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# Nexus among herding behavior, ESG disclosure, and market capitalization in the Egyptian stock market

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## Abstract

**Purpose** This study aims to investigate the impact of herding behavior on environmental, social, governance (ESG) disclosure among firms listed on the Egyptian stock exchange, with the moderating role of market capitalization.

**Design/methodology/approach** The sample consists of 37 Egyptian firms within the EGX70 index covering the period between 2019 and 2023. The analysis employs a panel data analysis using a Fixed Effects Model. ESG disclosure was measured using the ESG index, while herding behavior was measured by stock return dispersion, and market capitalization was measured by multiplying the number of shares outstanding by price.

**Research Limitation/Implication** This study is limited to the context of Egypt and the data sample, with further limitations including a small sample size and the influence of COVID-19 during the time period used. However, this study contributes to the growing literature on ESG and investigates the behavioral drivers of disclosure specifically in the Egyptian stock market.

**Findings** Results reveal that herding behavior has a positive but insignificant relationship with ESG disclosure. The study further investigates the moderating role of market capitalization, which has a positive but insignificant relationship, and has two control variables, with firm size showing a significant positive relationship, while financial leverage shows an insignificant positive relationship with the ESG disclosure. Overall, while some firms may imitate other firms in disclosing ESG practices, herding behavior is not the dominant force for ESG disclosure in Egypt.

**Theoretical implications** The study combined stakeholder theory and behavioral finance to provide evidence that internal and regulatory mechanisms overwhelm herding forces in emerging economies. The research resists typical market imitation thought by placing emphasis on institutional structure and firm-specific resources.

**Originality/value** This study has valuable insights for investors, regulators, and corporate directors by highlighting the limited impact of market imitation and emphasizing the importance of internal company characteristics in ESG disclosure. Moreover, the study suggests that a more robust regulatory framework must be in place and that more awareness initiatives should be implemented to promote better ESG disclosure across the Egyptian financial market.

**Keywords** ESG, Herding behavior, Market capitalization, Firm size

**JEL Classification** M14

## Introduction

Herding behavior is one of the well-known financial market cognitive biases where investors follow others at the expense of their information or rational thinking [1]. It could be due to the influence of social pressure, such as fearing being excluded or having to fit into the existing

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scenario, or cognitive heuristics on decision-making to avoid effort costs [2]. Herding is capable of generating extreme divergence between asset prices and their intrinsic values, leading to market volatility [1]. External influences, such as the actions of financial analysts, as well as social forces in general, support herding behavior. To explain, it is explained by Said et al. [3] that investors end up following professional advice more often than not, which once more can be impacted by the analysts' herding that trend-follow as opposed to independent research. Similarly, Reiner et al. [4] recognize that financial professionals are prone to lead clients into popular investment directions, continuing the herding behavior. Social pressure in the form of dependence on other people's actions during uncertain situations and normative pressure for compliance regarding group standards also drives herding further [2].

This measure reflects the sentiment of investors and the approximate financial position of a firm and thus facilitates cross-industry comparability [3]. Market capitalization comes out as a necessary instrument for investors who must assess investment prospects in highly changing monetary surroundings [3]. Market capitalization is subject to herding behavior by influencing stock prices relative to underlying values under periods of high volatility [1].

In terms of market capitalization in the Egyptian exchange (EGX), the graph illustrates five years' trends from 2019 to 2023. It uses a simple graphical curve to show that there is relative growth in the EGX market capitalization in five years, indicative of rising investor confidence in the Egyptian stock market. There have been periods of turmoil, especially from 2020 to early 2023; however, since then, there has been solid growth from

mid-2023 onward, showing strong investor sentiment and economic recovery (Fig. 1).

The connection between market capitalization, herding, and ESG disclosure is more applicable to emerging markets, which can be more under the control of informational asymmetry and behavioral bias [2]. Peer action or lack of information can be used by investors for increased herding which can affect the use of ESG practices in a negative way [2]. Conversely, good disclosure of ESG can defy herding through greater transparency and the attraction of sophisticated investors seeking fundamentals [5]. Investors, regulators, and business leaders who want to construct sustainable financial markets need to understand such dynamics.

Although there is increasing study on ESG disclosure and investor behavior, especially in developing countries such Egypt, major gaps still exist. Most current research mostly concentrate on developed markets where strong regulatory systems and experienced investor bases promote ESG adoption [6, 7]. Emerging markets can influence ESG disclosure in conformity with regulatory changes, investors' lack of knowledge, and attitude biases [8]. Herding behavior has been found to be associated with market movements [9], but how they influence ESG disclosure and the moderating influence of market capitalization on frontier markets such as Egypt, where Decree No. 108 of 2021 made ESG disclosure compulsory, is unknown. This study reveals the impact of herding behavior on ESG disclosure of Egyptian stock exchange (EGX70 index) firms and the moderating role of market capitalization. This Egyptian study of a rapidly evolving market economy provides new evidence on the structure and behavioral drivers of sustainability reporting of direct relevance to investors, regulators, and



**Fig. 1** Market Capitalization in the EGX. Source: CEIC, The Egyptian Exchange

policymakers aiming to build sustainable financial markets in the emerging world.

The rest of the study is organized as follows: Section "Theoretical framework" sets out the theoretical framework and hypotheses development. Section "Conceptual development and hypotheses" describes the research methodology, including sample selection, data collection, and measurement of variables, while Section "Data and methodology" presents the results of the empirical analysis, and Section "Data analysis" presents the conclusion.

### Theoretical framework

Theoretical frameworks employed in this study are based on five theoretical frameworks—information cascade theory, conformity theory, signaling theory, stakeholder theory, and behavioral finance theory—employed together to determine the relationship between herding behavior, environmental, social, and governance (ESG) disclosure, and market capitalization in the Egyptian market. These theories provide a reasonable framework for measuring investor behavior, firm disclosure policy, and market mechanisms within an emerging market environment.

#### Information cascade theory

Information cascade theory holds that investors, where uncertainty prevails, imitate perceived informed actors like fund managers and end up engaging in herd behavior [9]. Market capitalization and stock prices of financial markets can be boosted, especially for ESG-aware companies, as investors track the early birds without considering underlying fundamentals [9, 10]. Empirical research in emerging markets indicates that cascades increase volatility, as demonstrated in research on price deviations resulting from herding [11]. In Egypt, where informational asymmetry is rife, cascades are bound to induce investors to invest in firms with transparent ESG announcements and impact market capitalization [3].

#### Conformity theory

Conformity theory hypothesizes that investors follow group norms to secure social approval or escape disapproval and hence exhibit herding [12]. Social trading platforms and popular traders in Egypt's stock exchange can encourage conformity, and this affected investors to imitate ESG trends [13]. Empirical evidence showed that the herding of conformity is more likely if market signals such as peer firms' ESG disclosure are stronger [14, 15]. The existence of such a relationship may pressure Egyptian companies to internalize ESG in order to satisfy stakeholders, influencing disclosure levels [12].

#### Signaling theory

Signaling theory explains how firms signal quality to stakeholders of information asymmetry [16]. Business managers (signalers) utilize practices such as ESG disclosures (signals) to convey financial and non-financial capabilities to investors and other stakeholders (receivers) [17, 18]. In Egypt, corporate reputation with robust positive ESG values can speak on behalf of sustainability, distinguish in a competitive marketplace, and gain the attention of investors [16]. Quality disclosure of ESG constructs market capitalization through reduced risk and trust. The challenge lies in the fact that misinterpretation by stakeholders empowers them not [18].

#### Stakeholder theory

Stakeholder theory suggests that companies have an ethical responsibility to serve the interests of all the stakeholders to whom the company operations impact—employees, customers, suppliers, communities, and regulators—over a single-minded focus on shareholders [19]. With stakeholder sensitivity, companies can build their reputation, gain trust, and survive in the long run [20, 21]. Complete transparency on ESG issues in the Egyptian market is in line with stakeholders' expectations, as it enables good quality of information with the ability to overcome herding behavior through well-informed investment choices [19]. The board of directors plays a central role in supporting stakeholders' responsibility, and this can increase investors' confidence and positively affect market capitalization [20]. This stakeholder-led vision is but one illustration of the saliency of ESG practices in providing sustainable value across emerging markets.

