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Does Voluntary Sustainable Development Report Disclosure Affect Audit Fees? Evidence from Thailand-listed Firms (2016-2020)

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Abstract

This study examines the impact of voluntary Sustainable Development Report (SDR) disclosure on audit fees among Thailand-listed firms from 2016 to 2020. Utilizing data from standalone SDRs, annual reports, and shareholder meeting reports, we adhere to Thailand-SEC guidelines, SDG standards, GRI (G4), and GRI core options to perform a comprehensive content analysis. Our findings suggest auditors may increase fees due to perceived higher risks when firms provide minimal SDR information, particularly when following SEC guidelines, and devote additional audit efforts to firms disclosing more SDR information. Furthermore, we expand the understanding of auditors' perceptions of SDR disclosure in the context of voluntary non-financial reporting and various SDR frameworks in developing countries. The study also identifies significant inconsistencies in SDR reporting when firms adopt different frameworks, such as GRI, SDGs, or SEC guidelines. These findings offer valuable insights for policymakers, auditors, and companies striving to enhance transparency and accountability in sustainable development practices.

Keywords: Non-financial information, Sustainable Development Report, Audit Fees

1. INTRODUCTION

Non-financial information remains of significant interest to stakeholders, consistent with existing studies that document how investors perceive the future performance of firms. These investors benefit from high information symmetry, gaining access to crucial details, including the potential of financial statements for decision-making through various types of non-financial reports, such as annual reports, corporate social responsibility (CSR) reports, and sustainable development reports (SDRs) (Christensen, 2015; Chen et al., 2016; Hope & Thomas, 2008; Nguyen et al., 2019; Michelon et al., 2015; Cho et al., 2013).

In addition, non-financial information is currently a challenging topic for auditors. An auditor's responsibility includes reviewing a firm's engagement and other information related to the audit processes, as highlighted in the independent auditor's report under the Thai Standards on Auditing (TSA 700, Revised 2016) (Federation of Accounting Professions, 2023). The report states:

> "*Other information, my responsibility is to read the other information identified above when it becomes available and, in doing so, consider whether the other information is materially inconsistent with the financial statements or my knowledge obtained in the audit, or otherwise appears to be materially misstated. When I read the annual report, if I conclude that there is a material misstatement therein, I am required to communicate the matter to those charged with governance and request that the correction be made.*"

Many scholars agree that non-financial reports, particularly SDRs, are crucial public information that may affect a firm's financial statement processes since these reports are not based on the same rigorous control systems as

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financial reports (AI-Shaer, 2020; López Puertas-Lamy et al., 2017; Goicoechea et al., 2019; Cohen & Simnett, 2015; Simnett & Huggins, 2015).

In the case of mandatory SDR disclosure, many countries have implemented specific standards. For example, U.S.-listed firms follow the SEC Climate Disclosure Rule, U.K.-listed firms adhere to the UK Sustainability Disclosure Requirements, and other countries use standards like IFRS Sustainability Disclosure Standards, the Global Reporting Initiative (GRI), and the EU Corporate Sustainability Reporting Directive (CSRD). In contrast, voluntary SDR disclosure in developing countries, especially among Thailand-listed firms, is encouraged by the Thailand SEC. Firms can choose between several SDR frameworks, such as the Thailand SEC guidelines, the UN Sustainable Development Goals, and the Global Reporting Initiative (GRI) G4 or core options, depending on their budget, stakeholder needs, and regulatory challenges.

This study is motivated by the need to examine how SDR information is associated with audit costs. Previous studies suggest that auditors may consider SDR disclosures as a potential source of misstatements in financial statements. Evidence also shows a positive relationship between SDR disclosure and audit complexity, leading to higher audit fees (Garcia et al., 2020), as well as cases where SDR disclosures have reduced audit fees (Du et al., 2020) in listed firms in developing countries. However, there is limited evidence on the impact of voluntary SDR disclosure on audit complexity in these economies. Therefore, this study aims to determine whether SDR disclosure affects annual audit fees.

Our study focuses on voluntary SDR disclosure and audit fees among Thailand-listed firms from 2016 to 2020. We collected data manually from SDRs on company websites and annual reports, adhering to Thailand SEC guidelines, SDG standards, GRI (G4), and core options. Content analysis was conducted to evaluate the inputs, processes, and outputs of disclosed sustainable activities. Audit fees, our dependent variable, were obtained from annual reports (Form 56-1) and shareholder meeting reports. Our dataset comprises 2,685 firm-year observations, with corporate characteristics and firm profitability included as control variables.

The results of this study show that auditors read SDR information with professional skepticism during the audit process, consistent with TSA 700 (Revised). Existing studies indicate that a firm's non-financial information, particularly SDRs, is associated with audit complexity (Garcia et al., 2020). Our empirical results demonstrate that SDR is positively and significantly associated with audit fees, suggesting that auditors perceive a firm's SDR information as adding complexity to the audit process. This is because auditors may perceive higher audit risk when firms following SEC guidelines have more flexibility in disclosing their SDR content compared to those using international frameworks, which are potentially more standardized and provide greater detail as required by the framework. This ultimately leads to higher audit costs. Moreover, we divided the sub-sample to explore whether a firm's choice between the international standard or the Thai SEC guideline for SDR practices affects audit fees. The results show that auditors charge higher fees regardless of which framework is selected.

In addition, our tests use interaction analysis to explore the marginal effects of SDRs and other factors on audit fees. First, we examine the impact of SDRs assured by independent assurors as a joint variable, which shows a significant positive result. Second, we replace the joint variable with SDRs labeled as high-quality, which also yields a significant positive result. Thus, we can infer that even SDRs guaranteeing transparency and usefulness do not reduce auditors' perception of the audit effort or costs.

