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Investigating the contribution of corporate sustainability management in the association between cost stickiness and earnings management in Egyptian manufacturing firms

Dr Marwa Rabe Mohamed El Kamash[1*]

Abstract The main aim of this study is to empirically investigate the mediating contribution of corporate sustainability management on the association between cost stickiness and earnings management. In this research, a sample of 41 Egyptian firms listed on the Egyptian Stock Exchange was used for eight years, from 2015 to 2023. OLS regression was used to test the four empirical models.

Cost stickiness is measured using the Homburg and Nasev (2008) model. Selling, general, and administrative expenses are used as a proxy for cost stickiness. Dechow et al. (1995) model is used to measure earnings management, and the S&P Global ESG Score is used to assess a company's sustainability performance, determined by combining its environmental, social, and governance dimension scores.

The findings show that cost stickiness and earnings management are positively correlated. Furthermore, corporate sustainability management negatively impacts cost stickiness. Additionally, corporate sustainability management has a positive effect on earnings management. Finally, the findings indicate that corporate sustainability management mediates the relationship between cost stickiness and earnings management and conclude that it reduces the positive impact of cost stickiness on earnings management.

Practical implications Egyptian regulatory agencies may impose limits on a company's ability to borrow a certain amount relative to its assets to mitigate economic marginalization (EM), given that high levels of financial leverage may increase the risk of EM.

Social implications Increasing the accuracy of the financial accounts of publicly traded Egyptian firms and outlawing earnings management practices.

Originality as far as the researcher is aware, the studies address a scarce relationship, specifically in Egyptian manufacturing companies.

Paper type Research paper

Keywords Cost stickiness, Earnings management, Corporate sustainability management, Egyptian companies

JEL Classification M40, Q51

Introduction

Understanding the interplay between cost stickiness, earnings management, and corporate sustainability management is crucial for managers aiming to balance short-term financial performance with long-term sustainability goals. Companies that effectively manage these aspects

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are better positioned to achieve sustainable growth and maintain stakeholder trust.

When it comes to variations in the intensity of cost drivers, traditional cost behavior models make a distinction between fixed and variable costs. According to these models, costs behave symmetrically, meaning that while fixed costs stay constant regardless of changes in the levels of cost drivers, variable costs may fluctuate, respectively, with changes in the levels of cost drivers [31].

Cost stickiness means that when the business volume of the enterprise decreases, some costs and expenses are not reduced simultaneously but remain within the enterprise in the form of redundant resources Bai et al. [6].

Moreover, according to the agency theory, managers' act as agents who are hired by shareholders; they may have little incentive to optimize firms' operating efficiency. Due to this conflict of interest, opportunistic managers may choose not to reduce costs during periods of downturn for their interest, which will lead to a reduction in net income. A reduction in net income will motivate managers to manipulate earnings to smooth their income [5] and [9]). As costs are a vital component of accounting earnings, cost behavior also has the probable to impact financial reporting decisions. The financial decisions of a company are made based on the information received from the accounting reporting systems. Thus, users would not be able to make rational decisions if accounting information is manipulated [7].

Cost stickiness is a preventable phenomenon that can be disallowed by managers. It is the outcome of their choices about the adjustment of resource costs. Adjustment cost, managers' optimism, managers' incentives, product market competition, and operating policy are the dynamics and factors cause the downward cost adjustment process to be more constrained or slowed down over the period than the upward cost adjustment process [1].

Every company has a goal and a challenge to grow, and this could happen by maintaining earnings smoothing; therefore, if costs do not decrease at a sufficient rate, the earnings of the companies will reduce, and this will drive managers to commit earnings management (EM). Furthermore, regardless of industry or workforce size, earnings management is a complicated, multidimensional phenomenon that impacts companies of all sizes and in all nations Ali et al. [4].

Earnings management can be defined as the use of judgment in financial reporting to alter financial reports to mislead regarding economic performance and to impact outputs that depend on reported accounting figures [48]. Moreover, earnings management is a complex, multifaceted phenomenon that affects businesses of all sizes and in all countries, regardless of industry or workforce size Ali et al. [4]. Therefore, the CS phenomenon could positively affect the firm's [15, 26, 46].

Sustainability is a vital issue and a key concern in the globe. The importance of sustainability reporting has grown in recent years. Although it is not required, most organizations report on their social and environmental performance because of the increased pressure stakeholders place on them to disclose their CSP [25]. CSM is the pursuit of environmental, social, and economic goals to reach long-term success. Thus, corporate sustainability suggests sustainable development, "which meets the needs of the present without compromising the ability of future generations to meet their own needs," including social, economic, and environmental opportunities, it involves innovation in the organizational business model which can aid double the probability of a return on a set of different forms of capital (e.g., social, environmental) rather than just the return on the economic capital [16]. Many authors confirmed that EM practices are decreased in a firm with strong governance and high CSM [26, 33, 47, 50. As a result, governments everywhere promote the integration of sustainability (economic, social, and environmental) factors into businesses across all industries in the modern, competitive world.