#### Behavioral finance theory

Behavioral finance theory combines economic decision and psychological theory that explains the method of forming irrational financial choices via cognitive predisposition and affect [22]. Overconfidence, confirmation bias, and loss aversion lead to herding because the investor is using the crowd or affective choice rather than reasoning [23, 24]. Bias in Egypt's volatile stock market can also be compounded and affect the application of ESG and market capitalization [22]. The higher the application of fintech and AI systems, the more critical the situation is because overreliance on algorithms or circumventing automatic channels can lead biases to grow deeper [25, 26]. Approaches like goal-based investing and behavioral portfolio management can steer clear of these biases through connecting investment decisions with long-term targets

and showing more contained behavior on ESG-biased investment [23].

In Egypt’s developing stock market, confirmation bias and loss aversion are worsened by regulatory changes like Decree No. 108 of 2021 and economic uncertainty, requiring disclosure on ESG [27]. Empirical evidence shows that investors in emerging markets like Egyptian investors overspend on market sentiment due to the unavailability of reliable information, and thus herding becomes extreme, affecting companies’ ESG adoption practices [3]. This psychological behavior could deter small resource-constrained firms from placing a value on ESG disclosure because they follow market leaders rather than taking a different approach [8]. By providing regulation incentives or investor education, policymakers can align behavioral biases with sustainable investment objectives, improve ESG disclosure and market stability [23].

**Conceptual development and hypotheses**

This section develops the theoretical structure of the study by looking at the interactions between herding behavior, ESG disclosure, and market capitalization for the Egyptian market. The section has two subsections: The first is used to study the direct influence of herding behavior on ESG disclosure and develop the first hypothesis, and the second is used to study the moderating influence of market capitalization and develop the second hypothesis. In order to explain the relationship between theoretical frameworks and the constructs being studied, Table 1 assigns each theory to the variables of herding behavior, ESG disclosure, and market capitalization, announcing their conceptual relationships.

**Herding behavior and ESG disclosure**

Herding behavior has a considerable effect on financial markets by stimulating volatility and system risk,

especially in times of uncertainty such as Egypt’s [28]. Strategic following of market trends owing to perceived informational benefit and spurious following owing to communal information or regulation are at times involved in herding [11]. In the Egyptian stock market, dividend per share, price-to-earnings (P/E) ratios, and earnings per share (EPS) as company-specific factors increase herding, as investors imitate growth stocks or liquid markets [13].

ESG disclosure on environmental, social, and governance themes increases transparency and stakeholder trust, as required by Egypt’s Decree No. 108 of 2021 [27]. Nevertheless, insufficient available ESG data hinders investor decisions [29]. Herding can influence companies to follow ESG disclosure to be ahead of the market movement or competitor group, especially due to pressure from investors demanding green programs [30]. For example, large companies’ publication of quality ESG performance will trigger other companies to follow the behavior. It is a result of purposeful herding [11]. This indicates that the herding behavior plays a significant role in ESG disclosure practice under the Egyptian stock exchange. This would imply that herding behavior is a significant determinant of firms’ ESG disclosure practices in the Egyptian stock market. According to this, the following hypothesis can be formulated:

H1: Herding behavior has a significant impact on ESG disclosure in firms listed on the Egyptian stock exchange.

**Market capitalization moderating role**

Market capitalization, or the sum of the market value of all of a firm’s outstanding shares, is the perfect indicator of the size, growth potential, and investor faith in a firm [31]. Originally formed by way of an initial public offering (IPO) and later by supply-and-demand forces in the market, market capitalization reflects the worth of a firm and decides investment [31]. The firm is classified under

**Table 1** Mapping of theoretical frameworks to constructs

Theory	Herding behavior	ESG disclosure	Market capitalization
Information cascade theory	Investors mimic perceived informed agents, amplifying herding [9]	Cascades drive firms to disclose ESG to align with market trends [11]	Cascades inflate stock prices, increasing market capitalization [3]
Conformity theory	Social pressures lead investors to follow group norms, fostering herding [12]	Firms disclose ESG to meet stakeholder expectations [14]	Conformity-driven herding boosts demand for high-ESG firms, raising market value [13]
Signaling theory	Herding reflects investor response to firm signals [16]	ESG disclosure signals firm quality, attracting investors [6]	Strong ESG signals enhance investor confidence, increasing market capitalization [18]
Stakeholder theory	Herding reflects stakeholder-driven market trends [19]	ESG disclosure aligns with stakeholder demands for transparency [27]	Stakeholder trust in ESG practices boosts firm value [8]
Behavioral finance theory	Cognitive biases drive herding behavior [22, 23]	Biases influence firms’ ESG adoption based on market sentiment [25]	Biases amplify herding, impacting stock prices and market capitalization [11]

large-cap ( $\geq$  \$10 billion), mid-cap (\$2–10 billion), and small-cap ( $<$  \$2 billion) with a unique risk and return profile [31]. Large-cap firms, which are seen to be stable and powerful, would likely attract strong investor attention, potentially inducing herding due to their visibility and perceived credibility [13].

Market capitalization also can mitigate the herding behavior versus ESG adoption relationship in the case of ESG disclosure. Large-cap firms, with greater resources and stakeholder monitoring, will implement comprehensive ESG disclosures to convey sustainability and raise capital [27]. Investor herding behavior toward large-cap firms is most likely to be greater, as they are highly transparent and liquid, encouraging trend-following [13]. Thus, the influence of herding on ESG disclosure should be stronger in the case of large-cap firms since they are more prominent in the marketplace and thus stronger in their force to conform to ESG sentiments [30]. Small-cap firms, which have less with them in terms of resources as well as publicity, should exhibit weaker ESG uptake due to herding. Thus, market capitalization would mediate herding activity with ESG disclosure by influencing how much the firms respond to pressure from investors. Based on this, the following hypothesis has been formulated:

H2: Market capitalization serves as a moderator between herding behavior and ESG disclosure by Egyptian stock exchange firms.

### Data and methodology

This section presents an overview of the data collection process, sampling process, and methodology used in investigating how the impact of herding behavior is being moderated to influence ESG disclosure using market capitalization as a mediator in listed Egyptian stock exchange (EGX) firms. The model employs panel data regression, a widely used method of testing interactions between financial and behavioral variables in sustainability studies [20, 27]. The technique allows for the estimation of control variables, market capitalization, herding behavior, and ESG disclosure all at once, enabling valid inferences of hypothesized interactions.

Among mid- and small-cap firms whose aggregate contribution accounts for most of Egypt's non-financial market activity, 37 were selected to capture the diversity of the EGX70 index [3]. The panel data approach—185 firm-year observations for five years—is offset by the relatively small sample size ( $n=37$ ) by generating statistical power under the guise of cross-sectional as well as over-time coverage [32]. The specificity of the sample to non-financial firms ensures that it is relevant to firms in industries with comparable ESG disclosure conduct, while the omission of firms with missing data minimizes

bias, ensuring quality data [33]. Although the sample size limits broader generalizability, it is tailored to the EGX70's makeup and sufficient for panel regression analysis within an emerging market setting [20].

The study uses a fixed effects multiway FE model that controls for time-invariant firm-level heterogeneity, e.g., governance structures, that could affect ESG disclosure [34]. Although the FE model is effective in controlling unobserved firm-specific effects, it is not limitless. It then poses the question that unobserved heterogeneity is correlated with the regressors and perhaps not even fully capable of accounting for time-varying determinants of ESG disclosure such as shifts in market mood or sentiment or shifting regulation [35]. The FE model also eliminates between-firm variation, which may constrain conclusions for cross-sectional variation by industry [34]. With Egypt's sample size of 37 companies, this would limit the generality, especially for those industries which are underrepresented in the EGX70 index [20]. All these notwithstanding, stability of the FE model is guaranteed through the Hausman test, and the panel data structure addresses some of the issues through the use of both time-series and cross-sectional data [32].

