuzzaman, 2021). This enables firms to be better-equipped with ESG practices for long-term sustainability. The results indicate that firms engaging in ESG practices experience greater market acceptance and maintain good relationships with their stakeholders (Hamad et al., 2023). This helps lower the cost of financing and helps procure inventories at favorable terms and conditions to facilitate smooth business operations (Du et al., 2022).

From a managerial perspective, firms actively engage in ESG practices to not only enhance their long-term sustainability but also optimize WCM (Zhang et al., 2022). This involves integrating sustainability considerations into strategic decision-making processes. Managers can explore sustainable investment practices as a means to improve their WCM (Ye & Dela, 2023). A shorter CCC and lower financing costs can be achieved through sustainable investments, contributing to improved overall financial performance (Jaworski & Czerwonka, 2022). Further, it helps secure financing through green channels as it can better equip firms to address societal issues while efficiently managing working capital (Zeidan & Shapir, 2017). Although sustainable investment practices may not yield immediate financial benefits, it is vital for a firm's long-term sustainability and value creation (Khalil & Nimmanunta, 2023). Patience and commitment to ESG practices are essential for firm sustainability and growth.

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