Egypt has many vital initiatives such as applying the value-added tax to increase consumption expenditure, improving road networks for development, developing national railway networks, and a green economy for economic development. As a social role, Egypt works on providing an integrated, reachable, high-quality, and universal healthcare system capable of refining health environments and providing the required skills to students and trainees to think imaginatively and permit them technically and technologically [19, 20]. Therefore, the researcher needs to investigate CSM impact in Egypt.

The objective of this study is to examine the mediating influence of corporate sustainability management on the relationship between cost stickiness and earnings management. To the best of the researcher's knowledge, no study conducted in Egypt specifically in the Egyptian manufacturing firms looked at the potential mediating influence of CSM on the link between CS and EM. Thus, this study contributes to the literature and would help in filling this gap.

The results demonstrate a positive correlation between earnings management and cost stickiness. Additionally, it is found that corporate sustainability management has a large negative impact on cost stickiness. Earnings management is also significantly improved by corporate sustainability management. Ultimately, the results show that corporate sustainability management reduces the beneficial effect of cost stickiness on earnings management and

modifies the link between cost stickiness and earnings management.

The rest of the paper is designed as follows: Sect. "Literature review and hypotheses formulation" presents the literature and hypotheses development. Section 3 presents the study methodology, which includes an overview of data collecting, research models, and variable measurements, while Sect. 4 contains the analysis and discussion of the empirical results. Finally, Sect. "Conclusion" concludes the findings, and suggests future research paths.

Literature review and hypotheses formulation

The main objective of this study is to examine the relationship among CS, EM, and CSM, in the Egyptian context. Consequently, the literature review is divided into four sections: The first section covers the research that looks at the direct correlation between CS and EM. The studies in the second section look into how CSM directly affects a company's CS. An overview of research on the direct impact of CSM on a firm's EM is given in the third section. The research that looked at the mediating impact of CSM on the connection between CS and EM is analyzed in the fourth section.

Cost stickiness and earnings management

Several recent studies have concentrated on the association between asymmetric cost behavior and income-increasing short-term EM. This body of literature has interpreted changes in cost behavior as a simple result of financial accounting incentives such as compensation, meeting or exceeding last year's earnings, avoiding reporting losses, and meeting or exceeding consensus analyst forecasts [13].

The formation of an earnings mechanism assists investors in setting more fair prices or values when purchasing private equity placements, which improves the effectiveness of the capital markets [35]. Companies manipulate earnings when sales decrease because doing so increases the intensity of cost reduction through the manipulation of nondiscretionary costs [37]. Moreover, while effective corporate governance has a less significant impact on earnings management, it does lower expense stickiness [32].

Boakye et al. [8] found that firms with higher stickier costs have a stronger relationship with accruals and abnormal returns, implying that EM is more common in these firms. Additionally, Flannery and Mohs [15] argue that the existence of CS leads to decisions that may result in managing earnings to be compensated. Moreover, Xue and Hong [50] and Silva et al. [46] discovered that general administrative expense reduction is the main way managers keep costs under control.

Based on the above analysis of earlier studies, the first hypothesis is developed:

H1: Cost Stickiness has a significant positive effect on Earnings Management.

Corporate sustainability management and cost stickiness

Expectations from consumers, investors, employees, and communities are often the driving forces for social responsibility (CSR) initiatives. Meeting these expectations can enhance reputation, brand value, and stakeholder trust. Therefore, firms may avoid layoffs because they risk damaging the firm's reputation and undermining employee loyalty Guenther et al. [23].

When a company makes a long-term commitment to value creation to participate in CSR, it becomes challenging to immediately cut off committed resources. The degree of CS increases when CSR costs are included in the research model Kristianti and Yuyetta [33]. Fan et al. [14] demonstrated that Chinese organizations with stronger CSR behavior exhibit a higher degree of CS.

In the Egyptian context, Habib and Hasan [24] stated that organizations with stronger CSR behavior exhibit a higher degree of CS. The study found that when strategic CSR scores are high, CS becomes higher. This might be justified owing to the pressures exerted on companies nowadays to comply with societal requirements.

Based on the above discussion of literature related to CSM and CS, the second hypothesis is formulated:

H2: The CSM activities of a firm have a significant negative effect on cost stickiness.

Corporate sustainability management and earnings management

According to Velte [47], accrual-based earnings management (AEM) suffers from ESG practices, whereas real earnings management (REM) is unaffected. Furthermore, since more ethical behavior is linked to socially conscious organizations, Gaio et al. [17] validated this trend and the existence of a negative association between social performance and earnings management. Nevertheless, Moratis and M. van [39] argued that there is not a link between managing earnings and engaging in CSR. According to Goncalves et al. [21], managers who establish high levels of corporate social responsibility (CSR) compliance desist from actions that could negatively impact earnings due to their greater moral beliefs.

