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Corporate Governance and Earnings Management in Concentrated Markets

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Abstract

This study examines the difference between high and low concentrated markets in using accrual and real earnings management and the role of corporate governance in mitigating such activities across the two types of markets. We find that firms operating in concentrated markets use more accrual and real earnings management compared to those in non-concentrated markets. Furthermore, we find evidence that corporate governance, in the form of quality board characteristics, is more effective in mitigating earnings management in non-concentrated markets. In contrast, corporate governance in concentrated markets drives managers to substitute accrual with real earnings management as the latter is less easily detectable and its long-term negative consequences on firm value are likely to be mitigated by the higher competitive power of firms in concentrated markets. The findings of this study are potentially useful to regulators in enhancing the legitimacy of corporate governance in concentrated markets.

Keywords: Corporate governance, board of directors, accrual earnings management, real earnings management, market concentration.

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1. Introduction

Although corporate governance plays an important role in ensuring the presence of control mechanisms in the absence of competition (Campbel et al., 1991), it sometimes failed to prevent financial malpractices in concentrated markets. Some examples are evidenced in the search engines and soda production markets that represent ones of the most concentrated industries in the United States who significantly implement standards and policies to govern their operations (IBIS World, 2012). In the search engines market, Microsoft was involved in 'cookie jar' accounting practices that attempted to smooth earnings through financial reserves in order to make profits more stable over time (The New York Times, 1999). In the same sector, Google manipulated its accounting records to avoid high tax payments by moving its earnings to low tax jurisdictions around the world (The Telegraph, 2012). In the soda production sector, Coca Cola overstated its assets with an amount of $9 million (CNN, 2003), and the financial controller of Pepsi Co. created fictitious vendor accounts of $8.7 million between 1998 and 2009 (Accounting Today, 2016). The previous examples raise doubts about the effectiveness of governance mechanisms in preventing accounting manipulation in concentrated industries.

The level of industry competition, as measured by market concentration, can increase the propensity of firms to engage in earnings management. This can be attributed to three main reasons. First, the lower competition between firms in such markets decreases the probability that at least one of the firms will be willing to provide investors with accurate information, and thus makes it less likely for other companies that manipulate their accounts to be detected (Gentzkow and Shapiro, 2008). Second, the lower degree of competition for sources of finance in concentrated markets lessens companies' need to provide more information in order to reduce their cost of capital (Diamond and Verrecchia, 1991; Hoberg and Phillips, 2010). Third, the absence of the disciplinary power of competition demotivates managers from making efforts due to the lower chances of being compared to others (Hart, 1983; Nalebuff and Stieglitz, 1983).

However, firms in concentrated markets can also be perceived as less inclined than others to engage in earnings management. This is also attributed to three main reasons. First, the typical firm of a concentrated market is expected to have higher pricing power compared to the typical firm in a non-concentrated market (Peteraf, 1993). Therefore, it will be easier for such a firm to pass on adverse cost shocks to consumers, without having to resort to earnings management to inflate its earnings. Second, the lower degree of competition in concentrated markets lessens the need of firms to withhold proprietary information that would undermine their competitive position if revealed to competitors and new entrants (Clinch and Verrecchia, 1997). Third, firms in concentrated markets face less pressure to sustain a competitive advantage over their peers to survive or avoid takeover threat, and thus they are less likely to use earnings management (Shleifer 2004).

The characteristics of the board of directors are key components of corporate governance structure and have generally been perceived as effective mechanisms in mitigating earnings management (Beasly, 1996; Klein, 2002; Xie et al., 2003; Uzun, 2004; Peasnell et al., 2005). However, their effect could be influenced by the level of industry concentration in two different ways. According to one perspective, the mitigating effect of governance will be stronger in concentrated markets because governance can act as a substitute for the absent disciplinary power of competition (Allen and Gale 2000; Giroud and Mueller, 2011). On the other hand, this effect might be weaker because of the higher noise and information asymmetry in concentrated markets that make managers' behaviour more difficult to be monitored by independent board members (Demsetz and Lehn, 1985; Gillan et al., 2003; Cheng et al., 2013; Ali et al., 2014). In addition, the effect can be weakened by the higher negotiating power of managers within their firms which allows them to exercise more control over making decisions (Hermalin and Weisbach, 1998; Boone et al., 2007). Managers' power in concentrated markets is induced by the lower competition which lessens the threats to their careers.

Based on the arguments above, our paper aims to answer two questions. Firstly, although the previous studies have already examined the effect of market concentration on earnings management (e.g., Chang et al., 2013; Datta et al., 2013; Balakrishnan and Cohen, 2014; Markarian and Santalo, 2014; Shi et al., 2018), this is still an open area of research given the mixed empirical evidence in the literature. Therefore, we examine the effect of market concentration on earnings management. Secondly, previous empirical studies (Klein, 2002; Xie et al., 2003; Uzun, 2004; Peasnell et al., 2005) mainly provide evidence on the positive role of governance in mitigating earnings management but, to our knowledge, they do not specifically examine this impact in concentrated markets. Therefore, we examine whether the mitigating effect of corporate governance on earnings management will be stronger or weaker in more concentrated markets.

