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Does ownership structure reduce earnings manipulation practice of Egyptian listed firms? Evidence from a dynamic panel threshold model

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Abstract

This paper analyzes the nonlinear relationship between corporate ownership structure and income manipulation through accrual-based earnings management in the Egyptian context. To do so, we develop a sample of 78 listed non-financial firms, covering the period 2008–2017. Using the dynamic panel threshold analysis approach (Seo and Shin in J Econom 195: 169–186, 2016), we found a nonlinear relationship between ownership structure and earnings manipulations. This proves the presence of an optimal ownership structure threshold below which the ownership structure generates an entrenchment effect on earnings management. However, above this threshold, the ownership structure has an alignment effect. Certainly, these results confirm the theoretical predictions in relation to managerial ownership, governmental ownership, and earnings management (agency, political and development theories, respectively). These results yield important policy implications. It is recommended to set an optimal threshold of ownership structure to control the firm`s managers. This is likely to avoid earnings management.

Keywords Earnings management, Ownership structure, Monitoring, Non-financial firms, Dynamic panel threshold analysis, Egypt

Introduction

Over the last few decades, the world has seen a wave of financial scandals, the best- known being Enron in 2001 and WorldCom in 2002 in the USA. These scandals often stem from problems of asymmetric information, divergent interests between the firm's stakeholders (managers, shareholders, and investors) and the weakness of the firm's control system. Indeed, in an environment characterized by imperfect capital markets, imperfect information and divergent interests among the firm's stakeholders are at the root of managers' opportunism. Faced with such stakes and challenges, managers apply fraudulent practices and manipulations by playing on the firm's accounting figures (by either inflating their profits, hiding their losses, or even hiding debts). The acronym "*cosmetic accounting*," accounting manipulation or earnings management knows this strategy.

To remedy this, Leuz et al. [45] recommended the implementation of certain measures, thus ensuring more credibility and clarity of accounting information, alignment of interests between stakeholders, protection of shareholders' and investors' interests and auditor

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independence, etc. It is through the development of a stronger governance structure that opportunistic behavior by managers and earnings management problems could be reduced. Such a strategy requires a return to corporate governance mechanisms and their relationship with earnings management the ownership structure. In fact, the ownership structure is perceived as one of the main governance mechanisms, thus contributing to curbing fraudulent practices and managerial discretion [33].

Although there are several theories in the literature on financial accounting and corporate finance related to the issue of earnings management. The most frequently cited of which are the agency theory [32], the economic theory of regulation [8], the positive accounting theory [65] and the stewardship theory [14]. These different theories are inspired by agency theory [32].[1] Under agency theory, the separation between ownership and monitoring leads to conflicts of interest between managers and shareholders of the firm. Managerial opportunism and the gravity of agency problems prevent the owners of the firm from monitoring the behavior and efforts of their agents. In this case, agency costs will be higher, while the firm's value will be reduced [31]. This is likely to encourage managers to manipulate accounting figures in order to achieve individual benefits. In fact, this theory has highlighted the fundamental role that ownership structure can play in mitigating agency and earnings management problems. It assumes the presence of two opposing hypotheses: (i) entrenchment hypothesis and (ii) alignment hypothesis (or the convergence of interest's hypothesis). Under entrenchment hypothesis, ownership structure has a positive effect on earnings management [50, 66]. This often translates into a lack of control and supervision, inducing managers and/or equity holders to use their powers to manipulate accounting figures. However, under the alignment hypothesis, ownership structure has a negative effect on earnings management. It is seen as a governance mechanism, thus contributing to the reduction in fraudulent practices, including earnings management [32].

In practice, it is to be noted that most researchers focused their research on agency theory, while validating or rejecting entrenchment and alignment hypotheses. Specifically, several researchers tested the linear relationship between ownership structure and earnings management (accruals and/or real). Some researchers showed that the ownership structure positively affects earnings management, confirming the entrenchment hypothesis (e.g., [18, 20]. However, other researchers suggested that the ownership structure negatively affects earnings management, supporting the alignment hypothesis (e.g., [2, 10, 18, 63]. Furthermore, some authors exhibited the existence of a nonlinear relationship between governance mechanisms (including ownership structure) and earnings management and/or earnings quality, confirming the entrenchment and alignment hypotheses (e.g., [3, 18, 47, 50, 66, 63].

In contrast to developed countries, developing countries face greater problems of information asymmetry and higher agency costs because their financial markets are not well developed [5, 37]. However, several studies analyzing the relationship between ownership structure and earnings management are often carried out in advanced economies. Although there are studies on developing economies, they are very limited in scope. Like other emerging countries, Egypt is a civil law country characterized by an inefficient regulatory system. Hence, this study intends to contribute to fill this research gap by investigating the relationship between ownership structure and earnings management in Egyptian market. The choose of Egyptian context can be explained by several raison. First, the inefficiency stems from the vulnerability of the Egyptian institutional system, resulting in non-compliance with the disclosure requirements of accounting standards (particularly voluntary disclosure), high compliance of accounting profits with taxable income, and the absence of control and monitoring mechanisms to verify compliance with accounting standards. Second, these deficiencies are at the root of managerial opportunism relating to the manipulation and falsification of accounting figures. According to [35], earnings management (EM) is one of the most common practices in Egypt. It is widely practiced in most listed firms in order to obtain more financing, increase investment opportunities and maximize their wealth. Finally, this is likely to create a fraudulent image of their financial situation (especially their operating results), thus misleading some stakeholders (shareholders/investors).

Given the ineffective regulatory framework in Egypt, it is important to explore the role of corporate governance in moderating accounting fraud. Specifically, the relationship between the ownership structure and earnings management should be studied, with reference to the literature on the nonlinear relationship between governance mechanisms and earnings management [3]. Certainly, this nonlinear relationship could have different shapes, mainly the threshold effect. There are very few studies investigating the threshold effect of ownership structure on earnings management, thus reflecting our second contribution. In this case, there are several managerial implications of this research gap having potential

[1] The choice of one of these different theories depends mainly on the different dimensions of the firm ownership structure (e.g., managerial ownership, institutional ownership, family ownership, etc.).

insights that could be gained from this research. Specifically, identifying the threshold point at which ownership structure begins to have a significant impact on earnings management can help inform decision-making processes for company owners and managers in Egypt. This could include considerations such as the optimal level of ownership concentration for avoiding excessive earnings management, and the potential benefits of implementing governance mechanisms to mitigate the negative effects of concentrated ownership on financial reporting practices. Ultimately, these insights could contribute to improving the financial health and sustainability of Egyptian firms. With that being stated, the aim of this study is to answer the subsequent research inquiries:

Q1: Is there a nonlinear relationship between ownership structure and earnings management?

Q2: Is there an optimal threshold for each type of ownership structure? If so, what type of ownership structure could help listed firms to minimize the aggressive earnings manipulations?

Q3: In addition, what are the different strategies to be considered by stakeholders in order to mitigate discretion and earnings manipulation?

Using Dynamic Panel Threshold Analysis approach [57], we study the threshold effect of ownership structure on earnings management in Egyptian firms.

The rest of this paper is structured as follows. Sect. "Literature review" provides a literature review. Sect. "Hypothesis development" carries about hypothesis development our study. Sect. "Research method" describes our econometric methodology. We present the results in Sect. "Data analysis and discussion of results" and the conclusion in Sect. "Conclusion".

Literature review

Theoretical background

Since the emergence of the positive accounting theory, developed by Watts & Zimmerman [65], the phenomenon of earnings management has been at the center of debate in the literature of corporate finance and financial accounting. In fact, contrary to traditional research, positive accounting theory is purely based on the contractual utility paradigm of accounting information. It aims to clarify the information of financial statements, based on the credibility and intelligibility of the financial information. To achieve this goal, positive accounting theory is concerned with the study and prediction of the behavior of users of financial statements (shareholders, managers, government, owners, investors, etc.), with reference to the economic theory of regulation and the agency theory.