### Sample and data collection

The study population consists of non-financial firms listed on the EGX70 index, which captures mid- and small-cap firms in Egypt's market. The period of data collection is from 2019 to 2023 and coincides with Egypt's growing focus on sustainability reporting since Decree No. 108 of 2021 [27]. Data were obtained from annual reports, board of directors' reports, financial statements, and stock price data accessed through Investing.com, complemented with the EGX sustainability reports. Banks (3 firms) were excluded because of their specific regulatory and accounting requirements [20]. Upon the exclusion of 30 firms with lacking or missing data, the final sample includes 37 non-financial firms from a variety of industries, with 185 firm-year observations.

To quantify ESG disclosure, an ESG index score was constructed based on content analysis of GRI-aligned sustainability reports (Almnadheh [36]). Cross-sectional standard deviation (CSSD) of stock returns, widely applied in behavioral finance, was utilized to quantify herding behavior. Market capitalization was computed as the product of market price per share and outstanding shares [37]. A natural log of the size of the firm (total assets) and financial leverage control variables (total liabilities/total assets) were derived from financial statements. Sectoral diversification of the sample is depicted by the manufacturing, construction, and services industries in Fig. 2.

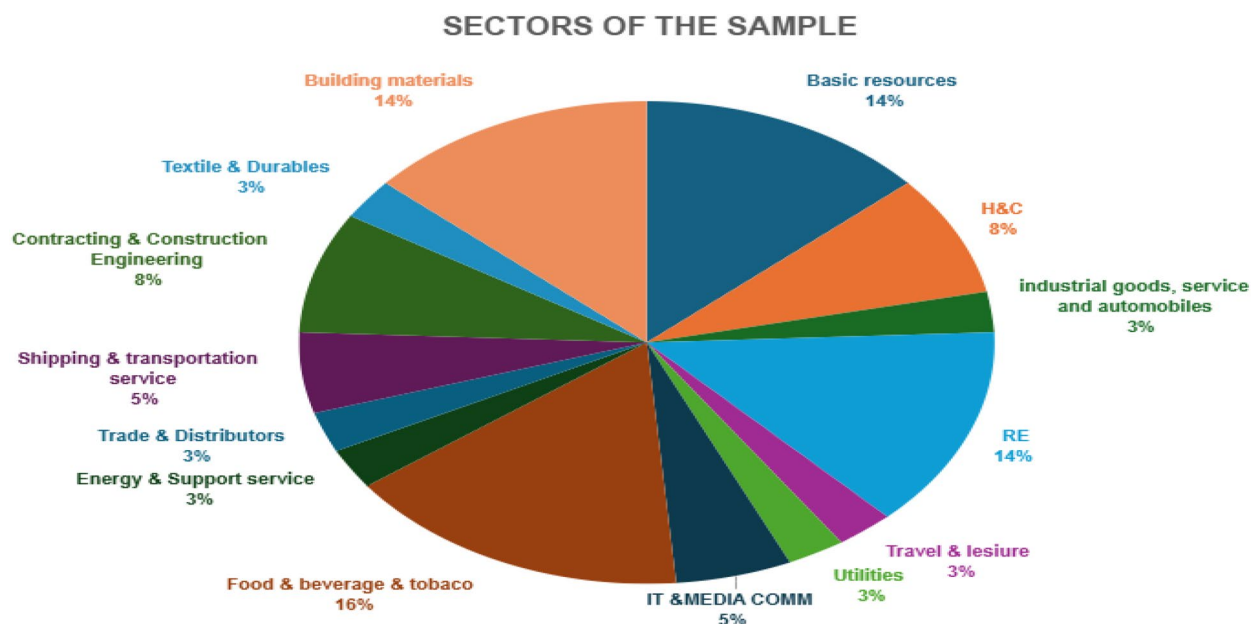


Fig. 2 Sample industry diversification

**Study variables and research model**

Theoretical and empirical research in herding behavior, ESG disclosure, and market behavior guide the selection of variables [20, 27]. Herding behavior (CSSD) is the independent variable to test its effect on the dependent variable, ESG disclosure, as gauged through the ESG index score [38]. Market capitalization (MCAP) is used as the moderating variable as specified by its function to enhance or suppress herding’s impact on ESG disclosure [37]. Control variables—firm size (FS) and financial leverage (LEV)—are used because of their documented effect on ESG practices and market behavior [20].

The theoretical model, shown in Fig. 3, depicts the hypothesized relationships: (H1) herding directly affects ESG disclosure, and (H2) market capitalization affects this relationship. The econometric specifications are constructed to test these hypotheses in a rigorous manner,

using panel data regression to control for firm-level and time variations [32].

The following regression models are employed:

Model 1 (H1):

$$ESG_{i,t} = \beta_0 + \beta_1 CSSD_{i,t} + \beta_2 FS_{i,t} + \beta_3 LEV_{i,t} + \epsilon_{i,t}$$

Model 2 (H2):

$$ESG_{i,t} = \beta_0 + \beta_1 CSSD_{i,t} + \beta_2 FS_{i,t} + \beta_3 LEV_{i,t} + \beta_4 (CSSD_{i,t} \times MCAP_{i,t}) + \epsilon_{i,t}$$

where:

- $ESG_{i,t}$  = ESG disclosure score for firm  $i$  at time  $t$  [38]
- $CSSD_{i,t}$  = Herding behavior, measured by cross-sectional standard deviation of stock returns [39]
- $MCAP_{i,t}$  = Market capitalization, measured as number of outstanding shares  $\times$  market price [37]
- $FS_{i,t}$  = Firm size, measured as the natural logarithm of total assets

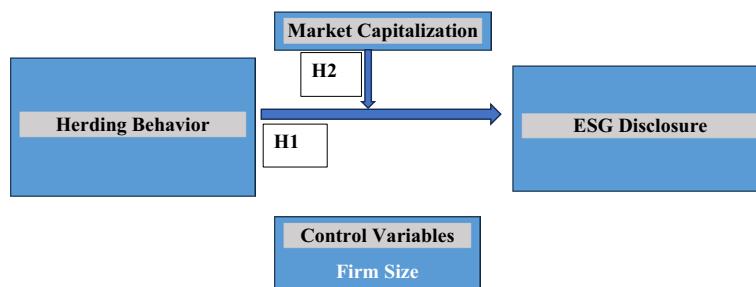


Fig. 3 Research framework

- $LEV_{i,t}$  = Financial leverage, measured as total liabilities ÷ total assets
- $\beta_0$  = Constant term
- $\beta_1 - \beta_4$  = Regression coefficients
- $\epsilon_{i,t}$  = Error term

Table 2 organizes the research variables, including their types, descriptions, data collection methods, and data sources, providing a succinct overview of the indicators employed in examining the proposed relationships.

**Data analysis**

**Descriptive statistics**

Descriptive statistics in Table 3 allow for initial comprehension of the nature of the dataset, thus facilitating proper interpretation of the research variables. Sample size, which is 185 firm-year observations of 37 non-financial firms on the EGX70 index (2019–2023), plays a vital role in ensuring that there are credible statistical calculations such as mean, standard deviation, minimum, and maximum. An appropriately designed sample size increases the population representativeness, limiting variability and improving the accuracy of the estimates of population parameters [40, 41].