Our study contributes to the literature on SDR disclosure from the perspective of financial report auditors, noting that SDR disclosure can reduce audit fees (Du et al., 2020), improve corporate governance (Karim et al., 2018; Lee et al., 2019), and enhance operational performance (Chiang et al., 2017). However, auditors may increase fees due to perceived risks (Garcia et al., 2020; Koh & Tong, 2013; Gray & Manson, 2007; Perrini et al., 2011; Pirson & Turnbull, 2018). We also expand the understanding of auditors' perceptions of voluntary non-financial SDR reports and various SDR frameworks in developing countries, challenging audit quality as firms disclose more non-financial information to meet stakeholders' requirements. However, our results are limited by contextual differences in analyzing SDR information according to SEC guidelines, highlighting significant gaps when comparing SDR information from firms using GRI or SDG frameworks.

In the next section, we present the theoretical perspective and review prior studies to develop our hypotheses. Section 4 outlines the empirical research methodology. The results, including descriptive statistics and empirical findings, are presented in Section 5. We present additional tests in Section 6. The final section provides conclusions and implications.

2. THEORETICAL PERSPECTIVE

This study explores two key theories—Stakeholder Theory and Agency Theory—to explain the relationship between top management's responsibility to address stakeholder needs through sustainable development reporting (SDR) and auditors' perspectives. Stakeholder Theory, as outlined by Edward Freeman (1984), emphasizes that corporations are interdependent with diverse stakeholders, such as investors, customers, employees, and communities. The theory suggests that businesses should consider and balance these stakeholders' needs to create long-term value. Sustainability reporting, according to Bell and Morse (2008), aligns with this framework, while Scherer and Palazzo (2007) argue that it should integrate multiple stakeholders' perspectives. Agency Theory, proposed by Jensen and Meckling (1976), explains the principal-agent relationship between shareholders and managers, where managers may act opportunistically, leading to information asymmetry. To mitigate this, companies disclose information to improve decision-making and market efficiency, with external auditors serving as a control mechanism to monitor management and reduce agency costs (Pucheta-Martínez et al., 2019). Both theories emphasize the importance of transparent reporting and ensuring that disclosed non-financial information aligns with financial statements to meet stakeholder needs and maintain audit quality.

3. LITERATURE REVIEW AND HYPOTHESIS

This section covers two main topics: sustainable development report (SDR) disclosure in Thailand and the development of hypotheses regarding the relationship between SDR disclosure and auditor efforts for Thai-listed companies based on existing related literature.

3.1 Sustainable Development Report (SDR) Disclosure in Thailand

The Stock Exchange of Thailand (SET) has encouraged listed companies to disclose corporate social responsibility (CSR) information, which later evolved into what is now called the sustainable development report (SDR). The goal of this shift was to assess and evaluate companies' long-term economic, social, and environmental performance in response to stakeholders' growing demand for non-financial information relevant to decision-making (Suttipun, 2021).

Since 2015, the SET has required listed firms to disclose CSR information covering three key areas: governance, social or community impacts, and environmental performance. These disclosures, which include inputs, processes, outcomes, and related plans, must be presented either in the firm's Form 56-1 (the annual disclosure form), the annual report (Form 56-2), or a standalone report, such as a sustainable development report (SDR) (SET, 2015). However, listed companies have the option to follow one of several SDR frameworks, including the Securities and Exchange Commission of Thailand (SEC) guideline (11 items), the UN Sustainable Development Goals (SDG) (17 goals), or the Global Reporting Initiative (GRI) standards. The GRI (G4) was launched in 2013 with seven main topics, and the GRI Core option was introduced in 2016 with 37 issues (Table 1).

This variety in voluntary SDR disclosure allows Thai-listed companies to tailor their reports according to their budget, stakeholder demands, and regulatory challenges. For instance, some firms opt to disclose SDR information within Form 56-1, which is less costly than preparing a separate sustainable development report, as they are already required to provide both financial and non-financial information in Form 56-1 annually. However, this approach limits the level of detail that can be provided (Wuttichindanon, 2017).

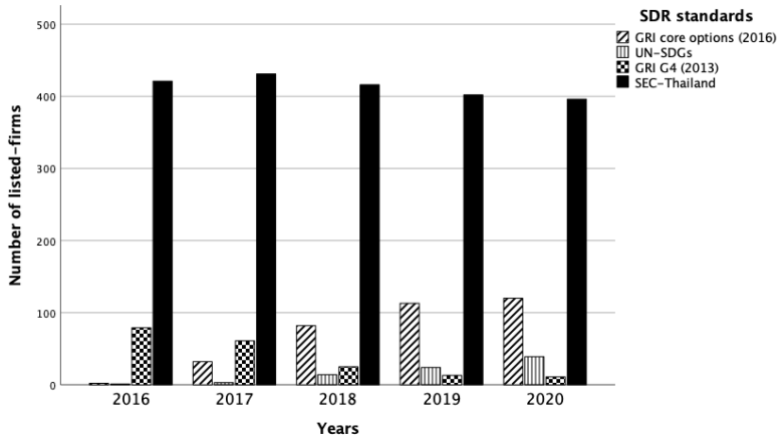

Figure 1: Trends in the Adoption of Various Voluntary SDR Standards
by Thai-listed firms (2016–2020)

Figure 1 illustrates the significant increase in Thai-listed firms adopting the GRI (including G4 and GRI Core options) and SDG frameworks for sustainable development reporting (SDR) from 2016 to 2020. These international standards offer a comprehensive and systematic approach to SDR, which has contributed to their growing popularity.