CSR is related to ethical and moral concerns about corporate decision-making. Participating in socially responsible initiatives not only raises stakeholder satisfaction but also develops corporate reputation. CSR policies may be an organizational tool that leads to more efficient resource utilization, which has an inverse impact on EM activities [22]. Alodat et al. [3] stated that managers use

less realistic earnings management to guard the firm's earnings in the long term. Chih et al. [10] found that CSR negatively affects EM. The inference behind this is that companies with comprehensive CSR initiatives have a strong commitment to social responsibility and that EM thus happens less frequently. Hong and Andersen [29] exposed that socially responsible firms engage less in REM practices. Scholtens and Kang [45] claimed that Asian enterprises with relatively excellent CSR are much less involved in EM.

On the other hand, Chih et al. [10], Prior et al. [44] in cross-countries, and Gargouri et al. [18] found that CSR has a positive impact on EM. This result is supported by the rationale that managers smooth earnings to reduce earnings volatility to provide stakeholders with more useful information. Earnings smoothing may be beneficial if it improves the information quality of stated profits and aids in forecasting profits for future periods. This occurs when management attempts to minimize current high earnings figures if they anticipate a drop in future profits. The opportunistic financial reporting hypothesis (OFRH) was presented by Pasko et al. [43] and Palacios-Manzano et al. [41]. OFRH suggested that managers continue to utilize EM while being fully aware of the damage it causes and use CSR as a cover to do so.

A useful starting point for studying the relationship between CS, EM, and CSM is stakeholder theory. This approach holds that CSM is required for the company to fulfill broader accountability standards by informing pertinent stakeholders (Buhr [52]; Guay et al. [53]). According to Freeman [51], stakeholder theory examines how organizations handle the people and groups that have the power to influence or be influenced by them. According to the theory, managers must take into account the interests of all stakeholders when making choices, and companies have a duty and obligation to a wider variety of stakeholders (Buhr 2001; Guay et al. 1996). However, this viewpoint does not directly predict management behavior in practice; rather, it offers guidance on how managers might implement methods to manage and respect their various stakeholders (Deegan [54]). According to Grougiou et al. (2014), managers try to attend to a multilateral set of stakeholders' objectives, which results in a high level of information asymmetry between managers and stakeholders because the firm is seen as a multilateral set of relationships among stakeholders. "p-"; Managers have the opportunity to practice EM because of the existence of information asymmetry. Additionally, according to Hoque [56], managers manipulate profits to further their interests at the expense of other stakeholders. Furthermore, as demonstrated by Grougiou et al. (2014) and Sun et al. [55], companies that use CSM to negotiate the interests of many stakeholders are unintentionally expected to use EM. Therefore, using the framework of stakeholder theory, it is reasonable to assume that EM, CS, and CSM have a positive relationship.

Therefore, based on the previous discussion of literature, the researcher formulated the third hypothesis, which could be stated as follows:

H3: The corporate sustainability management activities of a firm have a significant positive relationship with earnings management.

Corporate sustainability management, cost stickiness, and earnings management

CS hurts earnings transparency. This demonstrated how higher expenditures were associated with a decline in a company's earnings transparency.

Furthermore, the relationship between CS and earnings transparency is strongly mediating by CSM. This suggests that CSM initiatives serve as a safeguard against the unfavorable correlation between CS and earnings transparency Oh and Park [40].

Thus, the researcher formulated the fourth hypothesis, which can be stated as follows:

H4: The corporate sustainability management activities of a firm have a significant mediating role in the relationship between cost stickiness and earnings management.

Research methodology

Data collection

The original sample includes all industrial companies in the EGX 100 for 2023, as they are the leading publicly traded firms that meet the sustainability requirements. The data is collected over eight years, from 2015 to 2023, to provide sufficient observations for the research models and to provide robust results that can be generalized. The data collected from annual financial statements on the Mubasher information website mostly for the years 2018 to 2023 and the period from 2015 to 2018 was collected from the investing website.

The study sample contains 41 manufacturing listed companies and 420 firm-year observations. Financial firms were excluded due to their financial reporting requirements, which vary from those of nonfinancial firms, resulting in fundamentally distinct accrual activities that are unlikely to be adequately captured by ordinary accrual activity models.

In March 2010, the EGX introduced the S&P/EGX ESG, the first sustainability index for the MENA region to rank in the top 30. The S&P/EGX ESG assesses the environmental, social, and governance elements of the EGX100 companies. The data collection period covers the years 2015–2023, which marks the start of the implementation of sustainable development goals (SDGs).

The selected sample criteria were companies have to be publicly listed during the selected period. The financial data necessary for measuring CS, EM, and the control variables was collected from the annual financial statements obtained from the companies' official websites, Mubasher Misr, investing and the EGX information center. CSM was measured using the ESG index obtained from the EGX information center and Egypt for Information Dissemination EGID.

Variables measurement

This study uses the model of Homburg and Nasev [28] to measure CS. The Dechow et al. [12] model is used as a proxy for EM; the CSM is measured by the ESG index. To illustrate, this section presents the proxy measures of the study variables.