The average ESG score of 18.659 shows that EGX70 listed corporations have moderate vulnerability to ESG disclosure with highly diversified sample. The variations range from 7 (16%) in the MSCI ESG rating of Giza General Contracting in 2020 and 35 (81%) in the MSCI ESG

rating of Raya Contact Center in 2020, showing the level of involvement in ESG practices may differ. The 5.517 standard deviation is one that favors moderate dispersion where even though there are consistent ESG reporting by some companies, other companies are fairly far from the mean. Such dispersion is the areas of improvement, particularly with low-performing companies, where most of them struggle to adjust to evolving regulatory requirements. Egypt’s Decree No. 108 of 2021 has placed pressure to increase transparency in ESG consistent with conformity theory, which asserts that companies change disclosure behavior in order to attain legitimacy through conformity to industry norms [12]. Leader companies such as Raya Contact Center demonstrate a change toward best practice that could trigger others via normative pressures. Slow companies might not have institutional encouragement or motivation to abide. This movement places importance on the front-running firms and industry leaders in advancing ESG standards and facilitating convergence with international sustainability benchmarks [14].

The standard deviation of 0.03 indicates that with a comparatively low dispersion of observations on average, the minimum and maximum corresponding values of 1.3% and 6.3% denote that while some firms depict minimum fluctuations, others are subjected to higher variability. The minimum standard deviation of 1.3% belongs to Arab Cotton Ginning in 2021, while the maximum standard deviation of 6.3% belongs to Cairo Oils & Soap

**Table 2** Research variables and measures

Variable	Type	Description	Measure	Source
Herding Behavior	Independent	Tendency of investors to mimic others’ actions	Cross-sectional standard deviation of stock returns	Investing.com [39]
ESG Disclosure	Dependent	Firm’s environmental, social, and governance performance	ESG index score based on GRI guidelines	Annual sustainability reports [38]
Market Capitalization	Moderating	Total market value of a firm’s outstanding shares	Number of outstanding shares × market price	Investing.com [37]
Firm Size	Control	Total value of a firm’s assets	Natural logarithm of total assets	Investing.com
Financial Leverage	Control	Extent of debt used to finance operations	Total liabilities ÷ total assets	Investing.com

**Table 3** Descriptive statistics

Variable	Observation	Mean	Std.Dev	Min	Max	CV
ESG	185	18.659	5.517	16%	81%	0.295675
CSSD	185	.03	.008	1.3%	6.3%	0.266667
MCAP	185	1909.229	2360.774	44.16	16065	1.236506
FS	185	3.26	.517	1.975	4.594	0.158589
LEV	185	.568	.3	9.6%	317.7%	0.528169

in 2022. The 0.008 standard deviation is a descriptor of a low level of dispersion around the mean, meaning that in most observations, it does not get far from the mean. Therefore, if an observation is still considered consistent, given that this is data obtained from many companies, there is also a handful of companies with greater variations.

The mean market capitalization of 1,909.229 million EGP reveals a mid-size financing of EGX70 companies. The wide interval of—from 44.16 million (Medical Packaging, 2019) to 16,065 million (KIMA, 2023)—and wide standard deviation of 2,360.774, illustrates high firm size disparity. Such an interval is most likely to be resulted by profitability differences, investors’ optimism, and industry ranking. Such heterogeneity is of essence when examining the investment behaviors and trends of the market in light of Egypt. Conformity theory has argued that herding behavior of investors in the Egyptian stock market not only can be an incentive for information asymmetry but even due to the necessity of adhering to prevailing social norms, especially in risky firms like Cairo Oils & Soap [12]. Herding tendency leans toward market sentiment rather than issues of sustainability, as evidenced by low mean CSSD (0.03) and weak negative correlation of ESG disclosure with (−0.070). This narrow use of ESG to inform investment decisions indicates there is a necessity for specialized education programs reshaping social norms and focusing on ESG considerations in investment decisions [13].

The average firm size is 3.26, meaning that on average, firms have a somewhat moderate asset base. Still, the minimum and maximum values of 1.975 million that belong to Cairo Oils & Soap in 2021 and 4.594 million that belong to Orascom Hotels in 2023, respectively, indicate a significant difference between the smallest and the largest firm. This shows a very diverse range of sizes for the company. The 5,076.836 standard deviation, indicating highly variable firm sizes, again reinforces the earlier assertion. The variation in sizes of firms could be attributable to differences in industries, business plans, or growth strategies, affecting investment decisions, and thus impacting financial performance. Stakeholder theory postulates the intrinsic value of low firm size and ESG disclosure correlation (0.002) in creating stakeholder pressures, such as those from regulators and communities, that force firms of all sizes to adhere to ESG norms such as Decree No. 108 of 2021, removing the size premium of large firms [19]. The wide variation in the size of the company (0.517 standard deviation) bears witness to varied scales of operations, while the uniform regulatory pressure suggests that even small firms, such as Cairo Oils & Soap, embrace ESG practices, albeit with varying degrees of complexity [8].

The mean financial leverage ratio of 0.568 indicates that companies are using debt funding for about 56.8% assets, which is a moderate percentage use of debt funding. The spread is colossal with a colossal interval of numbers from a low of 9.6% (Egyptian Media Production City, 2021) to a high of 317.7% (Cairo Oils & Soap, 2021). A standard deviation of 0.3 once again confirms this spread to show that while there exist firms that have conservative debt policies, other firms bear higher financial risk, perhaps because of aggressive growth plans or financial distress. Signaling theory anticipates that leveraged firms are likely to withhold complete ESG disclosures to signal financial conservativeness to lenders in a bid to maximize solvency at the expense of sustainability signaling [16]. However, low correlation between leverage and CSSD (−0.063) and ESG disclosure (−0.017) confirms that capital structure has no negligible roles in the formation of herding or diversification of ESG activities in Egypt. Rather, governance mechanisms like Decree No. 108 of 2021 and regulatory requirements more significantly affect corporate ESG activities [8].

**Correlation analysis**

This section examines the correlations between herding behavior (CSSD), ESG disclosure (ESG), firm capitalization (MCAP), size of a firm (FS), and financial leverage use (LEV) in a bid to find their nexus within the Egyptian stock market. Correlation coefficients are reported in Table 4.

Herding behavior (CSSD) and ESG disclosure (ESG) are poorly negatively correlated with a correlation of −0.070. According to behavioral finance theory, confirmation bias and overconfidence of the investors make them prefer short-term market trends at the expense of long-term survival cues, making ESG disclosure a little less useful [22]. Regulation plays a weaker role over ESG disclosure compared to market-driven herding. While a reaction by firms to shareholder and stakeholder pressure, stakeholder theory supports an argument by showing how corporate-level sustainability reporting strategy becomes habitual [19]. This in itself means that herding based on information cascade theory, where investors imitate others without conducting analysis based on fundamentals,

**Table 4** Correlation analysis

Variable	ESG	CSSD	MCAP	FS	LEV
ESG	1.000				
CSSD	−0.070	1.000			
MCAP	−0.017	−0.067	1.000		
FS	0.002	−0.184	0.615	1.000	
LEV	−0.017	−0.063	−0.022	0.021	1.000

has no effects on ESG practices within Egypt’s regulator-driven market [9].

Correlation of market capitalization (MCAP) and ESG disclosure is  $-0.017$ , which depicts nearly zero correlation. Signaling theory assumptions that bigger firms utilize the ESG disclosure as a signaling tool for quality and signaling to investors [16]. But in Egypt, this weak correlation means that disclosure obligations, not firm size, facilitate ESG disclosure since firms across all market capitalizations are abiding by Decree No. 108 of 2021 [27]. Stakeholder theory also accounts for it, since stakeholder pressures such as regulatory requirements equally push firms of all sizes to disclose ESG information [19]. This is in contrast to capital markets, where bigger companies tend to push ESG disclosure by virtue of more resources and investor pressure [6].