According to the economic theory of regulation, developed by Posner [8], the application of the law by the government makes it possible to regulate and modify the economic behavior of individuals (individuals and firms). In this context, regulation is seen as a political process (legislation), supporting inter-individual competence and transfers of wealth. This is likely to maximize their interests. As an illustration, when a vertical alliance (conflicts of interest) arises between commercial procedures and public services on profit maximization, policymakers rely on certain forms of control to minimize such conflicts (e.g., accounting figures, accounting incomes, etc.). This economic legislation is aimed at the provision of services, while at the same time ensuring the survival and sustainability of firms.

From another viewpoint, under agency theory, the separation of ownership and control of a firm leads to conflicts of interest between stakeholders due to information asymmetry [32]. In this context, the gravity of information asymmetry problems (adverse selection and/or moral hazard) urges managers to engage in fraudulent practices, including earnings management, for personal purposes (e.g., salary increases). According to Healy & Wahlen [30], earnings management is defined as: "*Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers*". It follows from this definition that managers behave in an opportunistic manner in order to manipulate accounting numbers and produce poor quality annual reports, the purpose of which is to satisfy their personal needs and benefits. In addition, opportunism on the part of managers is then a source of concern and risk for certain stakeholders (shareholders and investors). Indeed, in the presence of imperfect information, if managers are not the owners of the firm, they are able to act opportunistically to maximize the value of their firm for their individual benefit at the expense of shareholders (owners) [21, 22]. In this case, owners are unable to effectively control the efforts of managers. This is likely to generate conflicts of interest between stakeholders, leading managers to expropriate shareholders' wealth and manipulate financial statements [32]. Moreover, Jensen & Meckling [32] defined ownership structure as the distribution and types of owners of a firm. Specifically, ownership structure refers to the set of contracts that defines the rights and obligations of owners and managers, and how the firm's profits and control rights are divided among them. This poor strategy undeniably leads to increased agency costs, reduced firm value, poor investment opportunities, and loss of trust between stakeholders.

To avoid these problems, it is important to return to governance mechanisms (agency theory principle). In

this context, the ownership structure is seen as an important governance mechanism, allowing the reduction of agency costs and conflicts of interest between shareholders and managers [32]. However, agency theory indicates that the ownership structure has two opposite effects on earnings management, namely entrenchment and alignment effects. The first effect assumes that the ownership structure positively affects the earnings management, indicating the tendency of managers to manipulate and falsify published results [50], [66]. The second effect proves the opposite. Specifically, the negative effect of the ownership structure on the earnings management is explained by the absence of vertical alliances between stakeholders and the reduction in agency costs. Therefore, agency theory assumes the existence of an optimal ownership threshold.

The empirical study

According to corporate finance literature, the relationship between ownership structure and earnings management has been the subject of several empirical studies on developed and developing countries. These various studies have often produced mixed results. This is mainly due to the specificity of each economy (advanced or developing), the type of firms (listed or unlisted), the period of study, the econometric method chosen by researchers, measures of ownership structure (managerial ownership, family ownership, institutional ownership, governmental ownership, etc.), and even measures of earnings management.

Specifically, several researchers studied the impact of ownership structure on real earnings management (REM)), supporting agency theory predictions (see, e.g., [11, 20, 46, 56, 58]. For example, Lo et al. [46] proved the presence of a negative relationship between state control and REM of Chinese firms. This result confirms the predictions of agency theory, indicating the presence of an alignment effect. Furthermore, Shayan-Nia et al. [58] analyzed the effects of ownership structure on REM in Malaysia. They used three ownership structure measures (managerial, institutional, and foreign). The main finding indicates that foreign ownership restricting income manipulation of Malaysian firms.

However, other studies examined the impact of ownership structure on accrual-based earnings management (AEM) (see, e.g., [18, 24, 29, 40, 42, 48, 63, 64]. For example, Warfield et al. [64] found that managerial ownership negatively affects AEM in China, proving the validity of the agency theory and the alignment effect. This result contrasts with that found by Cheng & Warfield [9]. However, in the same context, Firth et al. [24] showed that ownership concentration positively affects AEM. In addition, Alves [2] examined the relationship between ownership structure (measured with three variables: managerial ownership, ownership concentration and institutional ownership) and earnings management (measured by discretionary accruals) in Portugal. This study found that managerial ownership and ownership concentration have negative effects on discretionary accruals. This is explained by the fact that managers hold a large share of a firm's equity (managerial ownership), encourages them not to expropriate shareholders' wealth or to manipulate accounting information. This result reveals the presence of an alignment effect. Chi et al. [10] showed that family ownership positively affects earnings management in firms listed on the Taiwanese stock exchange. This result confirms the presence of the entrenchment effect of family ownership. The authors linked this result to weak legal systems and ineffective corporate governance in Taiwan. Certainly, the results of this study are consistent with some previous studies. La Porta et al. [43] showed that governance mechanisms (including institutional ownership) play an important role in improving income quality in Anglo-Saxon countries (particularly, the United States and the United Kingdom). Furthermore, they showed that family ownership is perceived as the main governance mechanism in other developed (especially Spain) and developing (especially Latin America countries).[2]

Other researchers analyzed the effects of ownership structure on the two types of earnings management (see, among others, [20, 67]. For example, Dong et al. [20] analyzed the relationship between managerial ownership and earnings management in China. Their findings indicate the existence of two opposite effects. First, there is a negative relationship between managerial ownership and REM, thus ensuring the presence of an alignment effect. Second, there is a positive relationship between managerial ownership and AEM. Although these empirical studies find evidence consistent with the predictions of agency theory, they remain very limited. In fact, these studies studied only the linear relationship between ownership structure and earnings management. They have made extensive use of the static panel to test the relationship between ownership structure and earnings management, leaving research screening at a very narrow level.

Further analysis has been carried out by other researchers based on the nonlinear relationship between the governance mechanisms (including ownership structure) and earnings management (see, among others, [18, 47, 50, 63, 66]. Their findings confirmed the validity of the entrenchment effect and alignment effect. Most of the

[2] The same finding has been proven by Arifin (2003) and Siregar & Utama [62] for the case of Indonesia.

previous studies used the quadratic method to test the nonlinear effect between some mechanisms of corporate governance, firm value, and earnings management.[3] However, there are other more sophisticated econometric techniques that have been used recently in the fields of corporate finance, namely Panel Smooth Transition Regression approach (PSTR) (see, among others, [13, 38] and Dynamic Panel Threshold approach Zhang et al. [68].

Given these different arguments, it is important to study the nonlinear relationship between ownership structure and earnings management in the Egyptian context. There are several reasons for choosing this context. First, empirical studies on African countries on the issue of earnings management are the least exploited. Second, Egypt confronted a weakness in governance practices, especially after the political transition of 2011. Third, the issue of nonlinearity is not widely analyzed in the empirical literature. In this case, we will examine the relationship between ownership structure and earnings management in Egypt. To do this, we will use the Dynamic Panel Threshold Approach [57].

In light of this literature review, we will develop in the following sub-section the hypotheses of our research.

Hypothesis development

In this sub-section, we present the hypotheses related to the impact of the four dimensions of ownership structure on accrual-based earnings management (AEM).

Managerial ownership and accrual-based earnings management (AEM)

Under agency theory, managerial ownership has two opposite effects on earnings management, supporting entrenchment and alignment hypotheses [32]. According to the entrenchment hypothesis, the possession of greater managerial ownership encourages managers to lead control over their firms and to adopt opportunistic behavior to serve their own interests to the detriment of shareholders' interests. Under entrenchment hypothesis, greater managerial ownership leads managers to abusively control their firms and to adopt opportunistic behavior to serve their own interests at the expense of shareholders' interests. This managerial discretion makes managers less exposed to supervision and dismissal [50]. As a result, there is a positive relationship between managerial ownership and earnings management [66].

However, under the alignment hypothesis, there is no conflict of interest between managers and shareholders. This is explained by the dominance of managerial ownership. In other terms, if managerial ownership is low, there is a conflict of interest between managers and shareholders. This can be explained by the presence of agency costs. This alignment effect assumes that as managerial ownership increases, opportunistic managerial behavior is reduced. As a result, there is a negative relationship between managerial ownership and discretionary accruals.