Cost stickiness (CS) is measured by the model of Homburg and Nasev [28]. Most previous studies measured CS using the [5] ABJ Model. According to Abdel Megeid and El- Deeb [1], the Anderson et al. [5] ABJ Model employs the term "cost stickiness" to characterize asymmetric cost behavior or costs that rise rather than fall in response to changes in demand. The model links variations in net operating revenue to shifts in SG&A expenses. The logarithmic ratio of current net sales and revenue to the previous period's revenue is the independent variable, and the logarithmic ratio of current SG&A to SG&A costs from the prior period is the dependent variable. Hui et al. [30] used a classical model developed by Anderson et al. [5] to estimate the degree of cost stickiness as well.

The literature refers to the asymmetric cost behavior with respect to directions in volume changes as cost stickiness, and when testing the sticky cost hypothesis, sales revenue is usually substituted for output volume, and SG&A expenses are used instead of total costs.

Agreeing with Anderson et al. [5], the dearth of substantial datasets on activity levels and total expenses explains their choice of measurement. According to Anderson and Lanen (2007), sales fluctuations are not an exogenous regressor since sales are dependent on prices, which are determined by management in addition to volume. Additionally, they emphasize that managers have discretion in how costs are categorized and that it can be troublesome to use SG&A, which accounts for around 30% of overall costs Homburg and Nasev [28].

Several follow-up studies have modified the ABJ model (2003) by introducing new determinants of CS (e.g., fixed asset intensity). Their model can be used to investigate various components of SG&A or other types of costs. Seeking more accuracy, the researcher measures the CS variable using the model of Homburg and Nasev [28], as it gives a value for the CS in each observation. According to Homburg and Nasev [28] model, CS is measured as follows:

$$\mathrm{CS_{it}} = \text{SGA Ratio}_{\mathrm{it}} * \text{ Dummy sales ratio}_{\mathrm{it}} * \text{Dummy SGA ratio}_{\mathrm{it}}$$

where SG&A = sales, general, and administrative for the firm I in year *t*. Salesit = sales for firm i in year t. SG&A Ratioit = $[\frac{\text{SG\&Ai,t}}{\text{Salesi,t}} - \frac{\text{SG\&Ai,t}-1}{\text{Salesi,t}-1}]$. Dummy SALES ratioit = 1 if $[\frac{\text{Salesi,t}}{\text{Salesi,t}-1}] < 1$, and 0 otherwise. Dummy SG&A ratioit = 1 if [SG&Ai,t Salesi,t − SG&Ai,t − 1 Salesi,t − 1] > 0, and 0 otherwise.

Earnings management

There have been difficulties in determining the degree of EM, and analysts have thought of several methods. The most widely used models to distinguish between discretionary and nondiscretionary accruals are the modified model created by Dechow et al. [12] and the original Jones (1991) model [38]. The method employed in this study was developed by Leuz et al. [34] and was based on earlier research by Dechow et al. [12], Dechow and Skinner [11], Wang and Campbell [49], and Marie et al. [36] utilized this model as well.

First, accruals and cash flow are shown. The accrual component of earnings is subtracted to determine the cash flow from operations. The accrual component of earnings, as per Dechow et al. [12], can be calculated as follows:

$$\text{Accruals} = (\Delta\text{CA} - \Delta\text{Cash}) - (\Delta\text{CL} - \Delta\text{ASTD} - \Delta\text{TP}) - \text{Dep} \quad (1)$$

where ΔCA = Change in total current asset. ΔCash = Change in cash/cash equivalents. ΔCL = Change in total current liabilities. ΔSTD = Change in short-term debt included in current liabilities. ΔTP = Change in income taxes payable. Dep = Depreciation and amortization. where Δ stands for changes from year t−1 to year t.

$$\text{Cash flow from operation} = \text{ operating earnings} - \text{Accruals} \quad (2)$$

$$\text{EM} = [\text{Accruals}]/[\text{Cash flow from Operations}] \quad (3)$$

Corporate sustainability management

Sustainability reporting is the process of evaluating, reporting, and being responsible to various stakeholders for organizational performance. Companies today need to take accountability for both the positive and negative effects of their actions on the environment and society as a whole. Additionally, the companies should accurately disclose these effects in a suitable sustainability report that provides a thorough overview of their governance

framework, stakeholder engagement strategy, and triple-bottom-line performance.

The business community is paying more and more attention to ESG disclosure, which includes detailed information about an organization's ESG performance and an assessment of its sustainability practices. Businesses that apply these ideas to their operations stand to gain better public relations, more devoted customers, and a positive work environment [2].

Corporate Sustainability Management The S&P Global ESG Score is a single assessment of a company's sustainability performance determined by combining its Environmental, Social, and Governance Dimension Scores, each of which is weighted based on its importance for a given sub-industry. Because of its comprehensiveness and simplicity, this overall score is frequently employed in portfolio or index design. Around 130 question-level scores provide even more information into a company's performance on certain subthemes within each criterion, with approximately half of the questions being industry-specific. Each question is supported by many data points, with a maximum of 1000 per organization. This provides unprecedented transparency about how the S&P Global ESG Scores are calculated and can be used in several ways.

Control variables

Table 1 summarizes the study's main variables and the control variables selected for this study, their proxy measures, and the data source of each variable.