To answer the previous questions, we introduce an empirical model that incorporates earnings management, market concentration and corporate governance. For measuring market concentration, we use the Herfindahl-Hirschman index, concentration ratio and Hall Tideman index (Hall and Tideman, 1967; Marciukaityte and Park, 2009; Karuna et al., 2012; Datta et al., 2013; Markarian and Santalo, 2014). For measuring corporate governance we use three characteristics of the board of directors that include tenure, qualifications, and independence (Chtourou et al., 2001). Finally, we distinguish between two types of earnings management activities: accrual and real earnings management. Accrual earnings management involves accounting choices in financial reporting process with the objective of improving the shape of the financial statements. On the other hand, real earnings management underlies operational, investment or financial decisions that deviate from optimal business strategies with the objective of enhancing the currently reported earnings. In this sense, while real earnings management is less easily detectable, it is considered more costly to the firm in the long run (Cohen and Zarowin 2010, Kothari et al. 2016). We implement four different models which

include Stubben's model and the Modified Jones' model for measuring accrual earnings management and Gunny's model and Roychowdhury's model for measuring real earnings management. We estimate our model at the industry level using GMM regression analysis.

We find that firms in concentrated markets use more earnings management compared to those in non-concentrated ones. This can be attributed to the high information asymmetry, stronger firm bargaining power and the lack of disciplinary effect of competition in concentrated markets. After including corporate governance into the previous relation, we find that its mitigating effect on earnings management is generally weaker in concentrated markets compared to that in non-concentrated markets. We also provide new evidence to the literature regarding the effect of governance on the use of accrual and real earnings management in concentrated markets. The presence of effective corporate governance mechanisms - in the form of more tenured, qualified and independent board of directors - in concentrated markets drives managers to use lower levels of accrual earnings management and higher levels of real earnings management. This evidence suggests that firms operating in highly concentrated markets switch to real earnings management to avoid the easily detectable accrual earnings management in the presence of strong governance mechanisms. Furthermore, firms in concentrated markets are less reluctant to use real earnings management because they enjoy high competitive power through their economies of scale and control over bargaining with suppliers and customers, and thus can mitigate the subsequent adverse consequences of real earnings management. Our results extend the work of the previous studies that examine the effect of industry competition on earnings management (e.g., Chang et al., 2013; Datta et al., 2013; Balakrishnan and Cohen, 2014; Markarian and Santalo, 2014; Shi et al., 2018) and those that study the effect of corporate governance on financial reporting quality (e.g., Klein, 2002; Xie et al., 2003; Uzun, 2004; Peasnell et al., 2005) by documenting the role of corporate governance mechanisms in the trade-off between accrual and real earnings management in concentrated markets.

The remainder of the paper proceeds as follows. In the next section, we review the related studies from the literature and build the hypotheses of the paper. In section 3, we explain the process of data collection, variable definitions, and the descriptive statistics. In section 4, we explain the methodology of the study. In section 5, we present and discuss the results. In section 6, we provide additional analysis. Finally, in section 7, we conclude the paper.

2. Literature and hypotheses development

2.1. Market concentration and earnings management

The revelation principle states the conditions under which privately informed managers achieve more benefits from revealing the truth as it allows them to avoid any subsequent penalties for misreporting firm results (Ronen and Yaari, 2008; El Diri, 2017). Any economic explanation

for earnings management can be derived by relaxing one or more of the non-realistic assumptions that the revelation principle relies on (Arya et el., 1998). Walker (2013) identifies four conditions that need to be violated for earnings management to occur. Any of these violations is sufficient to give managers the chance and the motivation to manage earnings. An example may occur when there are obstacles on communicating information that result in the lack of common knowledge between management and shareholders and thus does not allow the latter to know and understand managers' actions. As Walker (2013) points out, in real-world settings "*the management information set is rarely known or understood*" by the firm's stakeholders.

Given this information asymmetry between managers and shareholders, earnings management can be viewed as an example of the principal-agent problem. A firm's managers (the agents) are willing to engage in earnings management to obtain short-term private gains even though such activity might have a negative effect on long-term shareholders' (the principals) value (Bhojraj et al., 2009). Papanastasopoulos and Tsiritakis (2015) document that accounting distortions that can arise from accrual earnings management have a negative effect on the firm's future earnings and shareholders' value, while Al-Shattarat et al. (2019) show that firms engaging in real earnings management and not beating earnings benchmarks experience a decline in their future operating performance. This agency problem can take either a moral hazard or an adverse selection form depending on the impact of information asymmetry on the agent and the principal.

The moral hazard problem arises when existing shareholders are not able to monitor management and assess whether it works for maximizing the firm value. In that case managers can engage in value-destroying actions for private gains. For example, it has been documented that managers manipulate financial reports to achieve earnings targets when their compensation is linked to firm performance either directly, i.e. to the firm's ROA (Healy, 1985), or indirectly, i.e. to the firm's share price (Cheng and Warfield, 2005).