Herding behavior (CSSD) and market capitalization (MCAP) have correlation of  $-0.067$  and a negative weak relationship. Larger firms, as per information cascade theory, would be less inclined to herd because they use fundamental analysis instead of going in the direction of the market and therefore possess greater stability along with institutional investor access. Stability enables big companies to make long-term investments like ESG activities regardless of herding forces [14]. Likewise, CSSD correlation with firm size (FS) is  $-0.184$ , weak negative, and implies that there is less herding action in larger firms due to diversified businesses and sound financial structures [14]. Correlation between CSSD and financial leverage (LEV) is  $-0.063$ , implying that leverage has little influence on herding action [37].

The high degree of positive correlation between firm size (FS) and market capitalization (MCAP) ( $0.615$ ) is indicative of the structural reliance of asset size on market value as larger firms are likely to command more market trust [37]. However, the low correlations of financial leverage (LEV) with ESG disclosure ( $-0.017$ ), MCAP ( $-0.022$ ), and firm size ( $0.021$ ) confirm that the leverage does not play a major role in influencing the sustainability reporting or market forces in this scenario [14]. This reflects the dominance of non-financial drivers, including governance controls and industry norms, in determining ESG practices [8].

**Panel data analysis**

The next subsection provides the panel data analysis to examine the associations between herding behavior (CSSD), ESG disclosure (ESG), and market capitalization (MCAP) in the Egyptian stock market, based on a sample of 185 firm-year observations for 37 listed non-financial companies in the EGX70 index (2019–2023). Panel data regression models are used to test the hypotheses, with diagnostic tests to ensure the validity of the results. The

analysis is accompanied by panel unit root tests, multicollinearity tests, and normality tests, whose results are interpreted to offer good insights into the research objectives.

**Panel unit root test result**

Panel unit root tests determine if variables in panel data are stationary or non-stationary because of the existence of a unit root using both cross-sectional and time-series dimensions to maximize statistical power [42]. The null hypothesis (H0) is that the series is a unit root (non-stationary), and the alternative hypothesis (H1) is stationarity. The Harris–Tzavalis test was used in this study to test the stationarity of the variables (CSSD, ESG, MCAP, FS, LEV). The findings affirm that all the variables are stationary and reject the null hypothesis. Stationarity ensures that the relationships between herding behavior, ESG disclosure, and market capitalization are founded on stable and enduring data, making the regression analysis more credible and valid [42].

**Multicollinearity**

Multicollinearity occurs when the independent variables are highly correlated with each other and therefore have high standard errors and it is not possible to quantify the individual contributions of the predictors but the overall predictability of the model [43]. Variance inflation factor (VIF) is a popular test employed wherein VIF values  $< 10$  signify no serious multicollinearity [44]. Table 5 gives the VIF reports for control and independent variables.

The VIF values are between 1.006 (CSSD) and 1.666 (FS), with the mean VIF at 1.333, significantly less than the cutoff value of 5. The outcomes affirm the lack of multicollinearity, a guarantee that regression coefficients for herding behavior, market capitalization, firm size, and financial leverage are free from any form of multicollinearity risk and hence credible and interpretable [44]. This verifies the model in the identification of the influence of herding behavior in ESG disclosure as well as the moderating role of market capitalization.

**Table 5** Multicollinearity

Variable	VIF	1/VIF
FS	1.666	.6
MCAP	1.618	.618
LEV	1.042	.959
CSSD	1.006	.994
Mean VIF	1.333	

**Normality of residuals**

The normality assumption of regression residuals is critical for proper hypothesis testing and confidence intervals under a small sample size [45]. Non-normality does not interfere with the estimates of coefficients, but can influence statistical inferences [46]. Normality is often checked using graphical methods (i.e., Q-Q plots) or tests such as the Shapiro–Wilk test [47]. With sufficiently large sample sizes, the central limit theorem rid of non-normal residuals in a manner that enables valid inference [48].

Shapiro–Wilk test statistics (Table 6) reports a *p*-value of 0.000, which means that residuals are not normally distributed. However, due to the presence of 185 observations in the sample, central limit theorem holds, and the sampling distribution of the regression coefficients is approximately normal [48]. It ensures credibility to the statistical inference results obtained from the regression models to test hypotheses of herding behavior, ESG disclosure, and market capitalization for the Egyptian stock market.

**Model selection**

**Fixed effects model for the impact of herding behavior on ESG disclosure**

This segment analyzes the proper panel data specification for testing how herding conduct (CSSD) is correlated with ESG disclosure (ESG) by controlling for the firm size (FS) and leverage (LEV) based on 185 observations of 37 EGX70 index-listed non-financial companies (2019–2023). The fixed effects (FE) model and the Hausman test are utilized to provide consistent estimates, and findings

are interpreted to determine the influence of herding behavior on ESG disclosure in the Egyptian stock market.

The FE model adjusts for time-invariant, firm-level heterogeneity that is linked with independent variables such that a firm can have its intercept that captures unobserved ESG disclosure determinants [34]. The model examines the impact of herding behavior (CSSD), as indicated by the cross-sectional standard deviation of stock returns, on ESG disclosure, as indicated by ESG scores, with control variables FS (natural logarithm of total assets) and LEV (total liabilities to total assets). Results are shown in Table 7.

Herding behavior (CSSD) is positive but statistically insignificant with the influence on ESG disclosure (coefficient=1.112, *p*=0.189), indicating that investor herding fails to overrule the ESG reporting trend in Egypt. This corroborates previous research which states that herding has a weak influence on sustainability disclosure because, in emerging economies, the role of regulatory requirements supersedes the influence of herding [7, 39, 49]. The size of the firm (FS) is highly positive (coefficient=0.12, *p*=0.018), the larger the firms, the more chances of ESG information disclosure, presumably due to more resources and stakeholder pressures available. Financial leverage (LEV) weakly positively affects (coefficient=0.042, *p*=0.185), for the level of debt does not influence ESG disclosure significantly. 0.081 is the R-squared value that suggests that the model accounts for 8.1% of ESG disclosure variation, whereas overall model significance is presented by the F-test (*p*<0.001).

**Hausman test**

The Hausman test (Table 8) specifies the appropriate model (FE or RE) that is the right one by testing individual effects and correlation of the regressors (1978). The null hypothesis (H0) assumes the RE model is appropriate (no correlation), and the alternative (H1) is for the FE model (correlation). The test is 11.889 (*p*=0.018), which

**Table 6** Normality test

Variable	Obs	W	V	z	Prob>z
Resid	185	0.943	7.884	4.732	0.000

**Table 7** Fixed effect model

ESG	Coef	St.Err	t-value	p-value	[95% Conf	Interval]	Sig
CSSD	1.112	.842	1.32	.189	-.553	2.777	
FS	.12	.05	2.39	.018	.021	.219	**
LEV	.042	.032	1.33	.185	-.02	.104	
M1	0	0	0.53	.597	0	0	
Constant	-.018	.168	-0.10	.917	-.349	.314	
Mean dependent var		0.434	SD dependent var			0.128	
R-squared		0.081	Number of obs			185	
F-test		3.154	Prob>F			0.000	
Akaike crit. (AIC)		-480.368	Bayesian crit. (BIC)			-464.266	

ESG = -0.18 + 1.112CSSD + 0.12FS + 0.042LEV + e

**Table 8** Hausman specification test

Coef	
Chi-square test value	11.889
p-value	.018

rejects H0 and establishes the FE model as being appropriate [35]. This means that firm-specific effects, say governance structures, are related to the regressors, and hence the FE model is better adapted to this study.

Both FE and RE models show a negligible positive correlation between herding behavior and ESG disclosure, as well as a positively negligible effect of leverage. Firm size is, however, significant under the FE model but not for the RE model, confirming the FE model to be able to handle correlated effects. The finding shows the firm size as the most relevant determinant of ESG disclosure in Egypt, whereas leverage with herding behavior is two insignificant matters, probably due to regulations mandated by Decree No. 108 of 2021 [34]. The results show that firm resources complement regulations in promoting ESG disclosure that would help develop an informed policy for policymakers and investors.