As mentioned earlier, Thai-listed firms have several options for voluntarily disclosing SDRs. The data (see Figure 1) indicate that companies have increasingly focused on developing and disclosing key information related to sustainable performance. This trend may be driven by factors such as the need for higher stakeholder visibility (Gamerschlag et al., 2011; Wuttichindanon, 2017), motivation to be recognized as part of the Thailand Sustainable Investment (THSI) group, which requires firms to disclose environmental, social, and governance (ESG) information in their annual reports (Suttipun, 2021), or the desire to be rated in the Thaipat ESG Index by the Thaipat Institute. Being included in such indexes can provide investors with valuable benchmarks to compare returns before making investment decisions (ThaiPat, 2018).

Table 1 Sustainable development reporting component on several disclosure standards

No	Thai-SEC	UN-SDG	GRI	
			G4	Core option
1	Energy management	No Poverty	General Standard	Foundation
2	Water management	Zero Hunger	Economic	General Disclosure
3	Waste and pollution management	Good Health and Well-being	Environmental	Management Approach
4	Greenhouse effect management	Quality Education	Labor practices and decent work	Economic Performance
5	Labor/Management Relations	Gender Equality	Human rights	Market Presence
6	Customer Privacy	Clean Water and Sanitation	Society	Indirect Economic Impacts
7	Social and community development	Affordable and Clean energy	Product responsibility	Procurement Practices
8	Good Corporate Governance	Decent work and Economic growth		Anti-corruption
9	Sustainable Risk Management	Industry, Innovation and Infrastructure		Anti-competitive Behavior
10	Supplier Chain Management	Reduce inequalities		Tax
11	Innovation	Sustainable cities and communities		Materials
12		Responsible consumption and production		Energy
13		Climate action		Water and Effluents
14		Life below water		Biodiversity
15		Life on land		Emission
16		Peace, Justice and strong institutions		Waste
17		Partnerships for the goals		Environmental Compliance
18				Supplier Environmental Assessment
19				Employment
20				Labor/Management Relations
21				Occupational Health and Safety
22				Training and Education
23				Diversity and Equal Opportunity
24				Non-discrimination
25				Freedom of Association and Collective Bargaining
26				Child Labor
27				Force or Compulsory Labor
28				Security Practices
29				Rights of Indigenous Peoples
30				Human Rights Assessment
31				Local Communities
32				Supplier Social Assessment
33				Public Policy
34				Customer Health and Safety
35				Marketing and Labeling
36				Customer Privacy
37				Socioeconomic Compliance

3.2 Non-Financial Information and the Auditor's Perspective

Many scholars suggest that firms' non-financial information, such as sustainable development reports (SDRs), plays a crucial role in the audit risk assessment process. Auditors must ensure that the non-financial information disclosed by firms does not lead to material misstatements in the financial statements (AI-Shaer, 2020; López Puertas-Lamy et al., 2017). SDRs, whether as standalone reports or part of annual reports, provide information on a firm's economic, environmental, and social performance (van Marrewijk, 2003; Hedberg & von Malmborg, 2003; Aras & Crowther, 2009; Ballou et al., 2006; Bhimani et al., 2016). Although auditing standards do not specifically address non-financial information, auditors must ensure its accuracy, reliability, and usefulness. This is especially important because non-financial information is often not subject to the same robust information systems or controls as financial data (Goicoechea et al., 2019; Cohen & Simnett, 2015; Simnett & Huggins, 2015).

Previous studies have found that positive signals from non-financial information can enhance the quality of financial reports for stakeholders and help auditors reduce audit risk. Christensen (2015) explains that non-financial reporting allows investors to perceive management's intentions regarding future opportunities and potential risks. Managers often disclose SDRs to signal their trustworthiness and provide select information to investors. Firms committed to high-quality financial reporting and issuing CSR reports (non-financial reporting) send more credible signals about their future performance (Chen et al., 2016). SDRs can also positively influence investment behavior (Hope & Thomas, 2008; McNichols & Stubben, 2008) by reducing adverse selection (Lambert et al., 2007) and improving corporate governance mechanisms that prevent managers from exploiting investors (Fama & Jensen, 1983). Additionally, SDRs increase information symmetry, restraining managers from unethical behaviors that lead to agency problems (Nguyen et al., 2019; Michelon et al., 2015; Cho et al., 2013). This also reduces earnings management (Chih et al., 2008; Labelle et al., 2010) and the likelihood of financial accounting restatements (Lin et al., 2020).

In the case of voluntary SDR disclosures by Thai-listed firms, several reporting standards are used, including the Thai-SEC guidelines, SDGs, GRI (G4), and the GRI Core option. As a result, the SDR information auditors use to assess business and audit risks varies in content and structure. This diversity in SDR frameworks creates different levels of audit complexity for auditors depending on the client. Garcia et al. (2020) suggest that mandatory CSR disclosure in various countries is linked to differing audit risk assessment processes. High-quality CSR disclosures are associated with increased audit efforts, especially when CSR controversies arise (Koh & Tong, 2013; Campbell, 1988; Perrini et al., 2011; Pirson & Turnbull, 2018; Hoitash & Hoitash, 2018; Datta et al., 2020).

This study examines whether voluntary SDR disclosure impacts the auditor's efforts when assessing the varied SDR information provided by Thai-listed companies. We hypothesize that there is a positive relationship between voluntary SDR disclosure and auditors' efforts, both for BigN and non-BigN auditors. Therefore, this study tests the following hypothesis:

H1a: The auditor is not significantly influenced by the firm's SDR disclosure, and it does not signal increased audit-assessed risk.

