

# Moderating role of board gender diversity and firm size on the relationship between free cash flow and corporate sustainability of Thai listed companies

Sunanta Pasalao<sup>1</sup>, Wachira Boonyanet<sup>2</sup>, Supa Tongkong<sup>1,\*</sup>

<sup>1</sup> Faculty of Business Administration, Rajamangala University of Technology Thanyaburi, Pathum Thani 12110, Thailand

<sup>2</sup> Chulalongkorn Business School, Chulalongkorn University, Bangkok 10330, Thailand

\* **Corresponding author:** Supa Tongkong, [supa\\_t@rmutt.ac.th](mailto:supa_t@rmutt.ac.th)

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**Abstract:** This study seeks to explore the information value of free cash flow (FCF) on corporate sustainability and investigate the moderating effects of board gender diversity and firm size on the association between FCF and corporate sustainability of Thai listed companies. The dataset consists of companies listed on the Stock Exchange of Thailand (SET) in 2022. Multivariate regression analysis is executed in this study. Subsequently, PROCESS macro served to evaluate the proposed hypotheses. This study found that FCF has a significant positive relationship with corporate sustainability. As well, board gender diversity and firm size both moderate the relationship between FCF and corporate sustainability, such that the positive effect of FCF on corporate sustainability is stronger when the proportion of female boards diminishes, while firm size is smaller. However, when firms have a larger proportion of females on the boards of directors for all levels of firm size, free cash flow indicates that there is no statistically significant effect on corporate sustainability. This study contributes to FCF and sustainability literature by understanding the extent of corporate sustainability.

**Keywords:** cash flow; female board; gender diversity; sustainable growth; PROCESS; SET; Thailand

## 1. Introduction

Thailand like other country, during 2019–2021, the eruption of the COVID-19 pandemic triggered a Thai economic crisis resulting in a sharp and abrupt cessation in the performance of capital markets and an unprecedented surge in market volatility. This unexpected global instability had disturbed grassroots of economy, especially the listed companies. The word “sustainability” becomes recognized, and government and responsibility parties attempt to recover the crisis. For listed companies, the idea of maximizing profit is not that necessary but sustainable growth and consistent market share with long-term profit are now primary interests of companies. Also, in an intensely competitive industry, the fluctuated economy and politics change rapidly, sustainable growth is not straightforward, especially in increasingly sophisticated global circumstances (Amouzes et al. 2011). The vital question comes to investors’ mind what are reliable measure of financial positions and operation results (Rahim, 2017). Amouzes et al. (2011) recommended sustainable growth rate (SGR) referring to a company’s balance between cash flows and development path, where expansion can occur without incurring deficits or cash surpluses. The SGR is the alignment of a company’s target growth with its financial policies, such as its target capital structure and maintenance of the dividend policy and the issuance of new shares (Higgins, 1977). Additionally, the SGR holds significant appeal for investors, bankers, and analysts as a key target for long-term viability. By measuring the SGR, stakeholders, internal and

external stakeholders can make informed choices by understanding the factors shaping the firm growth (Nor et al., 2020).

How can SGR be measured? Ashta (2008) stated that firms can strategically set growth objectives by discerning their SGR aligning with their financing capabilities to mitigate any adverse impact on cash flow. Consequently, cash flow is essential for a business to enable viable business growth. As a result, researchers have been using SGR to indicate the long-term growth gap (Foerster et al., 2017; Jansen, 2021). Giacomino and Mielke (1993) stated that the utilization of the cash flow ratio as a tool for assessing a company's financial performance helps to determine its SGR, providing insights into its ability to maintain growth. The expansion of a firm largely depends on sustainable growth. It is a valuable tool for assessing the strength and potential an organization may have. Previous studies employed cash flows from operations (CFO) to represent companies' liquidity going concern (Mukherjee and Sen, 2018; Rahman and Sharma, 2020). However, the CFO presents net cash flows from operations which do not cover long-term commitments like investments in property, plants and equipment and other investments. Free cash flows (FCF) should be more appreciated, especially during economic crisis. This is because FCF is cash remaining beyond the essential funding for projects with positive net present value of the firm (Jensen, 1986).

The board of directors' effectiveness lies at the heart of robust corporations, significantly contributing to the efficiency of the capital market. Through its oversight role and valuable expertise, the board facilitates management teams in maximizing opportunities, operating efficiently, and presenting investors with reliable and timely financial information. The particular importance of the board's effectiveness in regulating cash flow and efficiency ratio affects corporate sustainable growth. To make better business decisions, all companies become dominant in the information hazard. In this environment, assessing future ability is challenging. Therefore, the board of director's policy is important because it sets the policy to perform cash management and disclose of cash flow information represents crucial financial operational data for companies, serving as the paramount factor for management in making decisions to attain the best company performance.

In addition, firm size measured by total assets is an essential indicator. Assets are the key financial factor for business sustainability (Murphy, 1985). The efficiency of asset utilization directly influences the economic activity of a firm. It is a tool for analyzing and managing assets appropriately and efficiently utilizing assets. Moreover, investment takes the form of working capital, property, plant and equipment and an excess of cash can be distributed to investors as a dividend. For analysts, the benchmark can provide the required data to assess a company's capacity for domestic growth and financial elasticity (Jones and Sharma, 2001).

Thailand as a representative of emerging markets. The sustainability issue has been one of vital concerns of investors. However, research on sustainability is limited. Therefore, this study initially replicates related previous studies to observe the informative value of FCF on firm performance (Park and Jang, 2013; Wen, 2017; Sapuan et al., 2021). This comes to the main objective of this study. The study aims to investigate the information value of FCF on corporate sustainability using Thai listed companies. Furthermore, this research is developed and goes beyond the claims

of existing theories by examining the outcomes of the relationship between free cash flow (FCF) and corporate sustainability when moderated by firm size (total assets) and board gender diversity.