The adverse selection problem arises when managers have access to information about the true value of the firm, while outside investors do not have such access. In that case, managers can use the private information to benefit existing shareholders at the expense of outside investors, such as potential new shareholders. For example, Teoh et al. (1998) and Rangan (1998) find that firms manage their earnings upward around SEOs in order to inflate their stock price. Furthermore, they find that stock price performance after the Seasoned Equity Offerings (SEO) is negatively related to the degree of earnings manipulation around the SEO event.

In the aforementioned context, the effect of market concentration on earnings management can be viewed through its impact on the agency problem. Specifically, the degree of earnings management by managers depends on how industry competition, usually measured by market concentration proxies, will affect their incentives to engage in such activities. There are three channels through which industry competition can affect the motivation of managers

to engage in earnings management activities, namely (a) the pricing power channel, (b) the information disclosure channel, and (c) the disciplinary effect channel.

Regarding the first channel, firms with greater product pricing power relative to other firms in an industry are expected to engage in lesser degree of earnings management, because they are more likely to be able to pass on cost shocks to their customers. This flexibility reduces the need of these firms to manipulate their earnings[4]. Datta et al. (2013) find evidence consistent with this notion. The aforementioned argument can be also extended to the industry level. At the industry level, the typical firm in a concentrated industry is more likely to enjoy higher supranormal profits in the form of Ricardian rents compared to the typical firm in a non-concentrated industry (Peteraf, 1993). Hence, it will be easier for such a firm to pass on adverse cost shocks to consumers in that industry, without having to resort to earnings management to inflate its earnings. In sum, the pricing power channel predicts that earnings management will increase with competition.

Regarding the second channel, i.e. the information disclosure channel, the degree of industry competition can affect the level of information asymmetry between the firm's managers and stakeholders, which will in turn affect the degree of earnings management. According to one perspective, non-competitive markets are less informative, impeding the ability of outsiders to monitor management decisions, and thus allowing managers to take more non-value-maximizing decisions. The literature provides two alternative mechanisms through which industry competition can affect information asymmetry. Holmstrom (1982) shows analytically that the existence of multiple agents allows for peer comparisons between agents and thus provides the principal with additional information for evaluating an agent's effort. This implies that higher concentration, i.e. lower industry competition, gives shareholders less information to evaluate firms based on peer company comparisons and thus aggravates the agency problem. Furthermore, Gentzkow and Shapiro (2008) show that the higher the level of competition between information suppliers, the higher the probability that one of them will be willing to provide accurate information. This discourages all suppliers from disclosing inaccurate information, as it increases the probability that they will be detected. Hence, higher levels of concentration demotivate managers from telling the truth and thus exacerbate the agency problem[5].

A number of empirical studies support the previous theoretical arguments by providing evidence documenting that both the quality and quantity of available information is lower in

[4] See Datta et al. (2013) for a thorough discussion on the relationship between firm-level product market power and earnings management.

[5] According to Jensen and Meckling (1976), variation in the level of product market competition will not affect agency problems between managers and shareholders, unless the different level of competition affects monitoring costs and/or the propensity of managers to act in the interest of the firm. Previous theoretical literature shows that both of these conditions are met. Specifically, Holmstrom (1982) shows that monitoring costs are higher in less competitive industries, while Gentzkow and Shapiro (2008) show that managers are less likely to reveal truthful information in less competitive industries.

concentrated markets. This indicates that concentration (competition) is positively (negatively) associated with information asymmetry. Botosan and Stanford (2005) document that firms in more concentrated industries disclose less information to avoid losing their competitive advantage. Hong and Kacperczyk (2010) find that the accuracy of analyst earnings forecasts declines when the level of competition among analysts declines. Cheng et al. (2013) find that market concentration has a negative effect on earnings quality. Furthermore, they document that the quality of public and private information held by investors and analysts, as proxied by the accuracy of earnings forecasts, is also negatively related to market concentration. Ali et al (2014) document that both the quality and the quantity of information are negatively correlated with market concentration. Specifically, they find that in highly concentrated industries, management earnings forecasts are less frequent and have shorter horizons, while the dispersion and the errors in analyst earnings forecasts are larger. Balakrishnan and Cohen (2014) find that accounting misreporting, as proxied by the frequency of earnings restatements, is positively associated with the level of market concentration of an industry.

According to another perspective related to the information disclosure channel, firms in concentrated markets are expected to reveal less proprietary information because they compete with fewer firms for the available sources of finance. Therefore, the lower degree of competition lessens their need to provide more information in order to reduce their cost of capital. Diamond and Verrecchia (1991) show analytically that a firm can increase the demand from large investors for its securities and thus decrease its cost of capital by revealing more information to reduce information asymmetry. Regarding competition, there is a larger number of rival firms competing for limited funds in competitive markets. Hence, the need for obtaining funds at a lower cost should be greater in such markets and thus the propensity of firms to reveal information should be stronger. This implies that firms in competitive (concentrated) markets will be associated with less (more) earning management. Following a similar rationale, findings by Hoberg and Phillips (2010) imply that it is more costly for investors to gather firm-specific information in competitive industries. This can motivate firms in such markets to reveal more proprietary information in order to reduce information asymmetry costs and attract more investors.