From an empirical viewpoint, Cheng & Warfield [9] and Dong et al. [20] found a positive relationship between managerial ownership and AEM. In contrast, Warfield et al. [64] and Alves [2] found a negative relationship between managerial ownership and AEM. The simultaneous consideration of both negative and positive aspects of managerial ownership on AEM leads us to hypothesize a nonlinear relationship between managerial ownership on AEM. We approach these different viewpoints by testing the following first hypothesis:

Hypothesis 1: There is a nonlinear relationship between managerial ownership and Accrual-based activity management.

Hypothesis 1.1: According to the entrenchment effect, managerial ownership has a positive impact on the AEM.

Hypothesis 1.2: According to the alignment effect, managerial ownership has a negative impact on the AEM.

Family ownership and accrual-based earnings management

Family ownership also generates two opposed effects on the earnings management. Under agency theory, the entrenchment and alignment hypotheses arise mainly from two main agency problems, namely the type of agency problem (Type I) and the principle-principal problem (Type II). In the case of Type I, family ownership plays a monitoring role, improving firm value and reducing income manipulation. Specifically, under the assumption of effective alignment/supervision, family shareholders are long-term oriented to maximize firm value. To do this, they are committed to aligning their interests with minority shareholders to minimize the probability of profit manipulation [15, 17]. In this case, family firms have a strong incentive to monitor management and reduce problems of free riding and agency costs. It follows from these findings that ownership concentration limits managers' discretionary attitudes [32].

However, under Type II, family owners exploit business assets to increase profits at the expense of the interests of minority shareholders. This is likely to minimize

[3] Some previous studies have used quadratic regression because their panel is unbalanced (non-cylindrical) (see, e.g., Khémiri & Noubbigh [37] on determinants of capital structure, Molinari [49] and Khémiri & Noubbigh (2020a) on investment and debt.

the firm's performance and income quality. Therefore, it is difficult to align majority and minority shareholder participation in monitoring terms. In this context, the hypothesis of the entrenchment/expropriation effect supports the idea that increased ownership concentration forces majority shareholders to increase their wealth at the expense of the interests of minority shareholders. Specifically, large block holders incite managers to manipulate corporate profits for their personal advantage [22, 23, 50, 61]. This type of opportunistic behavior thus generates the principle-principle problem.

Empirically, it important to note that there is clear ambiguity about family ownership-AEM nexux, with some studies showing positive association and others showing negative association [10, 20, 24]. Given these findings, we formulate our second hypothesis as follows:

Hypothesis 2: There is a nonlinear relationship between family ownership and Accrual-based activity management.

Hypothesis 2.1: According to the entrenchment effect, family ownership has a positive impact on the AEM.

Hypothesis 2.2: According to the alignment effect, family ownership has a negative impact on the AEM.

Governmental ownership and accrual-based earnings management

The effect of governmental ownership on earnings management has been of special importance in political and development theories. These different theories have identified two types of behavior that resemble those indicated in agency theory (opportunistic and non-opportunistic behaviors). Specifically, under political theories, governments behave selfishly toward the firms which they own [52, 53]. In fact, they are committed to monitoring firms for political objectives. They do this by providing subsidies to firms. These firms are then required to make political contributions and bribes [43], [60], [7]. Using these government measures, a firm with a high level of governmental ownership could then change the external economic environment conditions. In this case, the government regulations adopted by the firm serve their interests and produce a more favorable environment according to their needs. As a result, public enterprises are unlikely to make voluntary disclosure and provide more transparent information, resulting from expropriation activities. In addition, managers of public enterprises have less incentive to improve corporate profitability and promote financial reporting quality. Therefore, political theories support the idea that governmental ownership exhorts public enterprises to manipulate accounting data for political objectives.

However, development theories, advanced by Gerschenkron [25],Shleifer [59], consider government as benevolent. In this context, the existence of government as a majority shareholder reduces uncertainty and market imperfections (e.g., development of strategic industries, monopoly power or externalities, etc.). Therefore, this is likely to reduce accounting manipulations. According to these arguments advanced in the financial literature, governmental ownership affects earnings management. Empirically, Lo et al. [46] and Dong et al. [20] showed the presence of a negative relationship between governmental ownership and AEM, while Ding et al. [18] found the presence of a nonlinear relationship between state control and AEM. In this case, the third hypothesis of our research is as follows:

Hypothesis 3: There is a nonlinear relationship between governmental ownership and Accrual-based activity management.

Hypothesis 3.1: According to political theories, governmental ownership has a positive impact on the discretionary accruals.

Hypothesis 3.2: According to development theories, governmental ownership has a negative impact on discretionary accruals.

Institutional ownership and accrual-based earnings management

Institutional ownership is seen as another important governance mechanism. According to agency theory, the impact of institutional ownership on earnings management can be explained by two main hypotheses, namely passive hands-off and active monitoring hypotheses [41]. According to the passive hands-off hypothesis, institutional owners (also known as myopic investors) focus intrinsically on earnings timeliness (i.e., short-term earnings instead of long-term earnings) Bhide [4],Porter [55]. As a result, these investors find themselves unable to monitor management or even restrict managerial discretion in earnings management. This is likely to lead managers to aggressively manage their earnings by manipulating profits [41]. Therefore, the passive hands-off hypothesis suggests a positive relationship between institutional ownership and earnings management Bhide [4], Porter [55].

However, according to the active monitoring hypothesis, the monitoring mechanism used by the firm, including earnings management monitoring, is largely affected

by institutional investors. In fact, institutional investors, having a large scale of investment, are considered as more sophisticated and better-informed investors compared to small investors [1]. Because of the possession of reliable financial information on their companies, institutional investors are committed to effectively monitoring the activities of managers. This is likely to reduce information asymmetry problems and managers' demands for opportunistic profit manipulation. Active monitoring hypothesis suggests the presence of an inverse relationship between institutional ownership and earnings management [6, 48]. Empirically, Kouaib & Jarboui [42] and [58] found no impact between institutional ownership and earnings management. Although there is no clear evidence of the nature of the relationship between institutional ownership and AEM, it is expected that there is a nonlinear relationship between institutional ownership and AEM. The fourth and final hypothesis of our study is as follows:

Hypothesis 4: There is a nonlinear relationship between institutional ownership and Accrual-based activity management.

Hypothesis 4.1: According to the passive hands-off hypothesis, institutional ownership has a positive impact on the discretionary accruals.

Hypothesis 4.2: According to the active monitoring hypothesis, institutional ownership has a negative impact on the discretionary accrual.

Research method

Data and sample selection

To build our database, we used the listed firms in Egyptian Exchange (EGX). Following an economic reform program and privatization, the EGX has again grown.[4] In 2017, there were 226 firms listed on the stock exchanges. In our study, we used a sample of 78 listed non-financial firms covering the period 20,082,017. Financial, insurance and investment firms, firms that do not have information for at least 3 years and firms with relatively missing data of corporate governance were excluded from our analysis. We obtained 78 firms with total 780 firm-year observations. Table 1 describes the structure of our panel database. It should be noted that our sample (78) represents about 36% of the total 226 listed firms in 2017.

A distinguished data set, representing a sample of non-financial publicly listed companies in Egypt over the period 2006 to 2017 is the base from which the data examined in this study are drawn. The calculation of proxies of REM is based on two prior years before the base year for study. The focus of the study is from 2008–2017. The EGX, the Capital Market Authority (CMA) and Egypt for Information Dissemination (EGID) are the main sources from ownership structure data were collected manually. Data for the control variables set and EM proxies are calculated based on data collected from the DataStream.

Econometric model

Economical literature on dynamic models has recently become so interested in the implication of asymmetric nonlinear dynamics such as Markov-Switching, Smooth transition, and threshold models. These models have become popular because of their functions in drawing inferences about the process of generating underlying data or to obtain a reliable prediction that cannot be achieved by linear models. Until now, however, most of the econometric analysis stopped studying nonlinear issues of asymmetric mechanisms that are explicitly within context dynamic panel data. Hansen [28] proposed a static panel threshold model where regression coefficient can take on a small number of different values based on the value of an exogenous stationary variable. [26] generalize this approach and develop a panel smooth transition regression (PSTR) model, which permits the coefficients to change gradually from one regime to another.