The study fulfills the above research gap and discovers significant contributions in four folds. Firstly, this study confirms the informative value of FCF on corporate sustainability. Secondly, FCF significantly relates to corporate sustainability in a negative manner when moderated by board gender diversity. Thirdly, FCF significantly relates to corporate sustainability in a negative manner when moderated by firm size. Lastly, FCF significantly relates to corporate sustainability in a negative way when moderated by both board gender diversity and firm size. Furthermore, it is found that no matter the size of companies (small, medium, large), if the proportion of females on the board is low or average, corporate sustainability is higher. In addition, if the proportion of females on the boards is low, and firm size is small, corporate sustainability is more likely to be high. In summary, this study successfully identifies the boundary conditions of corporate sustainability relevant to difference firm size and board structure since board structure of board gender diversity powerfully enhances the investors' confidence to invest in firms and supports corporate sustainability. This study indicated that firm size and board gender diversity are the hidden variables amongst the effect of FCF and corporate sustainability. In addition, the findings reveal how FCF enhances corporate sustainability with a clear understanding of the effect of FCF on sustainability growth rate for listed companies, and also explain the mechanism of FCF and how it supports corporate sustainability. Stakeholders, such as investors can use the results of this research to analyze and make investment decisions while business firm benefits the firm's plan in determining the appropriated proportion of female board members despite differences in FCF, firm size, and firm performance.

This research is structured as follows. Starting with the introduction, section 2 deals with the literature review with the theoretical underpinning and hypothesis development. Section 3 shows the conceptual framework of this study. This is followed by section 4 in which the research method. Section 5 composes findings, discussion, and implementation. Lastly, section 6 illustrates the conclusion of this study.

## **2. Literature review and research hypothesis**

### **2.1. Corporate sustainability concept**

This study examines corporate sustainable growth, which refers to the long-term growth rate that a company can sustain. An analysis of the growth potential of a sustainable business means determining what is the appropriate growth size the business should strive for. That is important for both creditors and shareholders because the value of the business in terms of equity depends on profit growth, cash flow, and dividends in the future (SET, 2021). Higgins (1977) devised the concept of SGR, which suggests implementing with accounting credentials and ensuring consistent financial indicators. The aim is to estimate the highest growth rate that businesses want to achieve by utilizing retained earnings and increased internal income. Additionally, SGR represents the desired growth scenario from a financial perspective, assuming the provision of a clear financial framework and predefined

conditions. The significance of the SGR lies in its ability to combine operational aspects such as profit margin and asset productivity with financial aspects like capital structure and retention rates into a complete measure. Recently, SGR has been widely recognized as a relevant concept in contemporary financial management settings, offering strategic planning and control capabilities for corporations (Fonseka et al., 2012). Arora et al. (2018) posited that the SGR serves as a beneficial resource for managers seeking to synchronize their companies' operational and financial strategies. The premises of the SGR model are established on two fundamental assumptions. Amouzesh et al. (2011) and Pinto (2020) stated that the SGR of a firm is determined by its retention rate ( $R$ ) and return on equity ( $SGR = R \times ROE$ ), where  $R$  represents the retention rate of the firm. As a result, the calculation of  $SGR = ROE \times (1 - \text{Dividend payout ratio})$ .

## **2.2. Free cash flow concept**

Jensen and Meckling (1976) introduced the concept of agency theory. Later, Jensen (1986) explained the concepts of free cash flow and idle cash flow under agency theory. Jensen (1986) described FCF as the idle cash flow that goes beyond the expected amount for financing projects with positive net present value. Even in cases where the net present value is negative, managers may be inclined to enlarge the company beyond its desired size by engaging in additional activities. Ensuring effective cash management becomes crucial in such scenarios. Moreover, companies with surplus cash flows but limited growth prospects are more likely to rely more on debt financing. FCF is cash surplus beyond the necessary funding for projects with positive net present values in the firm. Typically, this excess cash flow is distributed to shareholders to maintain long-term efficiency. However, this form of payment can diminish the resources under the control of the manager (Jensen, 1986). Moreover, enhancing FCF is a reliable indicator for reinvesting in businesses and transforming surplus cash into returns and growth (Scatizzi, 2009).

Also, the pecking order theory is applicable in explaining the SGR and emphasizes that companies prioritize internal financing over external financing, particularly to support increasing sales. Additionally, this theory asserts that a positive correlation between cash flow and firm size, and market-to-book ratio is invented. Conversely, a negative association exists between cash flow and leverage, dividends, capital expenditure, and R&D expenditure (Myers and Majluf, 1984). This theory suggests that firms do not maintain specific target levels of cash; instead, cash serves as a buffer between retained and investment requirements. Furthermore, SGR is consistent with the pecking order hypothesis, which asserts that firms prioritize internal financing sources over external options like debt or new share issuance, considering the need to keep capital at the lowest cost as much as possible. If the company's internal resources are insufficient, its managers will prefer to issue shares as a last resort (Palombini and Nakamura, 2012).

Previous studies have defined FCF in various ways. Jensen (1983) stated that FCF was cash flow in the remaining amount of money required for all projects that had positive net present value when discounted from the relevant cost of capital. Later, Richardson (2006) stated that FCF represents the surplus cash flow that remains after

covering asset maintenance and expected new investments, defining FCF as the net cash generated by a company from its operating activities. This is then adjusted by deducting development costs, adding research and development expenditures, and subtracting investment costs for new initiatives. Moreover, Hackel et al. (2000) asserted that two definitions of FCF are offered. The traditional method deducts the company's investments from its operating cash flow, while the latest method considers discretionary cash expenditure and discretionary capital expenditure alongside the traditional calculations. In this present study, FCF is calculated as follows:

$$\text{Free cash flow (FCF)} = \text{Cash flow from operation} - \text{Capital expenditure}$$

Prior studies have to some extent described the benefit of a cash flow statement over the statement of financial position (balance sheet) and statement of income. Bernstein (1993) stated that capital markets tend to focus on earnings, disregarding the valuable insights provided by the cash flow component. Consequently, investors often overreact to accrual income, even though its impact is lower than actual earnings. So, a cash flow statement serves as a more direct measure in contrast to profit, making it applicable for making decisions. In addition, Sloan (1996), Kousenidis (2006), Amuzu (2010) and Bhandari and Iyer (2013) asserted that the investment community has traditionally placed great emphasis on profits. However, it is important to concentrate on real activities and omit non-cash charges. Among the different strategies pursued by firms, cost leadership yields a strong influence on generating positive cash flows, whereas differentiation strategies entail longer-term investment consequences and contribute to the stability and liquidity of cash flows. Therefore, cash flows provide the finest window for investment and forecast future stock returns.