Furthermore, based on the ownership structure of Thai-listed firms, approximately 61.30% of family businesses and 56.60% of them are audited by Big N firms. We, therefore, expect auditors to consider SDR disclosures from both family and non-family businesses equally. However, several studies suggest that auditors are less likely to have their recommendations accepted by family firms, and these firms face a higher fraud risk when weak corporate governance mechanisms are in place (Krishnan & Peytcheva, 2019). On the other hand, Lee et al. (2019) argue that family businesses or business groups may voluntarily disclose SDRs as part of a strategy to enhance their reputation and mitigate scrutiny from active stakeholders or social activists (Cespa & Cestone, 2007).

This study analyzes data from Thai-listed firms in developing countries. Recently, voluntary SDR disclosures by family and non-family businesses have become a common practice, though the methods and information disclosed may vary. Given this context, we expect no significant difference in how auditors consider SDR disclosures from family and non-family businesses.

H1b: The SDR disclosure practices of family and non-family businesses are associated differently with the engaged auditors.

3.3 SDR Disclosure and Audit Fees

Voluntary SDR disclosure can serve as a signaling mechanism, allowing firms to demonstrate corporate transparency by avoiding the concealment of critical information and preventing adverse market reactions (Brammer & Pavelin, 2004). In developing countries, listed firms gradually expand the content of their SDRs to meet stakeholders' needs (Velte, 2019) and build their reputations (Lee et al., 2019). This public information may be closely related to the audit process, functioning as a monitoring mechanism for voluntary information (Ngelo et al., 2022).

From the auditor's perspective, Garcia et al. (2020) suggest that a firm's CSR performance influences audit complexity and impacts audit effort, which is often measured by audit fees. Additionally, when firms are involved in controversial CSR activities, they are likely to pay higher audit fees due to the higher business risk and more intensive audit assessments (Koh & Tong, 2013). This increased risk, coupled with the larger volume and variety of SDR information, requires more audit effort (Gray & Manson, 2007; Perrini et al., 2011; Pirson & Turnbull, 2018). Furthermore, a firm's investment in SDR may increase its operational and accounting complexity (Campbell, 1988), and CSR activities may be associated with earnings management to meet stakeholder expectations (Prior et al., 2008). These findings suggest a positive relationship between SDR information and higher audit fees, as SDRs signal the need for more extensive audit efforts.

On the other hand, some scholars argue that SDR disclosures are linked to higher corporate morals and ethics (Waddock, 2008). This suggests that firms practicing SDR may provide greater transparency, reducing the agency problem and decreasing the need for audit efforts as stakeholder monitoring decreases (Karim et al., 2018; Lee et al., 2019). Moreover, SDR disclosure practices have been shown to improve a firm's operational performance (Chiang et al., 2017). Consistent with this, Du et al. (2020) find that the audit process may be simplified for firms with strong ethical perspectives, leading to a negative association between audit fees and CSR performance.

This study investigates whether firms' SDR disclosures affect audit risk and efforts, as measured by audit fees, within the context of Thai-listed companies. Thai firms have flexibility in selecting SDR disclosure standards, depending on their policies. We propose that audit fees present an effort to auditors during audit processes, particularly in risk assessment, audit planning, and audit findings. This study aims to test the following null hypothesis:

H2: There is no association between firms' SDR disclosure and audit fees.

4. RESEARCH METHODOLOGY

4.1 Data and sample

The primary data for this study consists of voluntary SDR disclosures, which are captured and analyzed by examining the SDR content from standalone reports, sustainable development reports published on company websites, and annual reports of Thai-listed firms. For the sustainable development reports, we assess which items are disclosed by the firms, following the SDGs standard, GRI (G4), and GRI core options, as detailed in the appendix tables at the end of the reports. We use content analysis to evaluate SDR information in the annual reports, focusing on content related to inputs, processes, and outputs, as per the Thailand SEC guidelines. Our analysis emphasizes the process, output, and future plans of the firm's sustainable activities. If the firm's SDR content only repeats the economic, environmental, and social responsibility policy from the previous year without substantive updates, we assign zero points for those sections.

Audit fee data are gathered from firms' annual reports, Form 56-1, or shareholder annual meeting reports. We include all firm-year observations from the Stock Exchange of Thailand (SET) covering SDR disclosure and audit fees from 2016 through 2020 (SET, 2020). Our unbalanced panel data excludes firms that (1) are listed on the Market for Alternative Investment (MAI), (2) are part of the property fund sector within the property and construction industry, (3) have been delisted or are undergoing rehabilitation, and (4) have missing data for SDR disclosures or audit fees. The final sample consists of 2,685 firm-year observations.

Panel A of Table 3 shows the sample distribution by industry. The services industry has the largest number of firm-year observations (559), representing about 21 percent of the sample, while the consumer products industry and technology industry have the smallest number of firm-year observations (198 and 187, respectively). Panel B shows the distribution of sustainable development reporting practices among the firms. The majority (77 percent) follow the Thai SEC guidelines, while 23 percent have adopted international standards, such as the SDGs, GRI core option, or GRI (G4). Panel C reveals that family businesses dominate the ownership structure, with 1,645

observations accounting for 61 percent of the total sample. Panel D indicates that 65 percent of the firms (1,735 observations) engage a Big N auditor.