The PTR and PSTR models are derived from the static panel models. However, they cannot deal with dynamic models and the problem of endogeneity. In this framework, Seo & Shin [57] proposed a general approach to generalized method of moment (GMM) based on first difference transformation (FD). The FDGMM approach should make it possible to overcome the main limitation of the existing literature [26], i.e., the assumption of exogeneity of the regressors and/or the transition variable, which may hamper the usefulness of threshold regression models.

To examine the nonlinear relationship between corporate governance mechanisms and earning management, empirical studies frequently use the quadratic form [18, 47, 50, 63, 66]. To enrich the existing literature, we will use the approach proposed by Seo & Shin [57]. We estimated the following earning management equation.

[4] The Egyptian Stock Exchange EGX was established in 1883 in Alexandria, followed by the Cairo Stock Exchange in 1903. It is one of the oldest established stock exchanges in the Middle east. In 1940, the EGX experienced a surprising growth and became the fifth largest in the world. However, it stagnated for a long time due to the central planning and socialist policies adopted during the period 1950–1990.

Table 1 Variable descriptions

Variables	Measures	Acronyms	Sources
Accrual-based Earning Management	Discretionary accruals by Kasznik [36]	DAKZ	Data Stream and financial statement
Managerial ownership	The total number of ordinary shares held by all directors of the board of scaled by the total number of ordinary shares of a firm at the end of its financial year	MAG	Annual Disclosure Books by EGX and ownership structure reports
Family ownership	The percentage of total shares held by family	FAM	Annual Disclosure Books by EGX and ownership structure reports
Governmental ownership	The total number of ordinary shares held by all government scaled by the total number of ordinary shares of a firm at the end of its financial year	GOV	Annual Disclosure Books by EGX and ownership structure reports
Institutional ownership	The average percentage of shares outstanding owned by institutional investors at the end of its financial year	INST	Disclosure Books, and ownership structure reports
Return on assets	Net income divided by the total assets at the beginning of the year	ROA	Data stream and financial statements
Return on equity	Net income divided by the total equity at the beginning of the year	ROE	Data stream and financial statements
Liquidity	Current assets to current liabilities	LIQ	Data stream and financial statements
Leverage	The percentage of book value of total debt to total assets of a firm at the end of its financial year	LEV	Data stream and financial statements
Gearings	The percentage of total debt to total ordinary equity of a firm at the end of its financial year	GEAR	Data stream and financial statements
Firm size	Natural log of the book value of a firm's total assets at the end of its financial year	SIZE	Data stream and financial statements
Tangibility	It is measured as net property plant and equipment scaled by total assets	TANG	Data stream and financial statements
Operating cycle	It is measured as the logarithm of the sum of the inventory period and the receivables period	OC	Data stream and financial statements
Earnings flexibility	It is measured as the sum of inventories and receivables scaled by total assets	EFLEX	Data stream and financial statements

$$EM_{it} = \left(\phi_1 EM_{it-1} + \phi_1 OS_{it} + \sum_{j=1}^{9} \theta_{j1} X_{it}\right) 1\{q_{it} \le \gamma\} \left(\phi_1 EM_{it-1} + \phi_{12} OS_{it} + \sum_{j=1}^{9} \theta_{j2} X_{it}\right) 1\{q_{it} > \gamma\} + \varepsilon_{it} \quad (1)$$

where $1\{\cdot\}$ is an indicator function, q_{it} the transition variable and γ the threshold parameter. θ_1 and θ_2 are the slope parameters associated with different regimes. EM is the earning management; EM_{it-1} is the lagged dependent variable; X_{it-1} is the vector of time-varying regressors (OS is ownership structure; ROA is return on assets; ROE is return on equity; LIQ is liquidity; LEV is leverage, GEAR is gearings; SIZE is firm size; TANG is assets tangibility; OC is operating cycle and EMFLEX is earnings management flexibility) and ε_{it} is the error term.

Variable measurements

The dependent variable (earnings management measurement)

In order to measure earnings management, it is important to distinguish between two main components of earnings management, namely the non-discretionary (normal) and the discretionary (or abnormal) components of operating accruals. The non-discretionary (normal accruals) components represent the company's financial position and sales growth. It is therefore very difficult for managers to manipulate normal accruals. The discretionary (abnormal accruals) components reflect managerial interventions in the accounting reporting process Chi et al. [10]. In our study, we measure earnings management by discretionary accruals.

In this framework, Peasnell et al. [54] recommended the use of two main methods to separate discretionary and non-discretionary accruals. These two methods

correspond to the Jones [34] model and the modified Jones model. They allow for the estimation of parameters of normal accrual activity. This is accomplished using a regression model, which contributes to regressing a measure of total accruals (operating accruals) on proxies for normal business activity. After the estimation of these parameters (i.e. normal accrual parameters), they are then combined with event period data. This is likely to create estimated unexpected accrual activity. However, according to Dechow et al. [16], the modified Jones model is seen as the most powerful model because it takes into account the change in receivables to earnings management. In contrast to the Jones model, the modified Jones model is therefore able to detect sales-based earnings management.

According to Peasnell et al. [54], there are two main methods to separate discretionary and nondiscretionary accruals. These two methods correspond to the Jones model and the modified Jones model (m-J). They allow the estimation of parameters of normal accrual activity. This is accomplished with a regression model, which contributes to regressing a measure of total accruals (operating accruals) on proxies for normal business activity. Once these parameters (i.e., normal accrual parameters) have been estimated, they are then combined with event period data. This is likely to create estimated unexpected accrual activity. However, according to Dechow et al. [16], the modified Jones model (m-J) is seen as the most powerful model because it takes into account the change in receivables to earnings management. In contrast to the Jones model, the modified Jones model (m-J) is therefore able to detect sales-based earnings management.

Following Peasnell et al. [54] and Chi et al. [10], we estimate the modified Jones model (m-J) using cross-sectional regression. This helps us to improve the efficiency of the estimation of the regression parameters, while avoiding the problem of continuation bias that is inseparable from the use of a firm-specific time approach. In addition, we use the modified Jones procedures to estimate abnormal accruals. To do so, we proceed in the following two steps. In the first step, we regress total accruals to manage estimated normal accrual parameters. These are regressed first on proxies for normal business activity for each sample firm with the time-series data prior to the event. In the second step, we combine the estimated parameters with event period data. This step aims at the determination of abnormal accruals.

$$\begin{aligned} \mathrm{NDA_{it}} = {} & \alpha 1\,(1/\mathrm{TA_{it}} - 1\,) + \beta 1\,(\Delta\mathrm{REV_{it}} \\ & -\Delta\mathrm{REC_{it}} - 1/\mathrm{TA_{it}} - 1\,) \\ & + \beta 2\,(\mathrm{PPE_{it}}/\mathrm{TA_{it}} - 1) \end{aligned} \tag{2}$$

where $\mathrm{NDA_{it}}$ is the non-discretionary accruals of firm i at date; $\mathrm{TA_{it-1}}$ is the book value of total assets; $\Delta\mathrm{REV_{it}}/\mathrm{TA_{it-1}}$ is the change of sales revenue scaled by $\mathrm{TA_{it-1}}$; $\Delta\mathrm{REC_{it}}/\mathrm{TA_{it-1}}$ is the change in the net receivables scaled by $\mathrm{TA_{it-1}}$; $\mathrm{PPE_{it}}/\mathrm{TA_{it-1}}$ is the gross property, plant, and equipment scaled by $\mathrm{TA_{it-1}}$. Following Kasznik [36] and Lara et al. [44], we define abnormal accruals (AA) as follows:

$$\begin{aligned} \mathrm{TAC_{it}}/\mathrm{TA_{it}} = {} & \alpha 1\,(1/\mathrm{TA_{it}} - 1) \\ & + \beta 1(\Delta\mathrm{REV_{it}}/\mathrm{TA_{it}} - 1) \\ & + \beta 2(\mathrm{PPE_{it}}/\mathrm{TA_{it}} - 1) \\ & + \beta 3\mathrm{CFO_{it}} - 1 + \varepsilon_{\mathrm{it}} \end{aligned} \tag{3}$$

where $\mathrm{TAC_{it}}$ is total accruals of firms i at date t; $\mathrm{TA_{it-1}}$ is total assets at date $t-1$; $\mathrm{CFO_{it}}$ is cash flow from operating activities; $\Delta\mathrm{REV_{it}}$ is change in revenues; $\Delta\mathrm{REC_{it}}$ is change in account receivable; $\Delta\mathrm{PPE_{it}}$ is gross property, plant, and equipment; and it is the error term.