A third perspective related to the information disclosure channel concerns the amount of information that a firm is willing to reveal to its competitors. Verrecchhia's (1983) model predicts that the more intense the industry competition, the higher the costs from revealing valuable information to existing rival firms in the form of losing competitive advantage and, hence, the less proprietary information will be released by the firm. Clinch and Verrecchia (1997) show that firms in more competitive industries are more strongly motivated to withhold proprietary information that would undermine their competitive edge if revealed to the competitors. The implications of these models suggest that firms in competitive industries are more likely to engage in earnings management. Verrecchia and Weber (2006) provide empirical evidence that firms are more likely to redact proprietary information in a non-

concentrated industry in support of the view that earnings management increases with industry competition. Furthermore, Li (2010) finds that higher competition from existing rival firms is associated with lower disclosure quantity by firms, while Datta et al. (2011) find that analysts' earnings forecasts are less accurate in competitive markets, in support of the view that industry competition has a negative effect on firms' propensity to disclose information. In sum, the information disclosure channel offers conflicting views on the relationship between the degree of industry competition and earnings management, both in terms of theoretical arguments and empirical evidence

The third channel through which industry competition can affect earnings management concerns the role of competition as a disciplinary mechanism of management behaviour. According to one perspective, a higher degree of competition can alleviate the agency problem between managers and shareholders and thus demotivate managers from engaging in earnings management activities. Theoretical work (Hart, 1983; Nalebuff and Stieglitz, 1983) supporting this view shows that competition allows a firm's shareholders to make better inferences about the managers' actions by comparing alternative aspects of the firm's performance with those of its competitors.[6]

There are also empirical papers whose findings support the previous arguments and indicate that competition can alleviate agency problems between management and shareholders. Baggs and De Bettignies (2007) find that a higher degree of competition increases managerial efficiency because it allows shareholders to monitor them more closely. Furthermore, the findings of Giroud and Mueller (2011) and Chhaochharia et al. (2017) indicate that industry competition serves as a substitute for internal corporate governance mechanisms. Allen and Gale (2000) conclude that competition is more effective in disciplining managerial behaviour rather than other mechanisms such as the threat of takeover or being monitored by financial institutions.

According to another perspective related to the disciplinary effect channel, the intensity of competition can have adverse effects on managerial behaviour. In competitive industries, there is a larger number of firms competing for limited funds, employees, market share, etc. The higher level of competition has a twofold effect on firms; it decreases their profitability and increases the threat of liquidation (Schmidt, 1997). This could put more pressure on managers to sustain a competitive edge over other firms and, thus, to increase their concerns about their career. As a result, managers are likely to adopt an opportunistic managerial behaviour, which might involve earnings management.

Some evidence from the literature supports the previous argument. Given that in competitive industries there is less certainty that a firm will survive, Shleifer (2004) argues that

[6] However, theoretical literature is not unanimous on the relation between competition and managerial effort. Other studies (e.g., Hermalin, 1992; Raith 2003; Beiner et al, 2011) show that the positive relationship between competition and managerial effort can arise under certain conditions; otherwise, the relationship can be ambiguous.

managers in such industries are more likely to engage in earnings management. The reason is that they are more eager to boost short-term reported performance and inflate the firm's current stock price. In this way, the firm can lower its cost of capital and/or avoid a takeover threat, which will eventually increase the probability of its survival. According to Markarian and Santalo (2014), managers are more strongly motivated to manage earnings in competitive industries, because higher competition makes stock market valuations more sensitive to reported earnings. They find that earnings management is more intense in competitive markets. Datta et al. (2013) also document that a higher degree of competition, either at firm-level or at industry-level, leads to a higher degree of accrual earnings management. The results from both papers support the view that competitive pressure can aggravate the agency problems between management and shareholders. In sum, the disciplinary effect channel offers conflicting views on the relationship between the degree of industry competition and earnings management.

Taken together, the previous three channels i.e., the pricing power channel, the information disclosure channel, and the disciplinary effect channel, through which market concentration can affect earnings management provide conflicting views. Therefore, we develop two alternative hypotheses and view the direction of this relation as an empirical question which we address in the empirical analysis. We therefore propose the following:

H1a: Firms in more concentrated industries will engage in more earnings management.

H1b: Firms in more concentrated industries will engage in less earnings management.

2.2 Corporate governance and earnings management

Corporate governance mechanisms can be external or internal to the firm and have been mainly perceived as effective methods of mitigating earnings management. Talking about the external ones, a number of studies have indicated that a stricter disciplinary environment can have a mitigating effect on earnings management activities by firms. Leuz et al. (2003) and Burgstahler et al. (2006) find that the degree of earnings management is lower in countries with stronger investor legal protection. Elyasiani et al. (2017) show that earnings management is less in firms with a higher share of institutional investor ownership. External auditors also play an important role in reducing earnings management activities, as indicated by Becker et al. (1988) who find that the clients of Big 5 auditing companies tend to manipulate their financial reports to a lesser degree compared to non-Big 5 clients.