Table 3 Sample Distribution

Panel A: Sample Distribution by Industry

Industry	**Firm-year Observations**	**Percentage of Total**
Agro and Food industry	271	10.10
Consumer Products	198	7.40
Financials	281	10.50
Industrials	450	16.80
Property and Construction	485	18.10
Resources	254	9.50
Services	559	20.80
Technology	187	7.00
Total	2,685	100.00

Panel B: Sample Distribution by Sustainable Development Report Selections

Sustainable development report selections	**Firm-year Observations**	**Percentage of Total**
Thai-SEC guideline	2066	76.90
The UN Sustainable Development Goals (SDG)*	189	7.10
The Global Reporting Initiative (GRI): (G4)**	81	3.00
The Global Reporting Initiative (GRI): Core option***	349	13.00
Total	2,685	100.00

*,**,*** This study combines the international standards for sustainable development report selections, resulting in a sample of 619 firm-year observations.

Panel C: Sample Distribution by Owner Structures

Owner structures	**Firm-year Observations**	**Percentage of Total**
Family Business	1645	61.30
Institution	1040	38.70
Total	2,685	100.00

Panel D: Sample Distribution by Auditors

Auditors	**Firm-year Observations**	**Percentage of Total**
Big N	1735	64.60
Non-Big N	950	35.40
Total	2,685	100.00

4.2 Measurement of SDR Disclosure and Audit Fees

1) SDR Disclosure

We use a checklist to record how many items listed firms disclose related to economic and governance activities, social responsibilities, and environmental activities from the standalone SDR report and the firm's annual report. We then modified the CSR disclosure score methodologies from Laksa & Gopal Maji (2018) and Sampong et al. (2018) to compute the SDR ratio as follows:

$$SDRDisc_{jt} = \frac{\sum_{i=0}^{n} X_{ijt}}{N_j} \times 100 \quad (1)$$

Where N_j = represents the total number of items disclosed under each SDR standard adopted by the firm j, where j is the company, i is the items, and t is the time. X_{ijt} It takes a value of 1 if a company discloses an item and 0 otherwise.

2) Audit fees

We manually collect data on the total audit fees disclosed by firms, which indicates how much the engaged auditors charged during each firm's accounting cycle, including the audit costs for both the company and its subsidiaries. We then take the natural logarithm of the audit fees for clients j each year.

4.3 Empirical Model - SDR Disclosure and Audit Fees

We examine the association between a firm's SDR disclosure and audit fees, which reflects auditor effort based on audit complexity when each firm submits its SDR as public information, using the following baseline model.

$$\begin{aligned} LnAudFee_t = {} & \beta_0 + \beta_1 SDRDisc_t + \beta_2 (SDRDisc)_t^2 + \beta_3 FamBus_t + \beta_4 BdSize_t + \beta_5 CEOSeat_t \\ & + \beta_6 PerIndir_t + \beta_7 BigN_t + \beta_8 Size_t + \beta_9 ROA_t \quad + \beta_{10} LEV_t + \beta_{11} Loss_t \\ & + IndustryandYearFixedEffects + \varepsilon \end{aligned}$$

(2)

We include control variables following prior studies that examine the potential determinants of auditor effort, which are commonly used in audit fee research (e.g., Asante-Appiah, 2020; Garcia et al., 2020; Nikkinen & Sahlström, 2004). Additionally, we consider corporate characteristics related to SDR information disclosure (García-Sánchez et al., 2022; Suttipun, 2021; Lee et al., 2019), namely family business (*FAMBUS*), board size (*BDSIZE*), CEO duality (*CEOSEAT*), percentage of independent directors (*PERINDIR*), Big N auditors (*BIGN*), and firm size (*SIZE*).

We also control for a firm's profitability using its return on assets (*ROA*) and include a dummy variable for firms that incurred a loss during the fiscal year (*LOSS*). Leverage (*LEV*), representing financial leverage, is included, with the expectation that a positive coefficient may indicate reduced audit risk.
Furthermore, we include year fixed effects (*YEARFIXED*) and industry fixed effects (*INDUSTRYFIXED*), measured using dummy variables for each year and industry in the sample, respectively. This controls for any time-invariant factors and inter-industry variations that could affect audit fees (Garcia et al., 2020). The definitions of the variables used in our model are shown in Table 2.

Table 2 Variable Definitions

Variables	Definitions
$SDRDisc^2$	Calculates the SDRDisc to the second power
AuditFees	Total audit fees in Thai Baht
AssuRe	An indicator variable, equal to 1 if the firm is audited the sustainable development report by external assurancers in year t, and 0 otherwise
FamBus	An indicator variable, equal to 1 if the firm's owner structure is family business in year t, and 0 otherwise
BdSize	Number of board committee members
CEOSeat	Number of CEO positions, counted inside and outside
PerIndir	Percentage of board committee members who are outside directors
BIG N	An indicator variable, equal to 1 if the firm is audited by a BIG N auditor in year t, and 0 otherwise
Size	Firm size, calculated as the natural log of total assets at the end of year t
ROA	The return on asset for year t, calculated as net income divided by total assets
LEV	Financial leverage, calculated as total liabilities divided by total assets
LOSS	A dummy variable, equal to 1 if the firm reports negative net income for year t, and 0 otherwise

5. Results

5.1 Descriptive Statistics

Table 4 provides descriptive statistics for the numerical variables. On average, firms disclose 29.50 percent of the SDR information (*$SDRDisc^2$)*, which includes the input, process, and output of SDR information based on each SDR standard component. Additionally, firms pay relatively high audit fees (*AUDFEE*), with a mean of 5.26 million baht. Firms also exhibit strong performance, with an average ROA of 0.031 and LEV of 0.451. Furthermore, 5 percent of firms engage SDR assurors to verify the credibility of their SDR information (*ASSURE*).