Empirical studies have been observing the incremental value of cash flow statements. Most focus on cash flow from operating activities (CFOs) (Farshadfar et al., 2008; Percy and Munasinghe, 2015; Wickramasinghe and Gunawardana, 2017; Mukherjee and Sen, 2018; Rahman and Sharma, 2020). Like the studies of cash flows from operations, FCF research is an important issue, but quite limited. Park and Jang (2013) found compelling evidence that FCF has a direct negative impact on company performance. Excessive FCF leads to investments in unnecessary projects, leading to overinvestment problems and subsequent deterioration in company performance. Sun (2014) stated that sustainability will discourage any over-investment of FCF, thereby delivering more efficient use of internally generated resources. The study pointed out that FCF depended on management's pursuit of its own interests. If managers had higher ethical standards, they would be more likely to make responsible use of FCF. Wen (2017) examined the influence of FCF, agency cost, and firm performance. The findings highlighted a positive and significant effect of FCF on firm performance. Yeo (2018) discovered that FCF was the chief determinant of investments and dividends. Larger FCF led firms to increase their investments and reduce dividends. Al-Fasfus (2020) asserted that FCF, liquidity, leverage and profitability affected the dividend pay-out ratio.

Sapuan et al. (2021) investigated the association between FCF, agency costs, and firm performance. The findings highlighted a positive and significant effect of FCF on firm performance. Fu et al. (2022) stated that cash flows contained informative value of future stock returns. The study recommended that buying when high FCF and selling with low FCF significantly affects the traditional trading strategy. Also, the

incremental cash flow was largely attributable to equity and debt investors. Aburishah et al. (2022) found that FCF, operating cash flow, managerial ownership and financial leverage were related to earnings management. Tee (2023) explored the scenario whether board diversity can reduce weaker executive directors' pay-performance link in high FCF and low-growth firms. The study detected a positive association between executive directors' pay and firm performance with high FCF and low-growth firms.

In summary, the FCF variable exhibits great significance in the formulation of financial management strategies and decisions. The variable raises important questions about how cash flow affects companies' sustainable growth and to confirm the agency and pecking order theory. The first hypothesis is phrased as follows:

Hypothesis 1: FCF has a positive and significant effect on corporate sustainability.

### **2.3. Moderating variables**

The study offers further evidence on the role of board effectiveness and firm size as moderators in the relationship between FCF and corporate sustainability. Below the link between the moderating variables (i.e., board effectiveness and firm size) and the dependent variable (i.e., corporate sustainability), is explained in more detail.

Board gender diversity:

Stakeholder theory underpins board gender diversity. Stakeholder theory states that businesses should consider the interests of all stakeholders, not just shareholders. A diverse board is seen as more likely to represent the interests of a wider range of stakeholders, including employees, customers, and the broader community (Freeman, 1984; Laplume et al., 2008). Gender diversity on the board can help ensure that the perspectives and concerns of female employees and customers are considered.

The literature on board gender diversity has been carried out for some time. Gender diversity supports gender representation on boards leading to improve effectiveness. This unfavorable perspective may offset the expected benefits of gender diversity on dividend policies in companies with substantial FCF, resulting in a minimal association between females on boards of directors and dividends (Al-Dhamari et al., 2016). Previous research has looked at women directors from multiple perspectives such as firm performance, earnings management (Harakeh et al., 2019), accounting quality and dividend payout (Chen et al., 2017), sustainability disclosure (Zahid et al., 2020), and corporate social responsibility (Gulza et al., 2019). Carter et al. (2010) and Tariverdi et al. (2014) argued that women have qualifications that are comparable to those of men, and it is further proposed that the presence of gender diversity does favor board effectiveness. Lucas-Pérez et al. (2015) asserted that females on boards can improve their decision-making by promoting a participative and process-oriented approach. Kılıç and Kuzey (2016) indicated a prevailing gender imbalance on the boards of directors, characterized by men's dominance. The study found a link between female boards and financial performance. Mirza et al. (2020) discovered that the inclusion of female on boards enhances investment efficiency by effectively monitoring operations and mitigating agency issues. The recent paper by Ain et al. (2022) provided empirical evidence supporting a positive relationship between women company directors and the SGR of firms, presenting a fresh viewpoint within the gender diversity literature and enriching our understanding of women

directors.

The inclusion of female boards aligns with the principles of agency theory, which suggests that gender diversity mitigates conflicts of interest between managers and shareholders. This view is supported by Bujaki and McConomy (2010), Hillman et al. (2002) and Rose (2007). These studies show that board of directors' women often hail from non-business backgrounds, and backgrounds and to engage in collusion with insiders for the purpose of exploiting external investors. This study introduced board gender diversity as a moderating variable. This is because board gender diversity may have both direct and indirect effect on corporate sustainability. To confirm the stakeholder theory, the hypothesis in this regard is as follows:

Hypothesis 2: Board gender diversity moderates the relationship between FCF and corporate sustainability.

Firm size:

Firm size has long been considered as a factor influencing many perspectives such as firm value, firm performance, and stock price among others. Murphy (1985) asserted that large businesses frequently hold significant market share in comparison to their rivals, which makes it easier for them to operate better. Firm size is then incorporated into the model to control the effects of large-firm management with revenue growth and continuously creates profit. Managers are assured of their continued employment and can expect salary raises due to the heightened responsibilities that come with overseeing a larger and successful organization. Consequently, large firm size is reflected in corporate sustainability.