Regarding the internal governance mechanisms, the board of directors can play a crucial role in monitoring a firm's management actions and protecting shareholders rights (Fama and Jensen, 1983). Certain board of directors' attributes are associated with higher quality governance and higher effectiveness in disciplining managers when reporting firm results. First, board independence can have a positive effect on earnings quality (Beasly, 1996; Klein, 2002; Peasnell et al., 2005). Usually, a firm's board of directors is composed of the firm's top

managers and outside/independent members, who are assumed to represent shareholders and have no other ties to the firm. The more the independence of the members, the stronger the disciplining role on managers, because the former avoid colluding with the latter to deceive shareholders, so that they do not destroy their reputational capital (Fama and Jensen, 1983). Klein (2002), Uzun (2004), and Peasnell et al., (2005) find evidence that earnings management decreases with board independence. Second, the length of the directors' tenure is also expected to enhance the effectiveness of the board as it indicates more experience and familiarity with the firm's operations. Finally, the qualifications and the professional experience of the board members are also very important. Boards which include more members with corporate and financial backgrounds are associated with firms that engage in less financial misreporting (Xie et al., 2003).

There are also two more board characteristics that received attention in the literature in terms of their impact on earnings management, i.e. board size and CEO duality. We have not included these two characteristics into our empirical model, because their expected effect is ambiguous. A larger board may result in lower levels of earnings management (Peasnell et al., 2005; Vafeas, 2000), because it is more likely to include a higher number of independent and more experienced directors who are more able to monitor management activities. On the other hand, a larger board may result in a bigger free-rider problem where the directors tend to rely on each other due to the distributed responsibility (Yermack, 1996). Moreover, a dual role of the CEO, i.e. being CEO and board chairman at the same time, may enhance a firm's financial performance since the CEO has a thorough knowledge of the strategies and the operations of the firm. On the other hand, when corporate insider directors are absent from a majority independent board, then the independent directors would rely heavily on the CEO for inside information. In that case, CEO duality may lead to increased opaqueness regarding firm's financial numbers; leading to higher earnings management (Dimitropoulos and Asteriou, 2010). As a result, we will focus on directors' independence, tenure and qualification in this paper.

2.3 The impact of corporate governance on earnings management in concentrated markets

The intensity of industry competition, as measured by market concentration, can impact the effectiveness of the board of directors in mitigating earnings management in opposite directions. According to the first view, competition can act as a disciplinary mechanism for managers and thus can be a substitute for corporate governance mechanisms (Allen and Gale 2000; Giroud and Mueller, 2011). Under this perspective, one would expect that firms in concentrated industries will benefit more from good board monitoring than firms in non-concentrated industries, given the lower level of competition in the former.

According to the second view, the effectiveness of board monitoring is inversely related to the degree of the noisiness of the firms' operating environment, because a noisier operating

environment makes managerial behaviour more difficult to monitor by independent board members (Demsetz and Lehn, 1985; Gillan et al., 2003). The operating environment is expected to be noisier in concentrated industries due to the higher level of information asymmetry (Cheng et al., 2013; Ali et al., 2014; Balakrishnan and Cohen, 2014). Therefore, one would expect that board monitoring will be less efficient for firms in concentrated industries than for firms in non-concentrated industries, and thus have a weaker effect in mitigating earnings management. In a similar argument, Boone et al. (2007) find evidence supporting Hermalin and Weisbach's (1998) theory that the stronger the influence of the managers in a firm, the more control they have over the appointment of the board members. Managers of firms in concentrated markets are expected to have higher negotiating power and thus more influence than those of firms in non-concentrated markets, as the lower level of competition entails less threats for their career, all else being equal. Hence, one would expect that board monitoring will be less efficient for firms in concentrated markets, given that managers will have more control over it.

Taken together, the arguments discussed above provide conflicting views on how market concentration will influence the effectiveness of the board of directors in mitigating earnings management. Therefore, we view this as an empirical question, which we address in the analysis, and we propose the following competing hypotheses:

> **H2a**: The mitigating effect of corporate governance on earnings management will be stronger in more concentrated markets.
>
> **H2b**: The mitigating effect of corporate governance on earnings management will be weaker in more concentrated markets.

3. Data, variable definitions, and descriptive statistics

3.1 Data

We include all firms in the United States from the Annual Compustat, Quarterly Compustat, Historical Segments Compustat, IBES, and BoardEx databases for the period from 1989 to 2016. We also make use of the dataset made available by Demerjian et al. (2012) for managerial ability control variable during the same time period. We start with all firms that have the required data for calculating our measures of earnings management, market concentration, and corporate governance after excluding firm-years that experienced accounting changes, merger and acquisition activities, or discontinued operations.[7]

[7] According to McNichols (2002), we specifically exclude firm quarters or years with non-blank values for accounting changes cumulative effects (ACCCHGQ_FN), or merger and acquisition activities (ACQMETH_FN), or discontinued operations (DOQ_FN) in the Compustat database.