Empirical models specification

Model one

The first model examines the direct impact of CS on EM using the following multiple regression model:

$$\mathrm{EM} = \beta_0 + \beta_1 \mathrm{CS_{it}} + \beta_2 \mathrm{SIZE_{it}} + \beta_3 \mathrm{ROA_{it}} + \beta_4 \mathrm{LEV_{it}} + \varepsilon$$

where Dependent variable = Earnings management (EM). $\beta 0$ = denotes a constant of the regression equation. $\beta 1$ CSit = denotes the regression coefficient of cost stickiness. $\beta 2$ SIZEit, $\beta 3$ ROAit, $\beta 4$ LEVit = denotes control variables, the regression coefficient of firm size, return on assets, and financial leverage. it = Firm i in period t. ε = Standard error term.

Model two

The second model examines the direct impact of CSM on CS using the following multiple regression model:

where

$$\mathrm{CS} = \beta_0 + \beta_1 CSM_{it} + + \varepsilon$$

$\beta 0$ = denotes a constant of the regression equation. $\beta 1$ CSMit = denotes the regression coefficient of corporate sustainability management. it = Firm i in period t. ε = Standard error term.

Model three

The third model examines the impact of CSM on EM using the following multiple regression model:

$$\mathrm{EM} = \beta_0 + \beta_1 \mathrm{CSM_{it}} + \beta_2 \mathrm{SIZE_{it}} + \beta_3 \mathrm{ROA_{it}} + \beta_4 \mathrm{LEV_{it}} + \varepsilon$$

where $\beta 0$ = denotes a constant of the regression equation. $\beta 1$ CSMit = denotes the regression coefficient of corporate sustainability management. $\beta 2$ SIZEit, $\beta 3$ ROAit, $\beta 4$ LEVit = denotes control variables, the regression coefficient of firm size, return on assets, and financial leverage. it = Firm i in period t. ε = Standard error term.

Model four

The fourth model examines the mediating impact of CSM on the relationship between CS and EM using the following multiple regression model:

$$\mathrm{EM} = \beta_0 + \beta_1 \mathrm{CS_{it}} + \beta_2 \mathrm{CSM_{it}} + \beta_3 \mathrm{CS_{it}} \times \mathrm{CSM_{it}} + \beta_4 \mathrm{SIZE_{it}} + \beta_5 \mathrm{ROA_{it}} + \beta_6 \mathrm{LEV_{it}} + \varepsilon$$

Table 1 Variables measurements, proxies, and sources

Name	Proxies measures	Data source
Cost stickiness (CS)	The model of Homburg and Nasev [28] is used CSit = SG&A Ratioit * Dummy SALES ratio it * Dummy SG&A ratio it	Financial statements
Earnings management (EM)	Dechow et al. [12]	Financial statements
Corporate sustainability management (CSM)	The S&P Global ESG Score	S&P Global ESG Score
Firm size (size)	*Size*it = *Natural log of* (*total assets*)	Financial statements
Return on assets (ROA)	ROAit = Net Income / Total Assets	Financial statements
Financial leverage (LEV)	LEVit = Total Debts / Total Equity	Financial statements