In the area of corporate sustainability, previous studies have indicated both positive and negative relationships between firm size and corporate sustainability. Quite a few studies found that larger firms are positively related to corporate sustainability (Rahim, 2017; Xu and Wang, 2018; Wang et al., 2019; Carp et al., 2020; Adebayo et al., 2021). A recent study by Adebayo et al. (2021) reinforced the view that the impact of firm size on corporate sustainable growth is expected to be positive, as larger companies tend to enjoy a stronger market position. However, Fama and French (2001) contended that dividend policies of mature firms differ from those of newer organizations, with the former typically distributing higher dividends due to their limited investment chances and larger accumulated assets, while the latter, characterized by smaller assets and more growth opportunities, are less inclined to pay significant dividends. These two opposite directions have been considered as an issue of sustainability. Also, Vuković et al. (2022) showed a negative association between firm size and SGR, suggesting that larger companies have lower rates of sustainable growth. Nonetheless, company size played a positive role in enhancing investment performance. The informative value of firm size to corporate sustainability is still controversial. This study intends to explore the value of firm size over corporate sustainability. The hypothesis referring to this issue is as follows.

Hypothesis 3: Firm size moderates the relationship between FCF and corporate sustainability.

Board gender diversity and firm size:

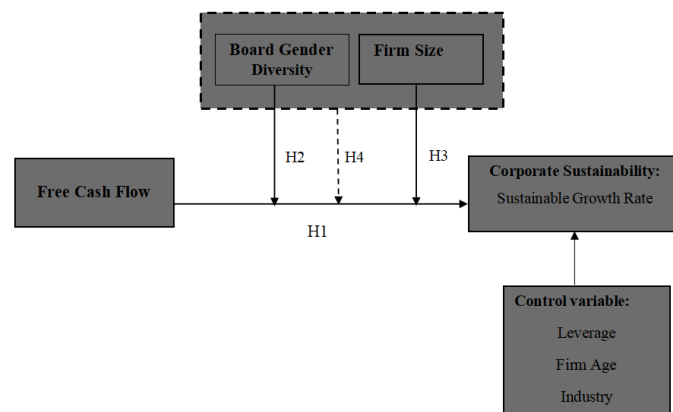
As mentioned in hypothesis 2, the relationship between FCF and corporate sustainability is moderated by board gender diversity and hypothesis 3, the relationship between FCF and corporate sustainability is moderated by firm size. It is

questionable whether the relation between FCF and corporate sustainability differs, or the relationship depends on the presence of both board gender diversity and firm size. Further analysis is proceeded by observing how board gender diversity and firm size, both enhance the effect of FCF on corporate sustainability. This is because the informative value of board gender diversity and firm size to this relationship is still unknown. Therefore, this study attempts to identify the boundary conditions of corporate sustainability relevant to difference firm size and board structure since board structure of board gender diversity powerfully enhances the investors' confidence to invest in firms and supports corporate sustainability. This study indicated that firm size and board gender diversity are the hidden variables amongst the effect of FCF and corporate sustainability. Thus, this study hypothesizes that board gender diversity and firm size are important determinants of how FCF impact corporate sustainability with potentially moderating effect in this association. The hypothesis for this particular issue is as follows.

Hypothesis 4: Board gender diversity and firm size moderate the relationship between FCF and corporate sustainability.

### 3. Conceptual framework

To summarize, the relationship between FCF and corporate sustainability is considered in this analysis. Offered here is further evidence for the role of board gender diversity and firm size as moderators in the relationship are determined based on findings from the previous empirical studies, and predicted effects are determined based on corporate sustainability from theoretical reasoning as shown in the previous section. Focusing on FCF, board gender diversity, firm size and corporate sustainability, the conceptual framework of this research is presented in **Figure 1**.



**Figure 1.** Conceptual framework.

## 4. Research methodology

### 4.1. Dataset and statistical analysis

The population and sample include the listed companies on the SET. All listed companies (683 companies) are employed, except finance companies (142), rehabilitation companies (3), companies with operational losses (123), non-December fiscal year-end (23) and outlier (9). The qualified samples contain 383 listed



companies. These samples differ from the others. For example, financial and rehabilitation companies have different financial structures. In addition, companies with operational losses may have a going concern issue. This research is a quantitative one using archival data. Data was collected from the financial statements and annual reports (56-1 One Report) for the year 2022, including information from the Securities and Exchange Commission (SEC) website and the SETSMART database.

Descriptive statistics are employed to summarize the characteristics of preliminary data and to provide a general overview of the data and nature of the basic statistical distribution. Hierarchical multiple regression analysis based on the concept of Baron and Kenny (1986) as well as PROCESS macro for SPSS (IBM SPSS Statistics) written by Hayes (2018) is applied to test the hypotheses. The direct terms were transformed to mean-centered to avoid multicollinearity problem (Aiken et al., 1991). PROCESS was used to calculate the products estimated by the best fitting OLS regression model and probe the interaction effects. The PROCESS procedure for SPSS model template 1 is applied to test hypothesis 2 and hypothesis 3 which is two-way interaction model with one moderator, while model template 2 is applied to test hypothesis 4 which is two-way interaction model with two moderators. Additionally, the pick-a-point approach is applied to describe the interaction effects.