In terms of firm characteristics, 61 percent of the firms are family-owned businesses (*FAMBUS*), the average board size (*BDSIZE*) is ten members, and the CEO (*CEOSEAT*) holds nine seats on committees both inside and outside the firm. Additionally, 40 percent of the directors are independent (*PERINDIR*).

Table 4 Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max
SDRDisc	2685	0.490	0.233	0.090	1.000
$SDRDisc^2$	2685	0.295	0.291	0.010	1.000
AudFee (Baht)	2685	5,252,383	10,104,241	380,000	156,732,930
AudFee (Ln)	2685	14.964	0.868	12.850	18.870
AssuRe	2685	0.050	0.214	0.000	1.000
FamBus	2685	0.613	0.487	0.000	1.000
BdSize	2685	10.030	2.448	3.000	21.000
CEOSeat	2685	9.290	11.950	1.000	101.000
PerIndir	2685	0.424	0.098	0.230	1.000
Variable	N	Mean	Std. Dev.	Min	Max
BIG N	2685	0.646	0.478	0.000	1.000
Total Assets (BahtMillion)	2685	64,660	326,863	156	4,639,502
Size	2685	22.734	1.671	18.870	29.170

ROA	2685	0.031	0.090	-1.500	0.560
LEV	2685	0.451	0.244	0.000	3.060
LOSS	2685	0.210	0.408	0.000	1.000

Table 5 Correlation Matrix of Variables

Variable	$SDRDisc^2$	Aud Fee	Assu Re	FamBus	Bd Size	CEO Seat	PerIndir	BIG N	Size	ROA	LEV	LOSS
$SDRDisc^2$	1											
AudFee	**0.162**	1										
AssuRe	**0.111**	**0.376**	1									
Fambus	**-0.054**	-0.037	**-0.165**	1								
BdSize	**0.172**	**0.229**	**0.316**	**-0.147**	1							
CEOSeat	**0.117**	**0.427**	**0.045**	**0.121**	**0.093**	1						
PerIndir	0.024	**0.115**	**0.126**	**0.139**	**-0.239**	-0.014	1					
BIG N	**0.173**	**0.342**	0.133	**-0.211**	**0.134**	**0.197**	-0.018	1				
Size	**0.274**	**0.690**	0.485	**-0.210**	**0.438**	**0.304**	**0.075**	**0.360**	1			
ROA	**0.150**	**-0.080**	0.031	0.028	**0.070**	-0.006	-0.019	**0.098**	**0.081**	1		
LEV	0.014	**0.374**	**0.109**	**-0.056**	**0.096**	**0.124**	0.032	**0.171**	**0.400**	**-0316**	1	
LOSS	**-0.132**	-0.019	-0.082	-0.004	**-0.111**	-0.022	0.014	**-0.156**	**-0.182**	**-0.603**	**0.132**	1

Bold characters are significant at 0.01 and 0.05 level

Table 5 demonstrates the Pearson correlation among the variables used in our analysis. The variables in this study do not exhibit multicollinearity issues. Correlation coefficients that are statistically significant at the 0.05 level or better are marked with asterisks. Notably, *SDRDisc²,* the measure of SDR information disclosed by firms, is positively correlated with the amount of audit fees (*AUDFEE*) (*correlation = 0.162*).

Additionally, AUDFEE is positively correlated with *ASSURE, BDSIZE, CEOSEAT, PERINDIR, BIGN, SIZE*, and *LEV* but negatively correlated with *ROA.* Therefore, we reject the null hypothesis H1a, suggesting that SDR information disclosed to the public can increase audit effort or audit risk (Garcia et al., 2020).

5.2 Empirical Results

We use Model 2 to test H1b and H2, examining whether the SDR disclosures of Thailand-listed firms affect audit fees and the direction of their associations. The main regression results are presented in Table 6. Panel A of Table 6 shows that SDR disclosure is positively and significantly associated with audit fees *(*0.933*, p-value < 0.01)* in the first column, indicating that SDR disclosures introduce additional complexity into the audit process, leading us to reject H2. Similarly, the variables *ASSURE, FAMBUS, CEOSEAT, PERINDIR, BIGN, SIZE,* and *LOSS* all have positive significant associations with audit fees *(p-value < 0.01 and 0.05)*. Conversely, the negative significant coefficients for *BDSIZE* and *ROA* suggest that these factors may mitigate audit risk *(p-value < 0.01).*

Columns 2 and 3 of the sub-sample analysis show that whether a firm follows international standards or the Thai SEC guidelines for SDR disclosure, the coefficients exhibit a positive effect, consistent with the main result from the full sample. Notably, firms that follow the Thai SEC guidelines show that SDR disclosure is positively and significantly associated with audit fees *(1.091, p-value < 0.01).*

Panel B reports the comparison between firms with different ownership structures, showing that both family businesses and non-family (institutional) businesses that disclose SDR information to the public experience increased audit efforts and higher audit fees. The coefficients for these effects are 0.754 and 1.148, respectively, in the second and third columns, both showing statistically significant positive associations at the 1% level. Therefore, we reject H1b.