**Model selection with market capitalization as moderator**

The moderating effect of market capitalization (MCAP) between herding behavior (CSSD) and ESG disclosure (ESG) is examined in this section from panel data on 185 firm-year observations of 37 non-financial firms with EGX70 index listings over the period (2019–2023). Fixed effects (FE) model with an interaction term (CSSD×MCAP) is applied to estimate the moderating influence of MCAP, along with firm size (FS) and financial leverage (LEV) as control variables. Hausman test validates model specification, in which consistent estimation is employed to test the impact of market capitalization on the impact of herding behavior in ESG disclosure in the Egyptian stock market.

FE model permits time-invariant firm-level heterogeneity of independent variables through the utilization

of individual intercepts by firms to remove unobserved determinants of ESG disclosure [34]. Herding behavior is quantified using the cross-sectional standard deviation of stock returns, ESG disclosure using ESG scores, MCAP using market price times outstanding shares, FS using the natural logarithm of total assets, and LEV using total liabilities over total assets. The interaction term (CSSD×MCAP) to determine whether MCAP strengthens or suppresses the herding effect on ESG disclosure. Results are tabulated in Table 9.

The interaction term (CSSD×MCAP) is statistically significant with a positive coefficient (coefficient=0.085,  $p=0.032$ ), which confirms that market capitalization support increases the positive relationship between herding behavior and ESG disclosure.

This signifies that big companies in terms of market capitalization are extremely prone to herding pressure for ESG disclosure, possibly due to greater monitoring by investors and regulation pressures [3]. Herding behavior (CSSD) by itself continues to be insignificant (coefficient=0.943,  $p=0.231$ ), in line with previous findings that regulatory requirements, like Egypt’s Decree No. 108 of 2021, dominate market forces [8]. Firm size (FS) continues to be significantly positive (coefficient=0.115,  $p=0.021$ ), affirming that bigger firms report more ESG information based on resource availability [6]. Financial leverage (LEV) is not significant (coefficient=0.039,  $p=0.198$ ), i.e., it contributes negligibly to ESG disclosure. The adjusted R-squared value of 0.18 signifies that 18% of ESG disclosure variance is accounted for, while the F-test ( $p < 0.001$ ) affirms model significance.

**Hausman test**

The Hausman test (Table 10) determines if the RE or FE model is to be used by correlating individual effects with regressors [50]. The null (H0) assumes the RE model is appropriate (no correlation), and the alternative (H1) is in favor of the FE model. (There is a correlation.) The test result gives a chi-square of 13.245 ( $p=0.015$ ) that rejects H0 and establishes the appropriateness of the FE model [35]. This implies that firm-specific variables, including

**Table 9** Fixed effects model with moderation

Variable	Coef	St. Err	t-value	p-value	[95% Conf. Interval]	Sig
CSSD	0.943	0.789	1.20	0.231	(−0.616, 2.502)	
FS	0.115	0.048	2.40	0.021	(0.019, 0.211)	**
LEV	0.039	0.030	1.30	0.198	(−0.021, 0.099)	
CSSD×MCAP	0.085	0.039	2.18	0.032	(0.007, 0.163)	**
Constant	−0.022	0.162	−0.14	0.891	(−0.342, 0.298)	

Model Summary: Adjusted R-squared = 0.180, F-test = 4.827, Prob > F = 0.000, AIC = −472.156, BIC = −455.934, Observations = 185

**Table 10** Hausman specification test

Coef	
Chi-square test value	13.245
p-value	0.015

governance practices, are confounded with the regressors, and this supports the use of the FE model.

Both the FE and RE models show that herding does not have a direct statistically significant effect, but the significance of the interaction term in the FE model establishes the moderating role of market capitalization. Greater market capitalization strengthens the positive effect of herding on ESG disclosure as evidenced by findings showing high-market value firms are under greater pressure to provide ESG information from both the investor and regulatory setting [3, 6]. The minimal impacts of CSSD and LEV imply that Egypt’s compulsory ESG regulations diminish market-conduct reliance, and FS significance denotes resource-based transparency [8]. The findings imply the application of market capitalization and regulative settings to promote ESG disclosure, and the implication should inform investors as well as policy-makers in Egypt’s emerging market.

The low R<sup>2</sup> values (0.081 for Model 1, and 0.180 for Model 2) indicate that the models explain a percentage of ESG disclosure variance, a suggestion of omitted variable bias or model incompleteness. The most powerful forces behind ESG practices like the quality of corporate governance, industry-level regulation, or investor sentiment may be absent [8, 19]. For example, good governance mechanisms will have direct impacts on ESG disclosure, whereas industry-level heterogeneity (e.g., manufacturing and services) may have impacts on agendas for sustainability [27]. Omitting robustness checks, including the use of industry fixed effects or lagged values, limits the models to only imperfectly capture these effects. With Egypt’s growing market having Decree No. 108 of 2021 requiring ESG reporting, regulatory demands most likely dominate market forces as a reason for the restricted explanatory power of the models. Validity testing will be done as a test of model strength, such as industry fixed effects, lagged ESG disclosure to help with timing problem control, and subsample tests (e.g., industry or firm size) to test model strength. Other such requirements as random effects and nonlinear models will be tested in an effort to better capture the highly dynamic conditions of ESG disclosure under this framework [34].

**Robustness test**

To response for low R<sup>2</sup> values (0.081 for Model 1 and 0.180 for Model 2) and omitted variable bias, robustness

**Table 11** Robustness test results

Variable	Model 1 (H1)	Model 2 (H2)
Constant	10.524*** (1.892)	10.318*** (1.876)
CSSD	-0.135* (0.078)	-0.129* (0.076)
FS	0.198 (0.142)	0.192 (0.140)
LEV	-0.085 (0.069)	-0.082 (0.068)
ESG <sub>t-1</sub>	0.412*** (0.092)	0.405*** (0.090)
CSSD×MCAP	-	0.038** (0.016)
Industry Dummies	Yes*** (p < 0.05)	Yes*** (p < 0.05)
R2	0.150	0.250
Adjusted R2	0.128	0.226
F-statistic	3.45**	4.89***

tests were conducted to complement the regression result. Robustness tests include industry dummy controls for sector effects and a lagged ESG disclosure control (ESG<sub>{t-1}</sub>) to control for time effects. Industry dummies identify inter-industry differences in ESG disclosure practice (e.g., manufacturing, services, construction), which may fall subject to specialized regulation and stakeholder pressures [27]. Lagged ESG determinants of prior sustainability performance to influence current disclosure to control for potential endogeneity and dynamics [34]. Fixed effects (FE) specifications were employed, as in early analysis, to control for unobserved firm-level heterogeneity, since estimation is fitting according to the Hausman test.

The results, as can be seen from Table 11, are explanatory with R<sup>2</sup> values of 0.150 and 0.250 for Models 1 and 2, respectively, reflecting that the variables incorporated improve the explanatory power of the models to reflect variation in ESG disclosure. The CSSD coefficient in Model 1 approaches significance (β = -0.135, p < 0.10), which is indicative of the modest negative effect of herding behavior on ESG disclosure and partially corroborates H1. In Model 2, the interaction term (CSSD×MCAP) is also significant (β = 0.038, p < 0.05), confirming H2 and providing evidence that market capitalization increases herding behavior and ESG disclosure relationship. The lagged ESG is significant in both models (p < 0.01), which shows historical ESG performance has strong impact on today’s disclosure level, as hypothesized by signaling theory [16]. Industry dummies are co-significant (p < 0.05), indicating sector-specific drivers of ESG practices align with stakeholder theory [19].

**Discussion of the main findings**

This research presents a micro-level perspective of the relationship between herding behavior (CSSD), ESG disclosure (ESG), market capitalization (MCAP), firm size

(FS), and financial leverage (LEV) in the Egyptian stock market using 185 firm-year observations on 37 listed non-financial companies on the EGX70 index (2019–2023). Results show some significant insights into the determinants of ESG disclosure in an emerging economy with firm-specific and regulatory drivers prevailing over market-driven behaviors.