Source: Author creation

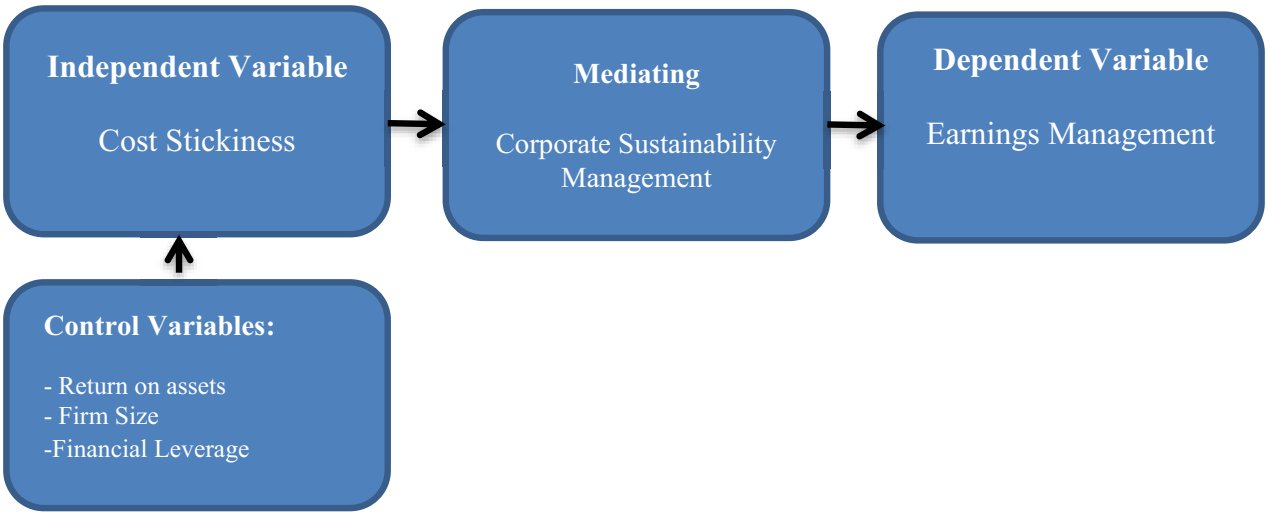


Fig. 1 The research conceptual framework. Source: author creation

where β_0 = denotes a constant of the regression equation. β_1 CSit = denotes the regression coefficient of cost stickiness. β_2 CSMit = denotes regression coefficient of corporate sustainability management. β_3 CSit × CSMit = denotes regression coefficient of cost stickiness × corporate sustainability management. β_4 SIZEit, β_5 ROAit, β_6 LEVit = denotes control variables, the regression coefficient of firm size, return on assets, and financial leverage. it = Firm i in period t. ε = Standard error term.

Figure 1 presents the research conceptual framework, showing corporate sustainability management as a mediating variable.

Results and discussion

The statistical analysis and hypotheses testing section is divided into the following: descriptive statistics, matrix of correlation, evaluation of the OLS regressions, hypotheses testing, and discussion of results.

Descriptive analysis

Table 2 shows descriptive statistics for the independent, dependent, and control variables of the study.

In terms of the dependent variables, the mean of EM is (0.071) and a median of (0.054) with a maximum value of (0.31) and a minimum value of (0.001) representing firms with a very low level of EM, and the standard deviation value is (0.069).

While CS has a mean of (0.004) and a median of (0) meaning that 50% or more of the observations have zero CS, with a maximum value of (3.552) indicating a high level of CS and a minimum value of (0) representing firms with no CS, and the standard deviation value is (0.005). CSM has a mean of (211.41) and a median of (209.39) meaning that 50% of data points have a value smaller or equal to the median and 50% of data points have a value higher or equal to the median, and the standard deviation value is (13.073).

Regarding the control variables, firm size has a mean of (27.55) and a median of (24.57), with a minimum and maximum value of (18.97) and (26.95), respectively, and

Table 2 Descriptive statistics

Variable	Obs	Mean	Median	Std. Dev	Min	Max
Earnings management (EM)	420	0.071	0.054	0.069	0.001	0.31
Cost stickiness (CS)	420	0.004	0	0.005	0	3.552
Corporate sustainability management (CSM)	420	211.41	209.39	13.073	0	1
Firm size (Size)	420	27.55	24.57	1.75	18.97	26.95
Return on assets (ROA)	420	0.063	0.052	0.062	−0.089	0.16
Financial leverage (LEV)	420	1.233	0.868	1.84	0.023	4.88

Source: Author creation

Table 3 Pearson correlation test

Variables	CS	EM	CSM	Size	ROA	LEV
CS	1.000	0.053				
EM	−0.003	1.000				
CSM	0.089	−0.021	1.000			
Size	0.124*	−0.148**	0.347***	1.000		
ROA	0.104*	−0.141**	0.200***	0.306***	1.000	
LEV	0.042	0.130**	0.025	0.272***	−0.220***	1.000

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Source: Author creation

Table 4 Variance inflation factor

	VIF	1/VIF
CSM	1.561	0.641
CS	1.189	0.841
SIZE	1.891	0.528
LEV	1.768	0.565
Mean VIF	2.484	

Source: Author creation

Table 5 Linear regression for model one

Dependent: Earnings management	Coef.	*p* Value	Sig
Cost stickiness	0.001	0.074	*
Firm size	−0.011	0.002	***
Return on assets	0.178	0.01	***
Financial leverage	0.005	0.06	*
R-squared	0.077	Number of observations	424

***$p<0.01$, **$p<0.05$, *$p<0.1$

Source: Author creation

a standard deviation value of (1.75). ROA has a mean of (0.063) and a median of (0.062), with minimum and maximum values of (-0.089 and 0.16), respectively, *and the standard deviation value is (0.062). Financial leverage has a mean of* (1.233) and a median of (0.868), with a minimum and maximum value of (0.023) and (4.278), respectively, and the standard deviation value is (1.294). GROWTH has a mean of (0.13) and a median of (0.124), with a minimum and maximum value of (0.583) and (0.831, 4.88), respectively, and the standard deviation value is (1.84).

To determine both the direction and the strength of the relationship between the independent and dependent variables, a Pearson correlation matrix is built. The Pearson correlation values with a two-tailed significance test are shown in Table 3. The findings displayed that firm size (Size) and return on assets (ROA) have the strongest correlations with corporate sustainability management (CSM), all of which are significant at the 0.01 level. This implies that large firms with high ROA have more sustainability practices. Moreover, the most correlated variable with cost stickiness (CS) is firm size (Size).

Companies may experience a higher level of CS due to reasons such as social, personnel, operating, psychological, and agency-related reasons. Additionally, the most correlated variable with earnings management (EM) is 0.130**, significant at 0.05 level.

Multicollinearity test

As said by Field [57], when two or more independent variables in a regression model have a strong association with one another, this is known statistically as multicollinearity. Because of this, while doing a regression analysis, it could be challenging to determine with precision the different impacts of each independent variable on the dependent variable.