The coefficients are estimated in the regression model in the first equation and are used as benchmarks to forecast non-DAs among firms in each portfolio. Non-DAs is then calculated as follows:

$$\begin{aligned} \mathrm{NDA_{it}} = {} & \alpha 1\,(1/\mathrm{TA_{it}} - 1) + \beta 1\,(\Delta\mathrm{REV_{it}} \\ & -\Delta\mathrm{REC_{it}} - 1/\mathrm{TA_{it}} - 1) \\ & + \beta 2(\mathrm{PPE_{it}}/\mathrm{TA_{it}} - 1) \\ & + \alpha 4\mathrm{CFO_{it}} - 1 + \varepsilon_{\mathrm{it}} \end{aligned} \tag{4}$$

After that, error terms are estimated by taking the difference between total accruals and non-DAs, which represents the components of DAs.

Main independent variables

The ownership structure of firms is seen as a key mechanism for the quality and completeness of the supervision administered in the organization. According to Shayan-Nia et al. [58] and Dong et al. [20], we used four indicators to measure ownership structure. The first indicator corresponds to management ownership (MNG). It is measured by the proportion of shares held by directors divided by the total number of shares outstanding each year. The second indicator is Family Ownership (FAM). It is measured by the percentage of total shares held by family members. The third indicator is government ownership (GOV). It is equal to the total number of common shares held by the government as a whole, measured by the total number of common shares of a firm at the end of its fiscal year. The fourth and final indicator is institutional ownership (INST). This variable is often used to examine whether there is an uneven fundamental

Table 2 Descriptive statistics

Variables	Obs	Min	Max	Mean	Std.Dev	Skewness	Kurtosis
Dependent variables							
$Kaznik_{t-1}$	780	−0.204	0.181	−0.008	0.091	−0.088	0.102
Main independent variables							
Managerial ownership	780	0	72	16.522	23.238	1.213	0.033
Family ownership	780	0	23.6	3.756	7.073	1.793	1.93
Governmental ownership	780	0	93.4	21.386	30.790	1.27	0.104
Institutional ownership	780	0	74.5	19.232	25.430	1.015	−0.49
Control variables							
Return on assets	780	−0.040	0.216	0.052	0.065	0.957	0.472
Return on equity	780	−0.069	0.374	0.100	0.118	0.813	−0.089
Liquidity	780	0.515	5.0461	1.834	1.188	1.375	1.141
Leverage	780	0.018	0.610	0.232	0.172	0.618	−0.626
Gearings	780	0.019	2.0804	0.518	0.555	1.554	1.667
Size	780	4.677	6.9666	5.692	0.696	0.374	−1.037
Tangibility	780	0.009	0.78	0.357	0.244	0.134	−1.156
Operating cycle	780	4.097	6.8154	5.351	0.757	0.219	−0.776
Earnings flexibility	780	0.080	0.873	0.400	0.224	0.557	−0.596

The table reports summary statistics (number of observations, mean, standard deviation, minimum, maximum, Skewness, and Kurtosis) for the variables used in the empirical analysis

influence of institutional ownership on firm performance. It is measured by the number of shares held by institutions relative to the total number of shares outstanding [10].

Control variables

We include several control variables in order to improve the explanatory power of our empirical model and reduce the problem of omitted variables. According to González & García-Meca [27],Dong et al. [20], we introduce firm-specific characteristics such as firm performance (ROA), liquidity (LIQ), capital structure (LEV), firm size (Size), assets tangibility (TANG), the operating cycle (OC) and earnings flexibility (EFLEX). Table 1 presents the measures and definitions of these variables.

Data analysis and discussion of results

Descriptive statistics

Table 2 summarizes the descriptive statistics for different variables used in our study. The mean, median, standard deviation, minimum, maximum values, skewness, and kurtosis are shown for the independent and dependent variables. The descriptive analysis helps understanding the most important characteristics of the data and accordingly contributes to pave the way for the interpretation of panel data analysis. This table includes data of the accruals EM, the ownership structure (measured by four variables managerial ownership (MNG), family ownership (FAM), government ownership (GOV) and institutional ownership (INST)) and the control variables for the sample of listed Egyptian firms from the years (2008–2017).

The level of discretionary accruals across the accruals-based EM Models is presented by descriptive statistics. The mean value of discretionary accruals computed from the Kaznik Model is used to compute discretionary accruals. This may be indicated that Egyptian firms engage in more income decreasing discretionary accruals compared with income increasing discretionary accruals on average. Examination of discretionary accruals across this model (the dependent variable) indicates that significant non-normality exists (skewness 0.17, kurtosis −0.339). This may result in non-normality in the residual of the regression, which violates the OLS assumption. Therefore, the study normalized data using the Van der Waerden approach [12] which effectively assigns ranks to non-normal data and transforms ranks to numbers with a normal distribution. Regarding ownership variables, Table 2 reports that managerial, family, institutions, and government ownership on average are 16.79%, 3.7%, 19.7%, and 21.4%, respectively. This indicates that, on average, most of the firms were held by government shareholders. In addition, we can see that the control variables introduced into our model show a progressive rhythm with a positive sign during the period (2008–2017).

Table 3 presents the results of the Pearson correlation matrix. The Pearson correlation test result shows that

Table 3 Correlation coefficient Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) DAKZ	1.000													
(2) MAG	−0.043	1.000												
(3) FAM	0.006	−0.007	1.000											
(4) GOV	0.073*	−0.378*	−0.227*	1.000										
(5) INST	−0.004	−0.357*	−0.184*	−0.382*	1.000									
(6) ROA	−0.053	0.018	−0.006	0.008	−0.001	1.000								
(7) ROE	−0.008	0.004	0.014	0.029	−0.035	0.864*	1.000							
(8) LIQ	−0.025	−0.003	−0.057	0.003	0.014	0.228*	0.046	1.000						
(9) LEV	0.026	0.006	−0.029	−0.086*	0.104*	−0.142*	−0.062	−0.371*	1.000					
(10) GEAR	0.058	−0.012	−0.021	0.001	0.067	−0.166*	−0.042	−0.364*	0.800*	1.000				
(11) SIZE	0.046	−0.019	0.015	0.068	−0.078*	0.233*	0.328*	−0.195*	0.051	0.155*	1.000			
(12) TANG	0.001	0.018	−0.025	−0.045	0.076*	−0.109*	−0.178*	−0.338*	0.115*	0.095*	0.118*	1.000		
(13) OC	0.084*	−0.004	0.035	0.058	−0.064	0.081*	0.255*	−0.288*	0.185*	0.336*	0.781*	0.010	1.000	
(14) EFLEX	0.028	0.001	0.071*	−0.007	−0.055	−0.049	0.111*	−0.041	0.049	0.091*	−0.153*	−0.452*	0.254*	1.000

This table reports the correlations of variables for non-financial firms listed in Egyptian stock exchange between 2008 and 2017. Correlation is significant at the 5% level

***, **, and * represent significance level at the 1%, 5% and 10% levels, respectively

there are no critical multicollinearity problems between the variables since all the estimated coefficients have values less than 0.80.