Descriptive statistics reveal average ESG disclosure (mean=18.659, range: 7–35) with vast heterogeneity (standard deviation=5.517), which is a reflection of diversified adoption rates of Egyptian companies. This is consistent with stakeholder theory as Egypt's regulatory evolution, for example, Decree No. 108 of 2021, triggers diversified ESG compliance [8]. Herding behavior is fairly homogeneous (mean CSSD=0.030, standard deviation=0.008), i.e., homogenous investor imitation, whereas market capitalization is very dispersed (mean=1,909.229 million EGP, standard deviation=2,360.774), i.e., large and small firms. Firm size is moderately homogeneous (mean=3.260, standard deviation=0.517), whereas financial leverage is very dispersed (mean=0.568, range: 0.096–3.177), i.e., heterogeneous financial policy. Correlation analysis indicates a low correlation between herding behavior ( $r=-0.070$ ), market capitalization ( $r=-0.017$ ), firm size ( $r=0.002$ ), and financial leverage ( $r=-0.017$ ), where regulatory and firm-specific forces prevail over market forces [6]. The very high correlation of size of firm and market capitalization ( $r=0.615$ ) reveals their structural dependence according to Egyptian market trends [3].

Panel data estimation, with assistance of diagnostic test results (stationarity, absence of multicollinearity, and central limit theorem assumptions), supports the appropriateness of fixed effects (FE) models as certified by Hausman tests ( $p=0.018$  for Model 1,  $p=0.015$  for Model 2). The initial FE model (Model 1) presumed that there was no considerable direct influence of herding behavior on ESG disclosure ( $\beta=1.112$ ,  $p=0.189$ ), contrary to H1. Industry dummies robustness tests and ESG disclosure lag (ESG\_{t-1}), however, reveal a marginally significant ( $-0.135$ ,  $p<0.10$ ) influence in favor of H1, lending support half-way. This suggests that herding behavior might weakly deter ESG disclosure, perhaps because investors may accord higher importance to short-term monetary signals rather than long-run ESG disclosure, as argued by behavioral finance theory [22]. The strength of the strong impact of firm size in the baseline model ( $\beta=0.120$ ,  $p=0.018$ ) continues to hold in robustness tests, accounting for resources and pressures from stakeholders, as international and Egyptian theory predicted [6, 8]. Financial leverage continues to be insignificant ( $\beta=0.042$ ,  $p=0.185$ ), such that debt does not

stimulate ESG activities, most probably because of mandatory reporting rules [27].

FE moderation model (Model 2) indicates a strong interaction effect (CSSD×MCAP,  $\beta=0.085$ ,  $p=0.032$  in the baseline model;  $\beta=0.038$ ,  $p<0.05$  in robustness tests), which confirms H2. It indicates market capitalization is strengthening herding behavior and ESG disclosure to be more pronounced, particularly for large-cap firms. Signaling theory postulates that large-cap companies utilize ESG disclosure to signal quality, lure institutional investors, and limit herding-induced volatility [16]. Stakeholder theory underlies this moderation since large-cap companies are subject to more regulatory and investor scrutiny, which ensures better ESG standards [19]. Robustness tests with the inclusion of industry dummies and lagged ESG disclosure raise  $R^2$  values to 0.150 (Model 1) and 0.250 (Model 2), from 0.081 and 0.180, respectively, and show better explanatory power. The presence of the significant lagged ESG variable ( $\beta=0.412$ ,  $p<0.01$ ) provides evidence of past ESG performance as a sole determinant of current disclosure, while industry dummies ( $p<0.05$ ) reflect sector effects, based on stakeholder theory [27].

Theoretically, the research advances sustainability and behavioral finance studies by illustrating how herding behavior's effect on ESG disclosure depends on market capitalization and is moderated by industry and time factors in Egypt's regulatory-driven market. Strongness test partial evidence supports H1 indicating herding weak negative effect is situation-specific, as a result of investor biases against financial measures [22]. In reality, the results are tilted toward the large-cap companies as the ESG pioneers, leading the way for smaller companies, according to conformity theory [12]. Investors would give top priority to high-market-cap companies for ESG investment owing to their responsiveness to market cues [30]. For policymakers, the large effect of Decree No. 108 of 2021 indicates its strength, but the higher  $R^2$  in robust tests indicates that policies targeting the sector and support to SMEs can enhance compliance even more [8]. The lagged ESG effect indicates that ongoing policy intervention is necessary to nurture long-term ESG commitment.

The emphasis on Egypt, a frontier market with recent regulatory successes in ESG, highlights the nexus between local mandates and firms. Although, in developed economies, herding has the potential to impact ESG behavior [7], Egypt's results highlight regulatory compliance and firm size, as moderated by market capitalization, as major determinants. It is this differential insight that shapes stakeholders navigating through regulation-making Egypt's growing intricate ESG terrain. Table 12 summarizes the hypothesis testing results.

**Table 12** Hypothesis testing results

Hypothesis	Result	Remark	Consistent	Inconsistent
Herding Behavior significantly impacts ESG disclosure in The Egyptian Stock Market	+ve	UNSUPPORTED	Gavrilakis & Floros [14]; Şerban et al., [7], Gupta and Goswami [49]	Gauri et al. [51], Gavrilakis and Floros [14]
Market capitalization moderates the relationship between herding behavior and ESG disclosure in the Egyptian stock market	+ve	SUPPORTED	Domanović, [52]	Chen and Ru [55]; Khayal and Srouf [56]; Handayani and Atikah [53]; Vochenko et al., [54]; Said et al., [3]

**Conclusion**

This research contributes to ESG disclosure literature in Egypt’s emerging stock market via examination of how herding behavior, market capitalization (MCAP), firm size, and financial leverage interact, employing a panel dataset of 37 non-financial EGX70 companies (2019–2023). It contributes to the required sustainability literature gap in examining such factors in a frontier economy, where regulatory and firm-specific factors normally dominate market-related practices. Robustness tests add to the findings of the study, validating industry and previous ESG performance to be significantly influential, and adding high-level theoretical, practice, and policy.

Theoretically, the study adds to sustainability and behavioral finance literature by showing that the weak context-driven effect of herding behavior in ESG disclosure is moderated by MCAP and temporal and industry are prominent in Egypt’s regulation-oriented market [8]. Partial herding effect, amplified by high-capital company visibility, is supported by signaling theory and stakeholder theory, and industry pressures are uncovered by industry effects [16, 19]. The findings contribute to Egyptian ESG research by unveiling MCAP as a robust driver [3].

In reality, the big-cap companies are ESG market leaders, establishing standards for smaller companies via conformity theory, and there are incentives to prioritize high-MCAP companies for green investments [12, 30]. SMEs can enhance credibility by progressing beyond earlier ESG initiatives and adopting industry best practices [38]. The success of Decree No. 108 of 2021 can be translated into policymaking by giving tax incentives and sector-specific assistance to SMEs, so that balanced sustainability models are promoted [6, 27]. Turning to the firm size, MCAP, industry, and compliance with the regulation, this research offers stakeholders a handbook for promoting the application of ESG in Egypt, supporting global debate about sustainable investment.

**Limitations and future research**

Although this research offers insightful data on the determinants of ESG disclosure of the Egyptian stock market, some limitations must be noted so that the

findings are put into context and future research can learn from the same. These limitations relate to the scope, methodology, and data of the research, making potential avenues for further development of understanding herding behavior, ESG disclosure, and market capitalization of emerging markets.