Table 6 The Effect of SDR Disclosure Information on Audit Fees

Panel A: Comparison of Firms with SDR Disclosure Selections

Variables	Dependent Variable: AudFee					
	Full Sample		Sub-samples *(SDR disclosure selection)*			
			International Standard		THAI-SEC Guideline	
	β	P-value	*β*	P-value	*β*	P-value
Constant	7.998	0.000	5.279	0.000	9.096	0.000
SDRDisc	-1.196	0.000	-.154	0.825	-1.256	0.000
$SDRDisc^2$	**.933**	**0.000**	**.086**	**0.872**	**1.091**	**0.000**
AssuRe*	.389	0.000	.157	0.051		
FamBus	.131	0.000	.032	0.603	.140	0.000
BdSize	-.020	0.000	-.015	0.222	-.025	0.000
CEOSeat	.015	0.000	.011	0.000	.018	0.000

PerIndir	.360	0.003	.471	0.051	.286	0.038
BIG N	.190	0.000	.024	0.735	.256	0.000
Size	.304	0.000	.427	0.000	.247	0.000
ROA	-.808	0.000	-.181	0.732	-.714	0.000
LEV	.293	0.000	.347	0.034	.306	0.000
LOSS	.062	0.067	-.004	0.962	.083	0.016
Year fixed effects	Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes	
Adj. R square	0.595		0.673		0.505	
F value	172.210		56.259		96.612	
N	2685		619		2066	

*In Column 3, our model excludes the *ASSURE* variable because none of the firms that follow the Thai SEC guidelines for SDR provide assurance for their reports.

Panel B: Comparison of Firms with The Structures of Business' Owners

Variables	Dependent Variable: AudFee					
	Full Sample		Sub-samples *(the structures of business' owners)*			
			Family Businesses		Institutions	
	β	P-value	*β*	P-value	*β*	P-value
Constant	8.208	0.000	7.940	0.000	8.514	0.000
SDRDisc	-1.144	0.000	-.1062	0.000	-1.355	0.000
SDRDisc^2	**.886**	**0.000**	**.754**	**0.002**	**1.148**	**0.000**
AssuRe	.371	0.000	.301	0.004	.532	0.000
BdSize	-.021	0.000	-.020	0.004	-.016	0.061
CEOSeat	.016	0.000	.011	0.000	.020	0.000
PerIndir	.472	0.000	.325	0.028	.278	0.177
BIG N	.166	0.000	.326	0.000	-.087	0.050
Size	.297	0.000	.312	0.000	.287	0.000
ROA	-.775	0.000	-.806	0.000	-.724	0.015
LEV	.321	0.000	.243	0.000	.229	0.009
LOSS	.050	0.140	.020	0.628	.128	0.028
Year fixed effects	Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes	
Adj. R square	0.590		0.601		0.615	
F value	176.882		113.791		76.590	
N	2685		1645		1040	

6. Additional Test

6.1 Assurance SDR and Audit Fees

Figure 1 shows that from 2016 to 2020, many listed firms in Thailand have increasingly adopted the GRI and SDG frameworks for sustainable development reporting, as these international standards offer comprehensive and systematic topics for disclosure. Notably, 126 out of 619 firm-years (approximately 20 percent) have opted to provide assurance for their SDRs, certified by external assurance service firms such as Lloyd's Register Quality Assurance, SGS (Thailand), and Big N. This assurance responds to heightened stakeholder scrutiny (Gamerschlag et al., 2011; Wuttichindanon, 2017) and provides stakeholders with the opportunity to verify that their concerns have been acknowledged (Wallage, 2000).

Although no regulation mandates that SDR information be assured before it is made available to the public, firms are not necessarily required to provide assurance for these reports. The process typically concludes once the SDRs are approved by the firm's board. However, existing studies have shown that assured SDRs can enhance external transparency, improve the credibility of sustainability information (Simnett et al., 2009; Manetti & Becatti, 2009; Gürtürk & Hahn, 2016), and contribute to corporate reputation (Simnett et al., 2009; Birkey et al., 2016). Assurance also fosters trust by strengthening stakeholder engagement and corporate reputation (García-Sánchez et al., 2022). Additionally, the credibility of SDRs can be further improved when recommendations are included in the assurance statement (Simnett et al., 2009; Birkey et al., 2016; García-Sánchez et al., 2022).

This evidence highlights the benefits of SDR assurance for firms, corporations, and stakeholders. Therefore, we hypothesize that SDR assurance may influence auditors' perceptions of the accuracy and reliability of financial statements, which are related to publicly disclosed SDR information. We expect that this perception will increase audit costs, reflecting the auditor's efforts to verify the critical SDR information.

Interaction Term of SDR Assurance on SDR Disclosure and Audit Fees

We focus on the sample firms that adopted international standards for SDR practices—619 out of 2,085 firm-years between 2016 and 2020—since these firms engaged SDR assurance providers (no records exist for firms that followed the Thai SEC guidelines for SDR disclosure). We include the variable *SDRASSURE* and the interaction term *SDRDisc x SDRASSURE* in the base model.

We expect the coefficient for β_4 to be positive, consistent with prior evidence, suggesting that financial statement auditors take into account the assurance statements of SDRs during the audit process.

$$LnAudFee_t = \beta_0 + \beta_1 SDRDisc_t + \beta_2 (SDRDisc)_t^2 + \beta_3 SDRAssuRe_t + \beta_4 ((SDRDisc)_t^2 \times SDRAssuRe_t) + \beta_5 BdSize_t + \beta_6 CEOSeat_t + \beta_7 PerIndir_t + \beta_8 BigN_t + \beta_9 Size_t + \beta_{10} ROA_t + \beta_{11} LEV_t + \beta_{12} Loss_t + IndustryandYearFixedEffects + \varepsilon \quad (3)$$

Table 7 shows that the coefficient of β_4 is statistically significant and positive at the 1% and 5% levels in the full sample (0.779, *p-value < 0.01*) and the two sub-samples (0.939, *p-value < 0.05* and 0.810, *p-value < 0.05*, respectively), which is consistent with the primary findings. These results suggest that SDR information contributes to audit effort or audit risk, regardless of whether the SDR is assured by independent licensed assurers or simply approved by the firm's board of directors.