Following Cheng et al. (2011), we exclude regulated industries that contain banks, credit institutions, brokers, insurance, real estate, holding companies, and investment firms because they have their unique accounting and financial practices and are subject to distinct regulations. Therefore, managers in these industries have different motivations to manipulate earnings than those of managers in other industry sectors.[8]

Following prior literature, we exclude any industry with fewer than six observations for each SIC code in a specific year to ensure sufficient data exists to calculate earnings management measures and make sure that OLS assumption regarding the normality of the error term holds (e.g., Rosner, 2003; García Lara et al., 2005; Kothari et al., 2005; Athanasakou et al., 2009; Iqbal et al., 2009; Alhadab et al. 2017). For that purpose, we follow the SIC classification of Fama-French (1997). As the model is dynamic, we ensure that information is available for at least five consecutive years for each firm over the study period (Miguel et al. 2004). As the empirical analysis is performed at the industry level and all variables are averaged for each industry grouping later, we end up with 6,873 industry-year observations in an unbalanced panel.[9]

3.2 Earnings management measures

For this paper to examine the effect of market concentration on earnings management, we distinguish between two types of earnings management activities: accrual and real earnings management. Accrual earnings management involves accounting choices in financial reporting process with the objective of improving the shape of the financial statements (e.g., managers can change the estimates for provisions, the depreciation method for fixed assets and/or the valuation method of inventories). Real earnings management underlies operational, investment or financial decisions that deviate from optimal business strategies with the objective of enhancing the currently reported earnings (e.g., managers can reduce R&D, maintenance, employee training, and advertising expenditures, overproduce inventories, or even postpone investment in capital projects) (Graham et al, 2005; Roychowdhury, 2006). Therefore, although accrual and real earnings management differ significantly in their characteristics, they serve a similar purpose in manipulating the financial statements and misleading the different stakeholders and thus they are both likely to take place.

We use Stubben's Model (2010) for measuring accrual earnings management and Gunny's Model (2010) to estimate real earnings management. The selection and calculations of the previous models are presented in the Appendix. In addition, we use two other widespread models as corroborating measures for accrual and real earnings management (Cohen et al.,

[8] We exclude firms with the following SIC codes: $4000 \leq SIC \geq 4900$ and $6000 \leq SIC \geq 6300$.

[9] By having an unbalanced panel, we avoid any issues regarding survivorship bias.

2008). We estimate accrual earnings management by using the Modified Jones' Model (1995) and real earnings management by using Roychowdhury's Model (2006).[10] All variables are normalized and averaged for each industry grouping with the average values used in the empirical analysis.

3.3 Market concentration measures

We use the Herfindahl-Hirschman index (HHI) as it is the most commonly expressed measure in the literature to proxy for market concentration. We calculate it using the following equation:

$$HHI=\sum_{i=1}^{N} \omega_i^2 \quad (1)$$

In equation (1), ω is market share for firm *i* measured by its sales divided by total industry sales; and N is the number of firms per year-industry. According to the United States Department of Justice, we classify industries with HHI scores above 2,500 points as highly concentrated and those with HHI scores below 2,500 points as low concentrated markets. Accordingly, we establish a dummy variable (*HHIdummy*) that takes a value of one in concentrated markets, and zero otherwise.

However, HHI suffers from some limitations. It is claimed that it might be confusing sometimes as it reflects both high and low competition, especially under endogenous market structure. Ideally, less concentrated markets tend to be more competitive. However, the intensity of competition might minimize profit chances for new entrants and, as a result, the market would stay concentrated. Similarly, the variation of product substitutability and pricing power might reflect high competition even in concentrated markets (Raith, 2003; Aghion et al., 2005; Datta et al., 2013). Accordingly, we use two other proxies that measure different aspects of market concentration. The first one is the concentration ratio which takes only the largest four firms in the industry into account as follows:

$$CR4 = \sum_{i=1}^{4} \omega_i^2 \quad (2)$$

Once more, ω is market share for firm *i* measured by its sales divided by total industry sales in equation (2). In addition, we use the Hall Tideman index that takes the ranks of all firms in the industry based on their market share as follows:

[10] The calculations and results of both models are not presented in this paper. Our inferences, however, are the same as those we make from the models of Stubben and Gunny.

$$HTI=1/[(2\sum_{i=1}^{N}(k*\omega))-1] \quad (3)$$

Where ω represents market share, N is the number of firms per year-industry, and *k* represents firm rank according to market share. In this sense, the HTI accounts for the absolute number of firms which reflects the entry barriers to the industry, in addition to emphasizing on the relative sizes of those firms (Hall and Tideman, 1967). For both CR4 and HTI, we classify industries with scores above the median value as highly concentrated markets and those with scores below the median value as low concentrated markets. Accordingly, we establish two more dummy variables (*CR4dummy* and *HTIdummy*) that take a value of one in concentrated markets, and zero otherwise. We present the calculations of the previous measures in Table 1.