Optimal ownership structure and earnings management

Table 4 presents the results obtained of the relationship between ownership structure and accrual-based earnings management (AEM), using a dynamic panel threshold model and estimate it with a first difference GMM approach (FD-GMM). The FD-GMM estimation results are reported, respectively, in the low and the high regimes. To check the validity of the nonlinearity, we report the test results for the null of no threshold effects in Table 4. We find that the bootstrap p-values of the linear test are all close to zero, providing strong evidence in favor of threshold effects. This result shows that the relationship between ownership structure and earnings management is nonlinear. The result for (1) shows that the thresholds of each measure of ownership structure are estimate at 18.67, 21.19 47.65, and 44.09, respectively.[5]

Based on the analysis of the lagged accrual-based earnings management variable $Kaznik_{t-1}$, we find that its coefficients have two opposite effects on current accrual-based earnings management (AEM). Specifically, in both regimes, lagged earnings management has a positive and statistically significant impact on AEM (see columns (3) and (4) in the lower regime and column (1) in the upper regime). However, in the upper regime (column (4)), lagged earnings management has a negative impact on current earnings management. This is due to the presence of adjustment costs related to earnings management.

It should be remembered that our basic model is subdivided into four regressions according to different measures of ownership structure. Specifically, we used the four measures of ownership structure (managerial ownership, family ownership, government ownership and institutional ownership) as transition variables. The results obtained from these different regressions are also mixed. In the first model (column 1), we find a nonlinear relationship between managerial ownership and earnings management. The coefficients of two regimes ($\hat{\phi}_1$ and $\hat{\phi}_2$) are statistically significant at 1% (see column (1)). For the lower regime, it represents Egyptian firms with low managerial ownership, where the MAG variable is less than 18.67% and the coefficient estimate ($\hat{\phi}_1 = 0.0134$) is positive. This result indicates the presence of a positive relationship between managerial ownership (MAG) and current accrual-based earnings management (AEM) in the lower regime. As for the upper regime, it refers to Egyptian firms with a high managerial ownership. In this regime, the MAG variable is greater than 18.67% and the coefficient estimate ($\hat{\phi}_2 = -0.0142$) is negative. This result can be explained by the presence of a negative relationship between managerial ownership (MAG) and accrual-based earnings management (AEM) in the upper regime. This indicates the presence of a nonlinear relationship between managerial ownership (MAG) and accrual-based earnings management (AEM) of Egyptian listed firms. In this case, the upper regime is considered to be

[5] All results are obtained through the Stata 16 software.

Table 4 Ownership structure and earnings management: Threshold estimation results

xit\qit	**MAG**	**FAM**	**GOV**	**INST**
	Lower regime ($\hat{\varphi}_1$)			
DKAZt − 1	−0.0655	−0.0226	0.164***	0.218***
	(0.0824)	(0.0452)	(0.0620)	(0.0611)
OWNS	0.0134***	0.00318	0.00936***	0.00114
	(0.00322)	(0.00390)	(0.00185)	(0.00139)
ROA	0.00962	−0.193	0.0691	0.780**
	(0.303)	(0.221)	(0.271)	(0.316)
ROE	−0.0672	0.0550	−0.198*	−0.388**
	(0.169)	(0.100)	(0.118)	(0.153)
LIQ	−0.00101	0.00182	0.00402	−0.0232***
	(0.00478)	(0.00327)	(0.00556)	(0.00446)
LEV	−0.0544	−0.0817**	0.0685	0.165***
	(0.0700)	(0.0387)	(0.0465)	(0.0362)
GEAR	0.0635**	0.0407***	0.000207	−0.0363***
	(0.0309)	(0.00764)	(0.00691)	(0.0139)
Size	−0.0212	−0.0669***	0.0308	0.0121
	(0.0238)	(0.0138)	(0.0291)	(0.0173)
TANG	0.0589	0.0129	−0.0125	−0.272***
	(0.0618)	(0.0395)	(0.0726)	(0.0444)
OC	−0.0376	0.0677***	0.0317	0.0609**
	(0.0306)	(0.0216)	(0.0292)	(0.0280)
EFLEX	0.00837	0.0838***	−0.192***	−0.0981*
	(0.0471)	(0.0303)	(0.0551)	(0.0543)
xit\qit	**MAG**	**FAM**	**GOV**	**INST**
	Upper regime ($\hat{\varphi}_1$)			
DKAZt − 1	0.441***	0.446	−0.0800	−0.610***
	(0.137)	(0.395)	(0.280)	(0.148)
OWNS	−0.0142***	0.216	−0.00816**	0.00488
	(0.00488)	(0.171)	(0.00372)	(0.00358)
ROA	1.780***	0.107	−0.746	−0.651
	(0.550)	(2.693)	(0.628)	(0.624)
ROE	−0.941***	−1.617	0.773***	0.231
	(0.250)	(1.627)	(0.291)	(0.299)
LIQ	−0.0105	−0.196**	0.0149	0.0388***
	(0.0144)	(0.0946)	(0.0218)	(0.0133)
LEV	0.345***	0.211	0.294**	−0.479***
	(0.0946)	(0.762)	(0.136)	(0.177)
GEAR	−0.202***	−0.331*	−0.0549	0.114**
	(0.0384)	(0.183)	(0.0456)	(0.0475)
Size	−0.0707*	0.295**	−0.271***	−0.0641*
	(0.0415)	(0.136)	(0.0574)	(0.0362)
TANG	−0.290***	−0.116	0.0247	0.347***
	(0.0733)	(0.169)	(0.101)	(0.0873)
OC	0.111***	−0.0590	0.203***	−0.103**
	(0.0373)	(0.146)	(0.0451)	(0.0473)
EFLEX	0.165*	−0.430	−0.0848	0.277***
	(0.0860)	(0.306)	(0.125)	(0.0895)
Constant	−0.0593	−5.734	0.293	0.274*
	(0.182)	(4.264)	(0.284)	(0.160)

Table 4 (continued)

xit\qit	MAG	FAM	GOV	INST
Threshold	18.67**	21.19***	47.65***	44.09***
	(9.222)	(0.872)	(10.84)	(10.64)
Linearity test (p – value)	0.000	0.000	0.000	0.000
Observations	780	780	780	780
Number of firms	78	78	78	78

This table presents the results of Dynamic Panel Threshold Approach (Eq. 1) derived by Seo & Shin [57]. The dependent variable is ownership structure measured by Kasznik [36] model (DKAZ). Sample period: 2008–2017. Linearity test is the bootstrap test of linearity where the null hypothesis is the no threshold effects.

Standard errors are reported in parentheses and *** denotes significance at 1%

***, **, and * represent significance level at the 1%, 5% and 10% levels, respectively

the optimal regime because its coefficient ($\hat{\phi}_2$) is higher than that of the lower regime ($\hat{\phi}_1$).

This analysis shows the existence of an optimal managerial ownership (MAG) threshold, which is equal to 18.67%, below which the positive relationship is explained by the fact that managers, as holders of a share of the capital in the Egyptian firms they manage, have an incentive to expropriate the shareholders' wealth for their own interests. To do so, they undertake to manipulate accounting numbers, including earnings, to increase their personal benefits. Therefore, they adopt an opportunistic behavior, allowing them to take advantage of managerial discretion. This is likely to increase conflicts of interest between managers and shareholders due to the asymmetry of information. As a result, this leads to increased agency costs and a decrease in the firm value. This result is in line with those found by Cheng & Warfield [9] and Dong et al. [20]. This result confirms the predictions of the agency theory and entrenchment hypothesis. Therefore, hypothesis 1.1 is validated. However, beyond this threshold, the negative relationship between managerial ownership and earnings management indicates that managers of non-financial firms hold a large share of the capital urges them to act in the interests of shareholders. Therefore, managers undertake to monitor and control the management of their firms effectively, thereby enabling them to restrict the manipulation of earnings management. In this case, the managers can properly manage the financial decisions of Egyptian firms (investment decisions, financing decisions and distribution of dividends to shareholders). It follows from this conclusion that as managerial ownership increases, opportunistic behavior is reduced. This is likely to minimize vertical alliances between stakeholders and reduce agency costs arising from information asymmetries. This result is like that found by Dong et al. [20]. The agency theory and the alignment hypothesis are confirmed. Our hypothesis 1.2 is accepted. In summary, our results suggested the presence of a nonlinear relationship between managerial ownership and earnings management. This relationship goes from positive to negative. This is explained by the fact that as managerial ownership increases (decreases), earnings manipulation decreases (increases). More specifically, the nonlinear relationship between managerial ownership and earnings management can be interpreted as a trade-off between the benefits and costs of managerial ownership. While managerial ownership can align managers' interests with those of shareholders and reduce earnings manipulation, it can also lead to entrenchment and an increase in earnings manipulation. The optimal level of managerial ownership that minimizes earnings manipulation will depend on the specific characteristics and context of the firm. This certainly proves the validity of hypothesis 1.