## 4.2. Measurements for the variables

**Table 1.** Measurement of study variables.

Variables	Acronym	Measurements	Previous studies
Sustainable growth rate	SGR	ROE × Retention rate, when Retention = 1 – Dividend pay out	Amouzesh et al., 2011; Fonseka et al., 2012; Arora et al., 2018; Pinto, 2020; Altahtamouni et al., 2022
Free cash flow	FCF	Cash flow from operation – Capital expenditures	Sapuan et al., 2021; Fu et al., 2022; Aburishah et al., 2022; Tee, 2023.
Board Gender Diversity	BG	The proportion of female boards to total number of directors	Mirza et al., 2020; Ain et al., 2022
Firm Size	FSize	Total assets	Rahim, 2017; Xu and Wang, 2018; Wang et al., 2019; Carp et al., 2020; Adebayo et al., 2021; Adebayo et al., 2021; Vuković et al., 2022
Leverage	LEV	Debt to equity	Fonseka et al., 2012; Ilie and Olaru, 2013; Rahim, 2017; Mukherjee and Sen, 2018; Mamilla, 2019; Mumu et al., 2019; Nor et al., 2020; Hinaya and Ellili, 2021
Firm age	FAge	The number of years since the establishment until the year of the study	Mukherjee and Sen, 2019
Industry	Ind	Each item is assigned a value of 1 in each industry group; otherwise, 0.	Rahman and Sharma, 2020

The study employs the variables as follows. The dependent variable is sustainability growth rate (SGR) as a corporate sustainability proxy. Secondly, FCF is

decided as a main effect (predictor) to observe informative value over corporate sustainability. Thirdly, moderating variables include board gender diversity and firm size. Fourthly and lastly leverage, firm age and industry serve as control variables. The measurements of these variables are summarized in **Table 1**.

### 4.3. Model specifications

To serve the objectives of the study, the analysis sets out the hypotheses as follows.

Hypothesis 1: FCF has a positive and significant effect on corporate sustainability.

$$SGR_i = \beta_0 + \beta_1FCF + \beta_2BG + \beta_3FSIZE + \beta_4LEV + \beta_5FAge + \varepsilon_i \quad (1)$$

Hypothesis 2: Board gender diversity moderates the relationship between FCF and corporate sustainability.

$$SGR_i = \beta_0 + \beta_1FCF + \beta_2BG + \beta_3LEV + \beta_4FAge + \beta_5FCF \times BG + \varepsilon_i \quad (2)$$

Hypothesis 3: Firm size moderates the relationship between FCF and corporate sustainability.

$$SGR_i = \beta_0 + \beta_1FCF + \beta_2FSIZE + \beta_3LEV + \beta_4FAge + \beta_5FCF \times FSIZE + \varepsilon_i \quad (3)$$

Hypothesis 4: Board gender diversity and firm size moderate the relationship between FCF and corporate sustainability.

$$SGR_i = \beta_0 + \beta_1FCF + \beta_2BG + \beta_3FSIZE + \beta_4LEV + \beta_5FAge + \beta_6FCF \times BG + \beta_7FCF \times FSize + \varepsilon_i \quad (4)$$

## 5. Findings

### 5.1. Descriptive analysis

**Table 2.** Descriptive statistics of the variables.

Variable	Minimum	Maximum	Mean	SD
SGR (percent)	-26.24	56.03	6.36	8.44
FCF (Million baht)	-5.43	81.36	2.50	8.76
BG (ratio)	0.00	0.67	0.22	0.15
FSize (Million baht)	466.36	926,987.18	37,677.59	108,110.09
LnFSize	6.14	13.74	9.08	1.54
LEV (ratio)	0.01	6.42	0.97	0.90
FAge (years)	0.01	47	18.11	12.46
Ln_FAge	-7.82	3.85	2.42	1.34

**Table 2** presents the descriptive statistics for the variables. The mean corporate sustainability (SGR) is 6.36. The central measures for FCF, board gender diversity (BG), and firm size (FSize) are 2.50 million baht, 22% and 37,677.59 million baht, respectively. In terms of control variables, the average debt to equity ratio is 0.97 times with minimum and maximum values of 0.01 and 6.42, respectively. Indicated here are the various capital structures of the listed companies. The average age of the companies is 18.11 years. It is noticed that Ln represents the natural log of the variables. This is performed as required by multiple regression assumption tests.

## 5.2. Data validity and reliability

The collection of data used for analysis is important, and because data quality is vital, reliability and validity are two crucial components that need to be checked. Therefore, the research emphasized validity, which involved the direct and comprehensive representation of all relevant material, while reliability focused on data consistency (Zikmund et al., 2012). The data sources for this study comprised companies' annual reports stored in the stock exchange database. SETSMART is deemed a reliable source of information that meets the accuracy requirements for companies listed on the SET. Therefore, the study ensured content validity.

After data collection is done, the regression assumption tests are executed. First of all, Mahala Nobis Distance is used to observe outliers. This technique results in deleting 9 companies from the dataset. Each deviation is subject to an independent test or assessed for automatic relationships. Hence, to fulfill the prerequisites of multivariate regression analysis, it is essential for each deviation to have automatic relationships. Researchers need to thoroughly examine the statistical values of Durbin-Watson; specifically the Durbin-Watson value is 2 or within the range of 1.5 and 2.5 (Kutner et al., 2005). In addition, to mitigate the problem of multicollinearity, it is essential to ensure that no correlation between the independent variables exists. This can be checked by analyzing the statistical values of tolerances and the variance inflation factor (VIF). It indicates the absence of multicollinearity issues if all independent variables have tolerance values above 0.5 and VIF values below 10 (Hair, 2010).

**Table 3.** Correlation analysis of study variables.

	FCF	BG	Ln_FSize	LEV	Ln_FAge	SGR
FCF	1					
BG	-0.088	1				
Ln_FSize	0.501**	-0.141**	1			
LEV	0.148**	0.002	0.368**	1		
Ln_FAge	0.102*	-0.069	0.115*	0.011	1	
SGR	0.162**	0.055	0.126*	0.061	-0.141**	1

Note: significant at \* $p < 0.10$ , \*\* $p < 0.05$ .

After those techniques were employed, it emerged that the tolerance value of the variables is close to 1. Furthermore, as shown in **Table 3**, Pearson correlation is lower than 0.8. When considering the VIF value, no variable value had a value greater than 10 as shown in **Table 4**. Finally, Durbin-Watson as shown in **Table 4** are between 1.5–2.5. All of these values indicate no concern about the regression assumptions.