Table 1 about here

3.4 Corporate governance index

In this paper we introduce an index for corporate governance (*Governance*) measured using the principal component analysis technique for three characteristics of the board of directors that include their tenure, qualifications, and independence. Stronger governance is associated with longer service of the directors on the board, highly qualified, and more independent directors (Chtourou et al., 2001). Tenure variable ($Tenure_{it}$) is measured as the time on board for the director at a selected annual report date. Qualifications variable ($Qualifications_{it}$) is measured as the total number of educational qualifications (undergraduate and above) for the director at a selected annual report date. Finally, independence variable ($Independence_{it}$) is measured as the number of the independent non-executive directors at the annual report date divided by total directors (Chtourou et al., 2001). We present the calculation of the previous characteristics in Table 1 too.

We perform a principal component analysis with varimax rotation to obtain an overall estimate for governance index for each firm. This step prevents the inclusion of highly correlated variables in the measure.[11] As a result, we obtain a factor that represents governance index from longer tenure, higher number of qualifications held by the members of the board of directors, and larger percentage of independent directors. The factor is expressed in the following equation:

$$Governance_{it}= (0.47\,Tenure_{it})+(0.63\,Qualifications_{it})+(0.41\,Independence_{it}) \quad (4)$$

[11] The principal component analysis step turns the set of correlated variables to be linearly uncorrelated according to the weights of their variances, thus reducing the number of variables to their principal components.

The governance scores are averaged for each industry grouping to be used in the empirical analysis at the industry level.

3.5 Control variables

Following Dechow and Dichev (2002), our first set of controls consider firm specific determinants and account for firm size (*FirmSize*), cash flow volatility (*CashFlowVolatility*), operating cycle (*OperCycle*), and historical losses (*Losses*). Larger firms have operations that are more predictable and more diversified businesses and thus earnings should be of higher quality and better communicated to the stakeholders (Dechow and Dichev, 2002). Managers in these firms, however, have more opportunities to manipulate earnings because of the large number of transactions they undertake and their complicated operations. Cash flow volatility reflects uncertainty in operations and, therefore, implies a higher likelihood of earnings management (Dechow and Dichev, 2002). Similarly, longer operating cycles increase uncertainty and therefore, the potential for earnings management (Dechow and Dichev, 2002). Prior losses are likely to result in more earnings management to meet investors' expectations in making profit (Dechow and Dichev, 2002). Equally, the previous three factors may drive managers to avoid earnings management as they will be facing more scrutiny by the market.

We also control for managerial ability (*MgrlAbility*) that may drive earnings management because more able managers possess the skills for both accrual and real activities although they may equally avoid them to maintain their reputation (Demerjian et al., 2013). We use a national auditor indicator (*NationalAuditor*) to control for any auditor effects as they are likely to mitigate accrual but not real earnings management (Zang, 2012; Becker et al., 1998). We add another indicator variable to control for litigious industries (*LitigationInd*) following Francis et al. (1994) as they are likely to influence earnings management depending on the subsequently imposed penalties.

We also add the market to book ratio (*MB*) and the one year sales growth (*SalesGrowth*), as they have been found to influence earnings management (Hribar and Nichols, 2007; Dechow et al., 2011). As firms with higher market to book ratios and growing sales have more growth prospects, they may be involved in more earnings management to meet market expectations (Hribar and Nichols, 2007). Meanwhile, such growth might create a buffer that reduces the pressure on management to manipulate earnings (Dechow et al., 2011). Finally, we use the number of segments (*Segments*) to control for businesses complexity (Karuna et al., 2012). With more complex transactions managers find chances to substitute earnings management activities because they get less likely to be detected (Karuna et al., 2012). All control variables are averaged for each industry grouping to be used in the empirical analysis at the industry level. We present the detailed calculations for each of the previous variables in Table 1 and summarize the expected and actual signs of all control variables in Table 2.

Table 2 about here

3.6 Descriptive statistics

We present the descriptive statistics in Table 3. Consistent with Demerjian et al. (2013), both accrual and real earnings management measures have means and medians of zero because they are calculated as the residuals from the relevant equations in the Appendix. Meanwhile, our measures of market concentration are comparable to those of Marciukaityte and Park (2009) and Karuna et al. (2012), taking into consideration the difference of our sample from those of the previous studies. Our control variables are also comparable to Karuna et al. (2012) and Demerjian et al. (2013) with some differences appearing because of the variations between our samples. Because of presenting the untransformed variables, firm size and operating cycle are associated with high standard deviations.

Table 3 about here

Table 4 presents the correlation matrix between the major variables in our study: earnings management, market concentration, and board characteristics. The correlation between the control variables has not been displayed here for easier demonstration. There is a negative correlation between accrual and real earnings management which suggests that they might be used as substitutes. We also observe a strong positive correlation between the proxy of market concentration and both accrual and real earnings management, suggesting a potential impact of market concentration on earnings management. While for the proxies of corporate governance, Table 4 shows a positive correlation between the three board characteristics, which implies that they all represent strong measures of the same variable. The same applies to the three proxies of market concentration. Furthermore, the negative correlation between corporate governance measures and earnings management activities reflects the importance of board characteristics in mitigating earnings management. The positive correlation between governance measures and market concentration emphasizes the role that corporate governance plays in the absence of competition. Finally, we check the VIF between the previous variables and make sure that all VIF factors are less than 10 in order to control for multicollinearity.