When the tolerance factor (1/VIF) is less than 0.10 and the variance inflation factor (VIF) of any independent variable is greater than 10, multicollinearity is present. Every explanatory variable in the OLS model has a tolerance coefficient of more than 0 and a VIF coefficient of less than 10, as shown in Table 4. Consequently, there is not any multicollinearity between them.

Evaluation of the OLS regression

Each hypothesis is tested using multiple regression after conducting tests that ensure that the findings are reliable.

Results of the relation between cost stickiness and earnings management

The coefficient of determination (R2) is 7.7%, as Table 5 demonstrates. This indicates that approximately 7.7% of the variance in the dependent variable, EM, is

explained by the independent variables included in the study model. The findings shown in Table 5 illustrate that, with a p value of (0.074) significant at 10% and a coefficient of (0.001), CS has a positive significant influence on EM. The results align with other research undertaken in various countries as well as the literature) [15, 26].

Thus, the first hypothesis which states that "*Cost Stickiness has a significant positive effect on Earnings Management"* is accepted.

The asymmetric cost behavior about changes in sales may justify this, as it increases earnings instability and limits managers' ability to report steady income streams. This suggests that companies with stickier costs are more likely to manipulate earnings to meet their targets, and as a result, managers will receive compensation.

Results of the relation between corporate sustainability management and cost stickiness

The coefficient of determination (R2) is 20.3%, as Table 6 demonstrates. This indicates that approximately 20.3% of the variance in the dependent variable, CS, is explained by the independent variables included in the study model. The findings shown in Table 6 illustrate that, with a p value of (0.056) significant at 10% and a coefficient of (0.004). CSM has a negative significant effect on CS. Therefore, the second hypothesis, which states that: "*The CSM activities of a firm have a significant negative effect on Cost Stickiness"* is accepted. This result is consistent with Wan and Wang (2011), and Chen et al. [9] that found that CSM and CS are negatively related.

The obtained results proved that on the one hand adopting sustainable practices usually means that companies have to become more economical with their resources. By using less energy and water and producing less waste, this can result in cost savings. By bringing expenses into line with real resource utilization, these efficiency gains may contribute to a decrease in CS. Applying sustainable techniques has a long-term impact on cost savings. On the other hand, sustainability frequently forces Egyptian businesses to embrace cutting-edge procedures and new technologies. Using renewable resources, streamlining operations, and cutting waste can all result in cost savings.

Table 6 Linear Regression for Model Two

Dependent: Cost stickiness	Coef.	*p* value	Sig
Corporate sustainability management	-0.004	0.056	*
R-squared	0.203	Number of observations	424

***$p<0.01$, **$p<0.05$, *$p<0.1$

Source: Author creation

Table 7 Linear regression for model three

Dependent: Earnings management	Coef.	*p* Value	Sig
Corporate sustainability management	0.001	0.078	*
Firm size	−0.011	0.001	***
Return on assets	0.178	0.016	***
Financial leverage	0.006	0.028	*
R-squared	0.084	Number of observations	424

***$p<0.01$, **$p<0.05$, *$p<0.1$

Results of the relation between corporate sustainability management and earnings management

The coefficient of determination (R2) is 8.4%, as Table 7 demonstrates. This indicates that approximately 8.4% of the variance in the dependent variable, EM, is explained by the independent variables included in the study model. The findings shown in Table 7 illustrate that, with a p value of (0.078) significant at 10% and a coefficient of (0.001). CSM has a positive significant effect on EM. Thus, "*The Corporate Sustainability Management activities of a firm have a significant positive relationship with Earnings Management"* is accepted. This result is consistent with Prior et al. [44], Gargouri et al. [18], and Pasko et al. [43].

The Egyptian government and regulatory bodies are putting more effort into sustainability and enforcing stricter laws on companies to minimize their environmental impacts. This could be the cause of the positive correlation between CSM and EM in the Egyptian listed companies. Adherence to these requirements often requires significant investments in sustainable practices. Due to their effects on the timing and recognition

Table 8 Linear regression for model four

Dependent: Earnings management	Coef	p Value	Sig
Cost stickiness	0.072	0.002	
Corporate sustainability management	0.001	0.076	*
CS x CSM	−0.001	0.002	***
Firm size	−0.011	0.001	***
Return on assets	0.167	0.017	***
Financial leverage	0.005	0.055	*
R-squared	0.087	Number of observations	424

***$p<0.01$, **$p<0.05$, *$p<0.1$

Source: Author creation

of expenses and revenues, these investments may affect accrual EM. Companies may be encouraged to control accruals to satisfy financial performance targets, follow the regulations, and offset the costs of sustainability programs. Furthermore, Egyptian companies can manage their earnings by implementing sustainability to qualify for tax benefits, or other incentives, which will raise earnings.