**Table 4.** Regressions analysis of FCF on corporate sustainability when moderated by board gender diversity and firm size.

Variables	Control variables model		Model I		Model II		Model III		Model IV	
			Main effect model		BG moderation model		FSize moderation model		Two-way interaction model	
	<i>B(t)</i>	<i>p</i>	<i>B(t)</i>	<i>p</i>	<i>B(t)</i>	<i>p</i>	<i>B(t)</i>	<i>p</i>	<i>B(t)</i>	<i>p</i>
<b>Constant</b>	10.547 (7.250)***	0.001	8.080 (2.360)**	0.018	10.847 (7.491)***	0.001	11.739 (7.850)***	0.001	12.012 (8.177)***	0.001
<b>Control variables</b>										
Lev	0.664 (-1.344)	0.180	0.320 (-0.0620)	0.535	0.535 (1.077)	0.282	0.432 (0.841)	0.401	0.626 (1.223)	0.222
FAge	-0.825 (-2.093)**	0.037	-0.980 (-2.472)**	0.014	-0.976 (-2.494)**	0.013	-0.057 (-0.148)	0.883	-1.064 (-2.732)***	0.006
Industry fixed effect	Included		Included		Included		Included		Included	
<b>Main effect</b>										
FCF			0.134 (2.380)**	0.018	0.014 (0.179)	0.857	0.480 (2.414)**	0.016	0.578 (2.922)***	0.003
BG			2.627 (0.880)	0.380	0.163 (0.052)	0.957			-2.223 (-0.698)	0.486
FSize			0.239 (0.661)	0.509			-0.057 (-0.148)	0.883	-1.334 (-0.346)	0.729
<b>Interaction model</b>										
FCF × BG					-1.610 (2.190)**	0.029			-3.069 (-0.186)***	0.001
FCF × FSize							-0.090 (-1.825)*	0.069	-0.186 (-3.363)***	0.001
<i>R</i>	0.258		0.303		0.319		0.313		0.362	
<i>R</i> <sup>2</sup> change			0.026		0.0116		0.0081		0.0394	
Adj. <i>R</i> <sup>2</sup>	0.046		0.065		0.076		0.058		0.080	
F-stastic	3.323***		3.405***		0.3841***		0.3660***		4.283***	
VIF	1.037–2.047		1.070–2.054		1.053–2.057		1.119–2.053		1.116–3.829	
Durbin-Watson	2.017		2.036		2.060		2.035		2.048	

Notes: Significant at \* $p < 0.10$ , \*\* $p < 0.05$  and \*\*\* $p < 0.01$ ; 1) SGR: Sustainable growth rate, 2) FCF: Free cash flow, 3) BG: Board gender diversity, 4) FSize: Firm size, 5) LEV: Debt to equity, and 6) FAge: Firm age.

### 5.3. Research results of hypothesis

The analysis results for the influence of FCF on corporate sustainability when moderated by board gender diversity and firm size are shown in **Table 4**. Initially, the study introduces the control variables into the analysis. It is found that firm age (FAge) significantly relates to corporate sustainability in a negative way ( $B = -0.825$ ,  $p < 0.05$ ). Model I is designed to explore the main effects of FCF, firm size and board gender diversity on corporate sustainability. Relating to the issue of whether FCF influence corporate sustainability in a positive way, the results in model I indicate that FCF has a positive effect on corporate sustainability ( $B = 0.134$ ,  $p < 0.05$ ). This finding supports hypothesis 1. However, board gender diversity (BG) and firm size (FSize)

have no statistically significant impact on corporate sustainability.

Model II is a simple linear moderation model designed with FCF as a main effect and board gender diversity as a moderating effect. The results show that the main effects of FCF and board gender diversity have no statistically significant impact on corporate sustainability. The regression coefficient for the product of FCF and board gender diversity ( $FCF \times BG$ ), which is negative and statistically significant ( $B = -1.610, p < 0.05$ ), and accounts for about 1.16% of the variance in support for corporate sustainability. Thus, the effect of FCF on support for corporate sustainability depends on board gender diversity, while the effect of FCF on corporate sustainability decreases by 1.610 as board diversity increases by one unit. This finding supports hypothesis 2.

Model III is a simple linear moderation model designed with FCF as a main effect and firm size as a moderating effect. The results show that the main effects of FCF have a positive effect on corporate sustainability ( $B = 0.480, p < 0.05$ ), while firm size has no statistically significant impact on corporate sustainability. The regression coefficient for the product of FCF and firm size ( $FCF \times FSize$ ) is negative and statistically significant ( $B = -0.090, p < 0.10$ ) and accounts for about 0.81% of the variance in support for corporate sustainability. Thus, the effect of FCF on support for corporate sustainability depends on firm size, while the effect of FCF on corporate sustainability diminishes by 0.090 as firm size increases by one unit. This finding supports hypothesis 3.

Finally, model IV is a two-way interaction model designed with FCF as a main effect and both board gender diversity and firm size as moderating variables (two-way interaction model). The analysis shows that the main effect of FCF has a positive impact on corporate sustainability ( $B = 0.578, p < 0.05$ ), while firm size and board gender diversity have an insignificant impact on corporate sustainability. The regression coefficients for the interaction effects of both the FCF and board gender diversity ( $FCF \times BG$ ) and the FCF and firm size ( $FCF \times FSize$ ) are negative and statistically significant ( $B = -3.069, p < 0.01; B = -0.186, p < 0.01$ , respectively). They account for about 3.94% of the variance in support for corporate sustainability. Thus, the effect of FCF on support for corporate sustainability depends on both board gender diversity and firm size. This finding supports hypothesis 4.