Turning now to family ownership (FAM), it has positive and not statistically significant effect in both lower and upper regimes (see column 2). This is explained by the fact that family ownership has no effect on AEM of Egyptian non-financial firms. This result suggests that there is no significant relationship between family ownership and AEM in non-financial firms in Egypt. This means that family ownership does not play a role in influencing or affecting AEM practices in these firms. This result undeniably contradicts the predictions of agency theory. Hypotheses 2, 2.1 and 2.2 are rejected.

For governmental ownership (GOV), it has significant and opposite coefficients of two regimes ($\hat{\phi}_1$ and $\hat{\phi}_2$). In the lower regime, thus representing a low state participation in Egyptian firms, the GOV variable is lower than 47.65%. In addition, the coefficient estimate ($\hat{\phi}_1 = 0.00936$) has a positive sign. This result reveals that the relationship between governmental ownership (GOV) and current accrual-based earnings management (AEM) is positive, especially in the lower regime. However, in the upper regime, indicates that the government holds the majority of the company's shares. This variable exceeds the optimal threshold which is equal to 47.65%,

(i.e., higher than the threshold value) and the estimation of the coefficient.

($\hat{\varphi}_2 = -0.00816$) would be negative. This is certainly explained by the presence of an inverse relationship between governmental ownership (GOV) and current accrual-based earnings management (AEM). From these different results, it follows that there is a nonlinear relationship between governmental ownership (GOV) and accrual-based earnings management (AEM). In this case, the comparison of the coefficients of two regimes ($\hat{\varphi}_1 = 0.00936$ for lower regime and $\hat{\varphi}_2 = -0.00816$ for upper regime), leads us to opt for lower regime because it has the higher coefficient (see column (3)). Therefore, the lower regime is considered the optimal regime. Given this result, we can see that the government's participation, below 47.65%, urges Egyptian firms to opt for strategies and techniques that serve their political interests. In this case, the managers of (state-owned) public firms are less committed to monitoring profitability levels, or even to disclosing more credible and transparent annual reports. Therefore, the Egyptian government encourages managers to manipulate accounting data (including earnings management) for political purposes. This is consistent with the predictions of political theories. Therefore, the hypothesis 3.1 is validated.

As for the result of the negative relationship between governmental ownership (GOV) and AEM, it proves the contrary. It indicates that as GOV exceeds the optimal threshold of 47.65%, the manipulation of Egyptian firms' earnings management is reduced. This result can be explained by the fact that the government's participation in the capital of firms ensures greater credibility and transparency of financial information. Indeed, the government, as the majority shareholder, can play a crucial role in monitoring the activities of managers, publishing more transparent annual reports and thus minimizing information asymmetries. This undeniably restricts earnings management practices. This result is similar to those found by Lo et al. [46] and Dong et al. [20]. In this case, we accept the predictions of development theories. Hypothesis 3.2 is then validated. Indeed, our results have shown that the relationship between governmental ownership and earnings management is nonlinear. There is an optimal threshold of governmental ownership, equal to 47.65%, below which government participation leads to manipulation of accounting data (including earnings management). However, above this threshold, government ownership limits any kind of fraud or accounting manipulation. More specifically, the nonlinear relationship between governmental ownership and earnings management can be seen as a trade-off between the benefits and costs of government intervention in the management of firms. While government ownership can help to reduce earnings management by providing greater oversight and regulation, it can also lead to government interference and manipulation of earnings. The optimal level of governmental ownership that minimizes earnings management will depend on the specific context and characteristics of the firm and the government involved. This result is consistent with that found by Ding et al. [18]. Therefore, the 3 hypothesis is accepted.

The coefficients of the fourth and last institutional ownership interest variable (INST) are not significant in both regimes. This result indicates that institutional ownership does not affect AEM of Egyptian firms. More specifically, this finding is that institutional investors in Egypt may not have a significant influence on the behavior of firms in the same way that they do in other countries with more developed capital markets. In addition, the regulatory environment in Egypt may not be conducive to the effective monitoring and regulation of earnings management by institutional investors. This could limit the ability of institutional investors to influence the behavior of firms and to encourage more ethical and transparent financial reporting practices. This result is clearly at odds with the predictions of agency theory. The hypotheses 4, 4.1, and 4.2 are rejected.

Let's now move on to the discussion of control variables. The effect of firm performance on earnings management is measured by two indicators (return on assets (ROA) and return on equity (ROE)). Our results suggested that the ROA coefficients are positive and statistically significant in both regimes (see column (4) for the lower regime and column (1) for the upper regime). Similarly, at the upper regime level, the ROE coefficient has a positive and statistically significant sign at the 1% threshold (see column (3)). In addition, our results showed that the ROE coefficients have negative signs with diverging degrees of significance at the level of two regimes (see columns (3) and (4) for the lower regime and column (1) for the upper regime). The positive relationship between ROE and AEM indicates that managers of Egyptian firms are motivated to manipulate accounting numbers to avoid losses. They have an incentive to falsify and publish current period results when their firm's performance is quite low (close to zero). In fact, the managers of Egyptian firms will try to disclose accounting and financial information, while considering the costs incurred by their firm and the expected benefits with the market. These actions are unobservable by shareholders and potential investors. It follows from this result that the lower ROA, the more the managers of these firms are motivated to manipulate earnings management. This manipulation reflects managers' demands to act opportunistically to increase the firm value before issuing share prices. Certainly, this will allow them to increase share

prices. This result is confirmed by Cheng & Warfield [9] and Roychowdhury [56]. In addition, the negative relationship between ROA and AEM is explained by the fact that non-financial firms, with a higher level of profitability, are more likely to restrict earnings management. In summary, poor performance increases managers' incentives to engage in earnings management activities. This allows them to signal the future firm value.

As for firm liquidity (LIQ), its coefficients have opposite signs with different degrees of significance. In both regimes, liquidity has a negative and statistically significant effect on earnings management (see column (4) for the lower regime and column (4) for the upper regime). In the upper regime (column 4), liquidity positively affects accrual-based earnings management (AEM). In fact, the positive relationship between liquidity and earnings management indicates that managers have more liquidity, allowing them to manipulate profits. In the absence of a strong governance structure, managers use this excess liquidity for personal purposes by investing it in inefficient (unprofitable) projects. They spend the excess funds on projects with low growth opportunities (with negative NPV) to maximize their benefits. To do so, they engage in manipulating accounting information (especially profit) to hide their useless activities and expropriate shareholder wealth.

The same observation is confirmed for the firm's capital structure as measured by two main indicators, namely financial leverage (LEV) and gearings (GEAR). Specifically, the results obtained on these two indicators are also mixed. On the one hand, we find that LEV and GEAR have negative effects on earnings management in both regimes. On the other hand, we find that both indicators have positive effects on earnings management. The positive relationship between capital structure and earnings management can be explained by the fact that over-indebtedness induces managers of Egyptian firms to apply accounting techniques and practices, thus enabling them to avoid breaching debt covenants. To do so, they commit to manipulating accounting numbers (including the result of the financial year) by amplifying the profits of the current period (the current year) to the detriment of those of future periods. This is likely to avoid additional costs (repayment obligation, renegotiation costs, etc.) [65]. However, the negative effect of financial leverage on earnings management can be explained by the fact that Egyptian firms use debt in their capital structure to restrict earnings management practices.