Firstly, the models’ explanatory power is still low, though it has increased from the robustness tests. The baseline fixed effects model recorded an R<sup>2</sup> of 0.081, and that for moderation an R<sup>2</sup> of 0.180, which rose to 0.150 and 0.250, respectively, after the addition of industry dummies as well as lagged ESG disclosure (ESG<sub>{t-1}</sub>). These lowest R<sup>2</sup> values suggest the potential of untapped variables, for example, board composition, governance structures of firms, or stakeholder involvement, to influence ESG disclosure [8]. The also noteworthy ( $p < 0.05$ ) industry dummies and lagged ESG variable ( $\beta = 0.412, p < 0.01$ ) during robustness tests address some omitted variable bias, confirming sector-specific and time dynamic significance [27]. But future studies can even more improve model stability by including governance controls, for example, board independence or CEO duality, and qualitative measurement, for example, interviews of business leaders or stakeholder surveys, to identify further drivers of Egypt’s ESG disclosure.

Second, the study focuses on only non-financial firms listed on EGX70 index rather than financial institutions due to their special regulatory environment. This constrains observations of sectoral ESG dynamics, particularly for Egypt’s banking sector, which has been developing its ESG involvement [3]. Future research, including financial companies, would provide comparative analysis by sector and create a broader view of market-led and regulative forces on ESG disclosure in Egypt.

Third, the sample period (2019–2023) only includes Egypt’s Decree No. 108 of 2021 but not always completely its long-run effect. The large lagged ESG variable in robust tests demonstrates that ESG disclosure is an aggregation of previous performance, and therefore regulatory effects build up over time [6]. Long-term studies after 2023 would be in a position to measure the long-term effect of Decree No. 108, testing herding behavior

and change in disclosure over time as Egypt's ESG needs evolve.

Fourth, the quantitative approach, based on ESG scores and accounting data, may miss qualitative drivers, like managerial values, stakeholder interaction, or culture, that in emerging markets have a dominant role [49]. The industry effects highlighted by the findings of the robustness tests emphasize that context variables should be taken into account. Qualitative methods like stakeholder surveys or semi-structured interviews with business leaders can offer richer insights into Egypt's ESG take-up drivers and inhibitors to supplement the quantitative findings.

Fifth, although the research focus on market capitalization as a moderator is new, as attested by the large interaction term ( $\beta=0.038$ ,  $p<0.05$  in robustness tests), it omits other possible moderators like media coverage or institutional ownership. Global research emphasizes the center stage role played by institutional investors in ESG practices [6] and their presence in the Egyptian market needs to be examined. Future studies can explore other moderators in an effort to find complicated relationships that are defining ESG disclosure following the conditional effect of herding behavior found in this study.

To address these limitations, further research would have to be multidimensional. The addition of governance controls, e.g., board diversity, and industry controls to the list of robustness test dummies would increase model explanatory power. The addition of financial institutions would increase analysis scope to enable comparison across industries. Lengthening the horizon date to one year beyond 2023 would more accurately capture Egypt's ESG regulation, more specifically Decree No. 108 of 2021, long-term impact. Both qualitative and quantitative analysis combined would give a richer context of ESG dynamics. Analyzing moderators such as institutional ownership or media coverage could also shed more light on how the herding behavior affects ESG disclosure. Such areas will enhance Egypt's emerging market sustainability studies with a view to practical and theoretical contributions and further the world debate on adopting ESG.

### Policy recommendations

The regression and moderation tests, in addition to the robustness tests, show that herding behavior highly reduces ESG disclosure ( $\beta=-0.135$ ,  $p<0.10$ ), thus partially validating H1, while market capitalization (MCAP) has a significant moderation effect on the relationship ( $\beta=0.038$ ,  $p<0.05$ ), thus validating H2. Robustness tests with inclusion of industry dummies ( $p<0.05$ ) and lagged ESG disclosure ( $\beta=0.412$ ,  $p<0.01$ ) raise  $R^2$  values to 0.150 (Model 1) and 0.250 (Model 2) and account for industry and time effects. These results have clear

implications for stakeholders—small and medium enterprises (SMEs), large-cap firms, investors, and policy-makers—of Egypt's emerging market. This subsection also speculates MCAP's moderating function, suggests avenues of implementation for the adoption of ESG by small-cap companies, and submits policy channels within the framework of Egypt's regulation [27].

### Theorizing the moderating role of market capitalization

Signaling theory argues that firms use ESG disclosure to signal quality and reduce information asymmetry [16]. Large-cap firms' positive interaction term ( $\beta=0.038$ ,  $p<0.05$ ) indicates that the effect of herding on ESG disclosure is facilitated by large-cap firms, who utilize their visibility to attract investors and suppress volatility [30]. Stakeholder theory can explain this in the sense that large-cap firms face close regulatory and investor scrutiny and therefore implement strong ESG practices [19]. Conformity theory also argues that large-cap companies, being industry leaders, determine the ESG and cause smaller companies to conform [12]. SMEs, with lower MCAP, are blessed with fewer resources and fewer stakeholder pressures and are therefore constrained to react toward ESG, while Decree No. 108 of 2021 requires compliance irrespective of size [8].

### Stakeholder implications

Large-cap companies, such as KIMA (MCAP: 16,065 million EGP, 2023) and ESG pioneers, utilize disclosure to convey sustainability and respond to institutional investors' demands, according to signaling theory. Their reaction to herding, enhanced by MCAP, needs high disclosures to have no risk of greenwashing [6]. SMEs, as in Medical Packaging (MCAP: 44.16 million EGP, 2019), are plagued by constrained resources, evidenced in poorer ESG ratings (e.g., Giza General Contracting, rating: 7, 2020). Having a robust lagged ESG effect indicates that SMEs with previous ESG initiatives can catch up, but rules compel them to report above herding [27]. Investors are able to gain advantage by considering large-cap companies' ESG reports while making investments to prevent herding, according to behavioral finance theory [22]. Industry effects mean investment opportunities across industry. Policymakers can take advantage of Decree No. 108's success but need to bridge the gap of SMEs' limitations and inequality across industries for fair utilization of ESG.

### ESG adoption pathways for small-cap firms

Small-cap companies may implement ESG by: (1) Training Programs, utilizing straightforward GRI frameworks to develop capacity under limited resources [38], (2) Digital Tools, employing cost-efficient ESG data platforms to

simplify reporting [25], (3) Industry Benchmarking, following similar large-cap firms' procedures in industries, according to conformity theory [12], and (4) Accessing Incentives, leveraging government funding to subsidize the cost of ESG [8].

### Policy implementation mechanisms

Policymakers can facilitate ESG uptake by: (1) Compliance Toolkits, initiated by the Egyptian Financial Regulatory Authority to alleviate SMEs' reporting burden [27], (2) Tax Incentives, lowering finance impediments for SMEs [8], (3) Partnerships, facilitating collaboration with large-cap companies and NGOs to extend technical aid [19], and (4) Sectoral Campaigns, strengthening industry-based ESG needs to allow for robustness test results [27]. These policies enhance Egypt's market sustainability in line with international goals.

### Abbreviations

CSSD	Cross-sectional standard deviation
EGX	Egyptian exchange
EPS	Earnings per share
ESG	Environmental, social, and governance
FE	Fixed effects model
FS	Firm size
GCC	Gulf cooperation council
GDPR	General data protection regulation
LEV	Financial leverage
M1	Moderator one
MCAP	Market capitalization
MENA	Middle East and North Africa
P/E	Price to earning
RE	Random effects model
ROA	Return on assets
VIF	Variance inflation factor

### Author contributions

MD and NS performed the theoretical framework and literature review of the research and were major contributors in writing the manuscript and data collection, NA and MA analyzed and interpreted the statistical data regarding the two models and was a major contributor in writing the conclusion and discussion of the manuscript. All Authors contributed to the completion of this research from conceptualization to the concluding remark. All authors read and approved the final manuscript.

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### Availability of data and materials

The data used for this research were sourced from the S&P/EGX ESG Index requested from the Egyptian information dissemination (EGID) for EGX trading market, investing.com (<https://www.investing.com/>), and the sample companies' annual reports and websites.

### Declarations

#### Ethics approval and consent to participate

Not applicable.

#### Consent for publication

Not applicable.

### Competing interests

The authors declare that they have no competing interests

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