#### **5.4. Further analysis the moderating role of board gender diversity and firm size**

For the regression analysis results in model IV, **Table 4** indicates the interaction effect between board gender diversity and FCF and the interaction effect between and firm age and FCF negatively relate to corporate sustainability. The study further analyses how board gender diversity and firm size as moderating variables impact corporate sustainability. The PROCESS analysis results of the two-way interaction model (specifying model = 2) are shown in **Table 5**, indicating that both board gender diversity and firm size are moderators of the effects of FCF on corporate sustainability. The two interaction terms function as a set accounting for 3.94% of the variance in support for corporate sustainability,  $F(2, 369) = 8.3664, p < 0.001$ . The moderation by board gender diversity uniquely accounts for 3.17% of variance [ $F(1, 369) = 13.4563$ ,

$p < 0.001$ ], whereas the moderation by firm size uniquely accounts for 2.66% of variance,  $F(1, 369) = 11.3094, p < 0.001$ ).

**Table 5.** Results of PROCESS macro for SPSS: Conditional effects of FCF on SGR at the value of the moderators.

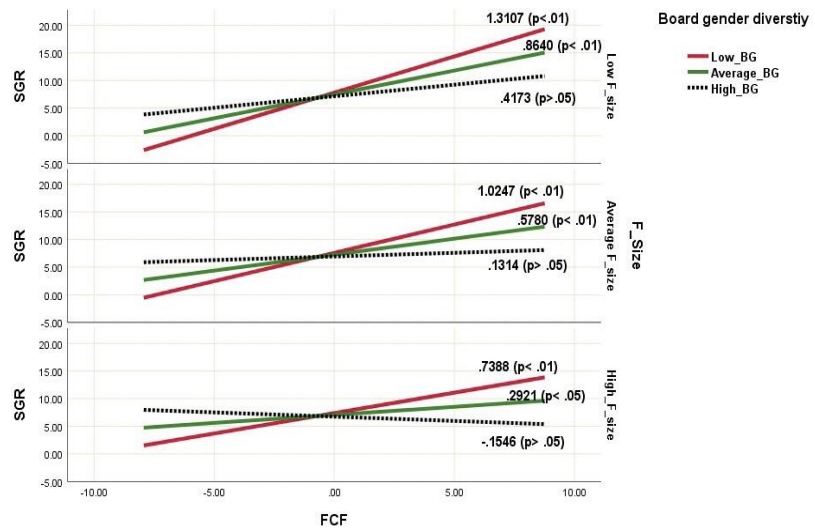
Model summary							
R	R-sq	MSE	F	df1	df2	p	
0.3621	0.1311	64.0219	4.2826	13.0000	369.0000	0.0000	
Test(s) of highest order unconditional interaction(s):							
		R <sup>2</sup> -chng	F	df1	df2	p	
X × W		0.0317	13.4563	1	369	0.0003	
X × Z		0.0266	11.3094	1	369	0.0009	
BOTH		0.0394	8.3664	2	369	0.0006	
Focal predict: FCF (X), Mod var: BG (W), Mod var: FSize (Z)							
BG	FSize	Effect	se	t	p	LLCI	ULCI
Low	Small	1.3107	0.3292	3.9811	0.0001	0.6633	1.9581
Low	Medium	1.0247	0.2467	4.1541	0.0000	0.5397	1.5098
Low	Large	0.7388	0.1666	4.4332	0.0000	0.4111	1.0665
Average	Small	0.8640	0.2768	3.1214	0.0019	0.3197	1.4083
Average	Medium	0.5780	0.1978	2.9222	0.0037	0.1891	0.9670
Average	Large	0.2921	0.1269	2.3019	0.0219	0.0426	0.5416
High	Small	0.4173	0.2730	1.5289	0.1271	-0.1194	0.9541
High	Medium	0.1314	0.2169	0.6055	0.5452	-0.2952	0.5580
High	Large	-0.1546	0.1846	-0.8374	0.4029	-0.5177	0.2084

Notes: Low/Small refer to the mean minus one standard deviation; Average/Medium refer to the mean; and High/Large refer to the mean plus one standard deviation.

**Table 5** also shows the conditional effect of FCF on corporate sustainability for various values of board gender diversity and firm size. It is found that the effect of FCF on corporate sustainability is consistently positive and statistically significant for both the low level and the average level of board gender diversity among the small, medium, and large-sized firms, while the effect of FCF on corporate sustainability is statistically insignificant for the high level of board gender diversity among all firm size levels. It is apparent from the conditional effects that the effect of FCF on corporate sustainability is positive and larger for the low level of board gender diversity than the average level of board gender diversity for all levels of firm size: low, average, and high. However, the conditional effects of FCF on corporate sustainability are statistically insignificant for the high level of BG for all firm sizes.

A visual representation of FCF on corporate sustainability when moderated by board gender diversity and firm size is shown in **Figure 2**. It illustrates that conditional effect of FCF on corporate sustainability is highest at 1.3107, followed by 1.0247, and 0.7388 when firm has the low number of females on company boards and small firm size, the low proportion of female boards and medium-sized firms, and low proportion of female boards and large firm size, respectively. It means that for all levels of firm size—small, medium, and large—those have the smallest number of females on boards,

means that there is an increase in FCF leading to enhanced corporate sustainability. Specifically, the conditional effect of FCF on corporate sustainability for small firms with minimal women on boards (1.3107) is greater than medium-sized businesses with a low proportion of females (1.0247) and large firms with not many females on their boards (0.7388), respectively. Additionally, conditional effects of FCF on corporate sustainability are 0.8640, 0.5780, and 0.2921 when firms have the average proportion of females on the boards of small firms, medium-sized firms, and large firms, respectively.



**Figure 2.** A visual illustration of FCF on SGR moderated by BG and FSize.

For the levels of firm size—small, medium, and large—those having the average number of females on the boards, means an increase in FCF leading to enhanced corporate sustainability. Specifically, the conditional effect of FCF on corporate sustainability for small firm with average proportion of females on the boards (0.8640) is greater than medium-sized firms with average proportion of females on the boards (0.5780) and large firms with average proportion of females on their boards (0.2921), respectively. Lastly, conditional effects of FCF on corporate sustainability are statistically insignificant for all firm size levels with a high proportion of females on the board of directors. It means that for firms with a high proportion of females on the boards, regardless of company size, the increase in FCF has no effect on corporate sustainability.