Results of the mediating effect of corporate sustainability management on the association between cost stickiness and earnings management

The coefficient of determination (R2) is 8.7%, as Table 8 demonstrates. This indicates that approximately 8.7% of the variance in the dependent variable, EM, is explained by the independent variables included in the study model. The interaction of CS and CSM, which represents the mediating effect of CSM on the relationship between CS and EM has a negative significant mediating role. Consequently, the fourth hypothesis which states that "*The Corporate Sustainability Management activities of a firm have a significant negative mediating role in the relationship between Cost Stickiness and Earnings Management*" is accepted.

The mediating role of CSM in the relationship between CS and EM in Egyptian firms results from the point that sustainable strategies are the identification and management of social and environmental risks; therefore, the companies that proactively manage these risks can lower the probability of unforeseen expenses and unfavorable financial outcomes. This risk management strategy can reduce the need for EM since companies are less prone to adjust financial results to balance unforeseen expenditures or prevent undesirable effects.

Conclusion

The accounting literature now includes empirical findings from the current investigation. The principal conclusions of this study are as follows: First of all, CS greatly enhances EM. The findings are consistent with earlier studies conducted in other countries. In the Egyptian context, asymmetric cost behaviors increase profitability volatility, making it more difficult for managers to report consistent revenue streams. This implies that companies with larger costs have a propensity to manipulate profitability to meet targets and, as a result, receive compensation.

Studying CS and EM could provide valuable insights to Egyptian managers, investors, and analysts in several ways. For managers, understanding CS could help managers identify cost categories that are more resistant to changes in activity levels. This knowledge allows managers to focus their cost control efforts on the less sticky cost components, which are easier to adjust in the short term. This understanding could help in setting realistic performance targets and evaluating the performance of different business units or departments. Therefore, managers would reduce EM practices.

CSM has a negative significant effect on CS. This is because using renewable resources, streamlining operations, and cutting waste can all result in cost savings. Similarly, companies with strong governance will have little conflict of interest, which could encourage management to put their interests first.

Moreover, CSM has a positive significant effect on EM. This could be seen as a result of the fact that using CSR has more advantages than disadvantages. To put it another way, there are several ways to boost income through sustainable measures without resorting to deception or using sustainability as a cover for unethical behavior. Companies may carry out more EM to show their shareholders eye-catching figures, but they may also carry out more CSR to avoid detection. Fourth, the CSM moderates the relationship between CS and EM. One common element of CSM is looking at the implications of company decisions. A company that prioritizes sustainability is more likely to focus on building long-term value rather than boosting profits in the short term. By emphasizing sustainable practices, companies can reduce the pressure on managers to employ EM tactics that are more immediate, like CS. Enhancing financial reporting transparency is another aspect of CSM. In particular, EM tactics including CS may become less necessary if companies reported on their nonfinancial as well as financial performance more thoroughly and accurately. More transparency about a company's operations means that stakeholders—like analysts, investors, and regulatory bodies—can more effectively oppose management's attempts to influence profits.

Egyptian managers would apply CSM practices due to their good impact on both the CS phenomenon and EM. For investors, EM could influence a company's stock price. When a company reports earnings that exceed expectations, its stock price often rises. On the other hand, if the reported earnings fall short of expectations, the stock price might drop. Therefore, understanding EM practices could help investors predict potential stock price movements. For analysts, knowledge of CS helps analysts make more accurate financial forecasts. By understanding the stickiness of costs, analysts can project the impact of changes in activity levels on a company's cost structure. So, this would not put stress on managers to meet the analysts' expectations by managing earnings because the projections were based on the existence of the CS phenomenon.

The study's conclusions could contribute to increasing the accuracy of Egyptian publicly traded firms' financial accounts and outlawing EM practices because they have an impact on decision-makers. Because excessive levels of financial leverage might increase the risk of EM, Egyptian regulatory agencies could put limitations on how much a company can borrow in relation to its assets to reduce EM.

Managers should identify which costs are sticky and which are not, and they should focus their cost-controlling efforts on the less sticky costs. This differentiation may prove beneficial in setting realistic performance objectives and evaluating the efficiency of different departments or business units. As a result, managers will use EM techniques less frequently, which will be reflected in their transparent financial reporting methods.

The study's findings, which have an effect on decision-makers, may help to increase the accuracy of the financial records of Egyptian publicly traded companies and to criminalize EM activities. Egyptian regulatory agencies may impose limits on a company's ability to borrow a certain amount relative to its assets in order to mitigate economic marginalization (EM), given that high levels of financial leverage may raise the danger of it.

It is recommended that managers determine which costs are sticky and which are not, and concentrate their cost-controlling activities on the less sticky expenditures. This distinction could be useful for establishing reasonable performance goals and assessing the effectiveness of various divisions or business units. Managers will consequently employ EM approaches less frequently, which will be obvious in their open and honest financial reporting practices. Future research could use information from Egypt's banking industry to look at how CS affects EM.

The study suffer from some limitations: small sample, ESG score limitations, potential reverse causality.

Abbreviations

CS	Cost stickiness
EM	Earnings management
AEM	Accrual-based earnings management
REM	Real earnings management
CSR	Corporate social responsibility
ROA	Return on assets
LEV	Financial leverage
VIF	Variance inflation factor
R2	Coefficient of determination

Supplementary Information

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Additional file 1.

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