Table 7 Effect of Interaction Between SDR Disclosure Information and SDR Report Assurances on Audit Fees

Variables	Dependent Variable: AudFee					
	Full Sample		Sub-samples *(the structures of business' owners)*			
			Family Business		Institutions	
	β	P-value	*β*	P-value	*β*	P-value
Constant	5.443	0.000	3.395	0.000	6.659	0.000
SDRDisc	-.076	0.912	-.477	0.624	.022	0.982
$SDRDisc^2$	-.078	0.883	.199	0.788	-.167	0.830
AssuRe	-.165	0.161	-.562	0.006	.001	0.995
$SDRDisc^2$ x AssuRe	**.779**	**0.000**	**.939**	**0.010**	**.810**	**0.003**
BdSize	-.015	0.200	-.033	0.044	.006	0.734
CEOSeat	.012	0.000	0.007	0.000	.027	0.000
PerIndir	.392	0.102	1.052	0.002	-.185	0.616
BIG N	.015	0.837	.070	0.492	-.172	0.124
Size	.420	0.000	.521	0.000	.368	0.000
ROA	-.160	0.760	-.804	0.402	.137	0.839
LEV	.397	0.014	.128	0.558	.355	0.169
LOSS	-.018	0.846	.027	0.839	-.056	0.685
Year fixed effects	Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes	
Adj. R square	0.680		0.738		0.651	
F value	55.678		37.559		26.764	
N	619		300		319	

6.2 High-Quality SDR Disclosure and Audit Fees

In several countries, such as the United States, the United Kingdom, and other Asian nations, mandated SDR disclosures are typically evaluated by regulators to assess the quality of their disclosure performance (Lee et al., 2019; Du et al., 2022; García-Sánchez et al., 2022). In the case of Thailand-listed companies, where SDR disclosure is voluntary, the SEC and Thaipat Institution collaborate in announcing annual rewards for firms that provide high-quality SDR information as part of a strategy to promote the development of non-financial information disclosure. To examine the effect of audit complexity for firms recognized for high SDR performance, we replace β_3 equation 3 with *REWARD* and include the interaction term β_4 *SDRISC x REWARD* to analyze the impact of high-quality SDR disclosure on audit fees for firms announced by the SEC in year *t*.

Table 8 shows that the coefficient of β_4 is statistically significant and positive at the 1% level (0.375, *p-value < 0.01*), consistent with the primary findings. This suggests that high-quality SDR disclosure does not reduce audit efforts or audit risks, even for firms recognized for their outstanding SDR performance.

Table 8 Effect of Interaction Between SDR Disclosure and SDR Rewarded by Regulator on Audit Fees

Variables	β	P-value
Constant	7.697	0.000
SDRDisc	-.980	0.000
$SDRDisc^2$	.673	0.001
Reward	-.098	0.160
$SDRDisc^2$ x Reward	**.375**	**0.002**
BdSize	-.016	0.003
CEOSeat	.015	0.000
PerIndir	.546	0.000
BIG N	.166	0.000
Size	.316	0.000
ROA	-.788	0.000
LEV	.302	0.000
LOSS	.050	0.144
Year fixed effects	Yes	
Industry fixed effects	Yes	
Adj. R square	0.586	
F value	166.468	
N	2865	

7. CONCLUSIONS

In the context of voluntary sustainable development report (SDR) disclosure, developing economies are increasingly providing crucial non-financial information through SDRs to meet stakeholders' needs, enhance corporate transparency, and mitigate information asymmetry that causes agency problems. This study reveals that SDR disclosure is positively associated with increased audit fees, indicating that SDR disclosures lead to greater audit complexity. Firms that engage in SDR tend to pay higher costs due to the increased effort and risk assessment required by auditors.

Additionally, we found that firms assuring their SDR disclosures tend to incur higher audit fees. The assurance process enhances the credibility of the disclosed data, which in turn increases the audit effort needed to verify these claims. This additional layer of verification acts as a significant factor in determining audit fees, further complicating the audit process and raising costs. Moreover, this study highlights that even firms recognized for high-quality SDRs do not experience a reduction in annual audit fees.

Our study makes several contributions to the literature. First, it adds to the understanding of SDR disclosure from the perspective of financial report auditors, building on recent work (Du et al., 2020; Garcia et al., 2020). While some researchers suggest that SDR disclosure can reduce audit fees (Du et al., 2020), improve corporate governance mechanisms (Karim et al., 2018; Lee et al., 2019), and enhance operating performance (Chiang et al., 2017), our findings show that auditors may increase fees due to the audit efforts and audit risks involved in understanding the firm's SDR information (Garcia et al., 2020; Koh & Tong, 2013; Gray & Manson, 2007; Perrini et al., 2011; Pirson & Turnbull, 2018). Second, we expand the understanding of auditors' perceptions of SDR disclosure in the context of voluntary non-financial reports and the various SDR frameworks used in developing countries. This raises challenges for audit quality, especially as firms disclose more non-financial information to meet the demands of stakeholders.

Finally, our results have some limitations, particularly related to the analysis of SDR information that follows SEC guidelines. There is a significant gap when comparing SDR information from firms using the GRI or SDG frameworks versus those adhering to the SEC's framework.

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