## 5.5. Discussion and implementation

### 5.5.1. The informative value of free cash flow on corporate sustainability

Analysis of the results indicates that FCF provides informative value to corporate sustainability in a positive way. This means that once companies set aside more FCF for business operations, it is more likely to sustain their businesses. However, if companies employ net cash flows for other purposes, for example, investing in property, plant, and equipment, joining other business ventures, paying dividends, they may not have business continuity. This informative value of FCF is in line with previous studies, for instance Sapuan et al. (2021), Fu et al. (2022), Aburishah et al. (2022), and Tee (2023). The implication of this finding is important. The board of

directors should set an FCF level policy together with other reasons for using cash outflow. This is to balance cash retention, dividend payment and investments in the attempt to maximize profit and ensure sustainable growth for the business.

#### **5.5.2. The moderating effect of board gender diversity on the relationship between free cash flow and corporate sustainability**

Considering the moderating effect of board gender diversity, the effect of FCF on support for corporate sustainability is negative and depends on board gender diversity. Less board gender diversity indicates a fall in the number of female board members. The interaction effect between FCF and board gender diversity significantly relates to corporate sustainability in a negative manner. Therefore, FCF increases corporate sustainability when the proportion of female board declines; FCF decreases corporate sustainability when the proportion of female board members increases. The implication of this finding means that regulators and chairmen of the boards of directors must set the right proportion between men and women on company boards. Previous studies indicate that having more women on boards is more likely to produce much more efficient performance (Mirza et al., 2020). This can be interpreted as meaning that females on boards are perhaps very conservative when new investments for projects are considered. Consequently, lack of new projects being confirmed to go ahead means that corporate sustainability becomes a sensitive issue.

#### **5.5.3. The moderating effect of firm size on the relationship between free cash flow and corporate sustainability**

This study also introduces firm size as a moderator in the relationship between FCF and corporate sustainability. It is found that the interaction effect between FCF and firm size significantly relates to corporate sustainability in a negative manner indicating here is that the effect of FCF on support for corporate sustainability is negative and depends on firm size. Subsequently, FCF curtails corporate sustainability when firm size increases; FCF increases corporate sustainability when firm size shrinks. Regarding firm size, big companies are not always sustainable because they may have high fixed expenses (i.e., depreciation) causing burdens in operational processes. Meanwhile smaller companies have limited funds, so they are more likely to have lower fixed expenses but also more opportunity to grow. Therefore, they have the potential to improve their profits, attract more investment and ability to generate greater market share. The implication of this finding suggests that managers should carefully consider investing in profitable projects by seriously undertaking financial feasibility studies before making the final decision.

#### **5.5.4. The moderating effect of board gender diversity and firm size on the relationship between free cash flow and corporate sustainability**

When considering the moderating effects of board gender diversity and firm size, the interaction effects between FCF and board gender diversity as well as the interaction effect of FCF and firm size, both significantly relate to corporate sustainability in a negative manner. It emerges that the effect of FCF on support for corporate sustainability depends on both board gender diversity and firm size. Regardless of the latter, the effects of FCF on corporate sustainability are consistently positively significant when the number of female directors is between low and average



levels, while FCF exerts no significant effect on corporate sustainability when proportion of females on the board is at a high level. Interestingly, when the proportion of female board members is low and average, the positive effect of FCF on corporate sustainability is significant and larger for small firm sizes compare to medium-sized businesses. No significant effect for large firm size is indicated. When considering the small, medium, and large firm sizes, the positive effect of FCF on corporate sustainability is significant and larger for the smaller number of female board members over the average number and shows no significant effect for the high proportion of women on the boards of directors.

In summary, for all levels of firm size (small, medium, and large), those businesses having a low and average number of female board members, means an increase in FCF leading to enhanced corporate sustainability. However, the effect of FCF on corporate sustainability is larger for the low number of females compared to the average proportion of females on the board. Conversely, FCF has no effect on corporate sustainability for firms with a large number of female board members, regardless of company size. This is the significant finding of this study, and it contributes to assessing how efficient companies are when gender diversity is taken into account.

## **6. Conclusion**

The study aims to find the informative value of FCF and what it means for corporate sustainability. This study further introduces the moderating effects of board gender diversity and firm size on the relationship between FCF and corporate sustainability. The dataset consists of companies listed on the SET in 2022. Multivariate regression and PROCESS analysis are employed. Firstly, the study confirms agency theory stating managers (agents) use these FCF in ways that maximize shareholder value and do not waste or misuse them for their own benefit in the long-term, so corporate sustainability is protected. Secondly, the study shows that FCF significantly relates to corporate sustainability. Companies with higher FCF are more likely to continue functioning well. On the other hand, spending too much on property, plant and equipment and making other investments or paying high dividends, will compromise corporate sustainability. Lastly, the study observes the moderators that influence corporate sustainability and successfully finds that there is a significant relationship between FCF and corporate sustainability when moderated by board gender diversity and firm size. A higher proportion of female board members may lead to firms having less sustainable growth than they should do. This is perhaps because women on board of directors are conservative in making investment decisions and attempt to maintain higher FCF. In addition, large businesses (high total assets) may be close to saturation state; this causes the sustainable growth rate to remain the same or increase slowly. Lastly, older companies may not indicate any interest in corporate sustainability or know how to achieve it, while newer companies may well do so.

## **Limitations and further studies**

Due to the fact that the dataset is based on Thailand's gradual economic recovery from COVID-19 and having a new government in power with untested economic

policies, FCF is deemed to be very vital. Studies on this issue should be conducted in different dataset environments in the future. This will help to create a more informative value of FCF in reference to corporate sustainability. Several new factors should be introduced into future analyses, including GDP, consumer index, stock exchange index, or unemployment rate. Longitudinal datasets should be seriously considered when new studies are conducted.

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