In addition, the coefficients for firm size have diverging signs and degrees of significance. In both regimes, our results suggested the presence of a negative relationship between Size and accrual-based earnings management (AEM) (see column (2) for the lower regime and columns (1), (3), and (4) for the upper regime). However, in column (2) in the upper regime, the relationship between firm size and earnings management is positive. The negative relationship is explained by the fact that large Egyptian firms are able to restrict the manipulation of earnings management. In fact, they are more controlled compared to their smaller counterparts. Large firms (especially listed firms) are characterized by having the necessary resources, allowing them to develop more efficient structures and processes. This provides an incentive for them to publish good quality financial reports. Transparency and comprehensibility of financial information contribute to the reduction of information asymmetry, political costs and uncertainty about the financial situation of Egyptian firms. Certainly, this improves the quality of financial information, ensures more confidence and credibility for users of financial statements, and even increases growth opportunities (attracting more investors). Indeed, large firms restrict earnings management activities because most of them have corporate governance policies that reduce the flexibility of manipulating accounting information.

We now arrive at the firm's tangibility (TANG), its coefficients also have opposite signs with diverging degrees of significance. In both regimes, the negative relationship between company tangibility (TANG) and earnings management can be explained by the fact that the Egyptian firms' holding of many guarantees reduces the manipulation of earnings management (see columns (4) and (1)). However, in the upper regime, the positive relationship between firm tangibility (TANG) and earnings management indicates that (see column (4)). Finally, mixed results are still observed in the operating cycle (OC) and earnings management flexibility (EFLEX).

Regarding the operating cycle (OC), it generally has a positive and statistically significant effect but with different degrees of significance. This positive relationship indicates that listed firms in Egypt have longer operating cycles. This is likely to help them benefit from greater flexibility in AEM, since they are characterized by holding fairly large accrual accounts over a longer period of time. Of course, this allows these companies to proceed with the reversal of accruals. This result is in line with that found by Lara et al. [44]. As for the earnings management flexibility (EFLEX), it often has a positive and statistically significant effect on AEM. This relationship is explained by the fact that non-financial firms in Egypt have higher levels of receivables and inventories. This is likely to help them to manage earnings through accruals.

Conclusion

Conclusions

This study aimed to analyze the nonlinear relationship between corporate ownership structure and income manipulation through accrual-based earnings management in the Egyptian context. To achieve this goal, we conducted an econometric study on threshold panel data covering the period 2008–2017 and, on a sample, made up of 78 listed non-financial firms.

In this case, we used the Dynamic Panel Threshold Analysis approach developed by Seo & Shin [57] to detect the existence of a nonlinear relationship between ownership structure and accrual-based earnings management. For more robustness, we have chosen four dimensions of the company's ownership structure (managerial ownership, institutional ownership, family ownership and governmental ownership), the object of which is to know whether these different dimensions increase or decrease income manipulation. The results obtained by Kasznik [36] model provided support for theoretical predictions and some previous empirical studies. They suggested the presence of a nonlinear relationship between ownership structure and accrual-based earnings management. This nonlinearity was only observed for managerial ownership and governmental ownership. In terms of analysis, this could be explained by the presence of an optimal structural ownership threshold for these two dimensions, below which the ownership structure generated a rooting effect on the earning management (increase in income manipulation through accrual-based earnings management). However, beyond this threshold, the ownership structure has resulted in an alignment effect (reduction of income manipulation through accrual-based earnings management). Without a doubt, this finding proved the predictions of agency, political and development theories. The results found on the control variables are also considered significant.

In summary, this study contributes to the literature on the following aspects. On the one hand, in contrast to previous empirical work which is largely focused on developed countries, this study focuses on examining the nonlinear relationship between ownership structure and earnings management in the context of a developing country such as Egypt. On the other hand, it is also based on a sophisticated econometric technique (Dynamic Panel Threshold Analysis approach), thus making it possible to take into account both endogeneity problems and the issue of nonlinearity. This investigation also takes into consideration four dimensions of ownership structure (managerial ownership, family ownership, governmental ownership and institutional ownership) in determining income manipulation. The introduction of the various structural ownership indicators has brought more clarity to the link between this variable of interest and earnings management. In fact, it should be noted that there is a complementarity between managerial ownership (firm specific measure) and governmental ownership (country specific measure) in order to accurately measure the impact of ownership structure on earnings management of Egyptian listed firms. This made it possible to confirm the theories related to these two dimensions.

Theoretical and managerial/practical implications

The threshold effect of ownership structure on earnings management refers to the idea that there is a certain level of ownership concentration or dispersion that can either promote or hinder earnings management behavior by firms. In this case, this study reveals several theoretical and managerial/practical implications. For theoretical implication, the threshold effect has important implications for agency theory, which suggests that managers have an incentive to engage in earnings management to maximize their own interests at the expense of shareholders. The threshold effect suggests that this behavior may be more prevalent in firms where ownership is either highly concentrated or highly dispersed, as these ownership structures may create greater agency problems.

For managerial/practical implications, there are several implications. First, the threshold effect suggests that firms can reduce the likelihood of earnings management by choosing an ownership structure that is neither too concentrated nor too dispersed. Firms with moderate levels of ownership concentration or dispersion may be less likely to engage in earnings management because they have a more balanced distribution of power and resources. Second, the threshold effect also highlights the importance of strong corporate governance to prevent earnings management. Firms should have independent boards and auditors, as well as clear and transparent accounting policies, to ensure that earnings are reported accurately and fairly. This is particularly important in firms with highly concentrated or dispersed ownership, where there may be greater agency problems. Finally, the threshold effect suggests that regulatory agencies should consider the impact of ownership structure on earnings management when developing regulations. For example, regulations may be needed to prevent excessive ownership concentration or to encourage greater ownership dispersion in certain industries or markets. Additionally, regulations should promote transparency and accountability in financial reporting to reduce the incentive for earnings management.

Limitations, and suggestions for future research

Although this study made it possible to understand the type of relationship that exists between ownership

structure and earnings management, it remains limited until the end. In fact, setting an optimal structural ownership threshold certainly reduces fraud, managerial opportunism, and manipulation of accounting figures. However, this strategy remains insufficient. In fact, structural ownership is not the only mechanism through which Egyptian firms are able to minimize income manipulation. To resolve this dilemma, it is advisable to advise the Egyptian regulatory authorities to engage in setting an optimal level of ownership, imposing voluntary disclosure, respecting accounting standards, strengthening enforcement IFRS standards, the establishment of more effective audit and control systems. All of these procedures will often strengthen the Egyptian institutional system, have better corporate governance and therefore minimize income manipulation.

Abbreviations

REM	Real earnings management
AEM	Accrual earnings management
EGX	Egyptian stock exchange
EGID	Egypt for information dissemination
EM	Earnings management
GMM	Generalized method of moment
FD-GMM	First difference generalized method of moment
PSTR	Panel smooth transition regression
ROA	Return on assets
ROE	Return on equity
LIQ	Liquidity
LEV	Leverage
GEAR	Gearings
SIZE	Firm size
TANG	Assets tangibility
OC	Operating cycle
EMFLEX	Earnings management flexibility
CG	Corporate governance
CMA	Capital market authority
ECCG	Egyptian code of corporate governance
EIoD	Egyptian institute of directors
DAS	Discretionary accruals
VIF	Variance inflation factor
FGLS	Feasible generalized least square
PCSE	Panel-corrected standard error
MNG	Managerial ownership
FAM	Family ownership
GOV	Government ownership
INST	Institutional ownership
ε_{it}	The error term

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EA developing the conceptualization, validating, writing and developing the original draft, design of work, collecting the data, analyzing the results, using new advanced statistical techniques, concludes the draft and was the major contributor in writing the work. WK edited and reviewed the draft and made constructive changes to the draft. MM adds substantial contributions to the conception of the work and gave his valuable comments to develop the quality of research. All authors have read and approved the manuscript.

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