Table 4 about here

4. Methodology

To examine the difference between concentrated and non-concentrated markets (first hypothesis) we split our sample into two subsamples. According to the Justice Department in the US, we consider industries with HHI above 2,500 points as more highly concentrated while those with an HHI lower than 2,500 points as non-concentrated markets (Department of Justice, 2015). For CR4 and HTI, we consider industries with scores above the median value as highly concentrated while those below the median as non-concentrated markets. Subsequently, we perform the two-tailed t-test for the difference of means between the two subsamples. The results appear in Table 5.

Moreover, we perform a propensity score matching analysis between the previous subsamples to confirm their difference in using accrual and real earnings management. For that purpose, we form matching pairs of industries with similar propensity scores based on certain observable attributes[12]. We compare earnings management measures between the treatment (high concentration) and control (low concentration) groups by measuring the average effect of the treatment on the treated group (ATT). The results appear in Table 6.

Next, we test the second hypothesis by presenting a model that identifies earnings management ($EarningsManagement_{jt}$) as the dependent variable with its two proxies of accrual (*AccrualEM*) and real *(RealEM*) earnings management. We introduce market concentration ($Concentration_{jt}$) as the explanatory variable with its three proxies previously identified (*HHIdummy*, *CR4dummy* and *HTIdummy*). We add corporate governance ($Governance_{jt}$) as another explanatory variable measured by the governance index discussed above. In addition, we incorporate the interaction term between market concentration and corporate governance ($Concentration_{jt}$*$Governance_{jt}$) in the same model.[13] We also use the lagged values of earnings management ($EarningsManagement_{j,t-1}$) to explain its current levels. We control for the dynamic effect of earnings management because earnings performance in the past year will influence earnings management behaviour during the current year (Kim et al. 2003). In addition, earnings management levels are associated with meeting prior earnings' benchmarks (Graham et. al. 2005, Cohen et al. 2008, Gunny 2010). As a result, managers have to be aware of the prior year's earnings management when managing earnings in the current period. To complete the model, we add the previously identified control variables and an error term (ε_{jt}). We express the new model in equation (5) at the industry level (j).

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[12] The matching is based on the average firm size covariate in each industry and year which has been previously identified in the control variables section.

[13] $Concentration_{jt}$ is a dummy that takes a value of 1 in highly concentrated markets and zero otherwise. Three proxies are used to measure this variable including *HHIdummy*, *CR4dummy* and *HTIdummy*. Therefore, $\propto_2$ is the coefficient of governance when market concentration is low while ($\propto_2$+$\propto_3$) is the coefficient when market concentration is high.

$$
\begin{aligned}
EarningsManagement_{jt} = {} & \alpha_0 + \alpha_1 Concentration_{jt} + \alpha_2 Governance_{jt} \\
& + \alpha_3 Concentration_{jt} * Governance_{jt} \\
& + \alpha_4 EarningsManagement_{j,t-1} \\
& + \alpha_5 FirmSize_{jt} + \alpha_6 CashFlowVolatility_{j,t-4,t} \\
& + \alpha_7 OperCycle_{j,t-4,t} + \alpha_8 Losses_{j,t-4,t} \\
& + \alpha_9 MgrlAbility_{jt} + \alpha_{10} NationalAuditor_{jt} \\
& + \alpha_{11} LitigationInd_{jt} + \alpha_{12} MB_{jt} \\
& + \alpha_{13} SalesGrowth_{rk\,jt} + \alpha_{14} Segments_{jt} + \varepsilon_{jt} \qquad (5)
\end{aligned}
$$

The model suffers from the problem of unobservable individual heterogeneity attributed to time-invariant industry effects. The industry culture (e.g., the nature of relations and knowledge sharing between competitors in the same sector) may contribute to the information asymmetry in the market; hence using higher levels of earnings management activities by firms in specific industries compared to other sectors. Consequently, the sample is expected to be heterogeneous (Graham et al., 2012).

In addition, the model suffers from an endogeneity problem because of the mutual causality between the dependent and explanatory variables. While market concentration influences the levels of earnings management, earnings management is a determinant of market concentration as it contributes to misleading investors and ultimately driving some firms to exit the market. This effect would be captured in the error term and ultimately results in a correlation between the explanatory variable and the error term (Pindado and Requejo, 2014).

Therefore, the OLS estimator will not be able to solve the model as it ignores the impact of the unobservable individual heterogeneity or endogeneity problems. Furthermore, while the fixed effects estimator tackles the unobservable heterogeneity by demeaning the variables in the model, it does not solve for the endogeneity problem as it assumes strict exogeneity. Therefore, we solve the model using a system generalized method of moments (GMM) estimator that demeans the variables in the model to solve for the heterogeneity and introduces instrumental variables to solve for the endogeneity problem.

As a result, to avoid the consequent bias in the error term (ε_{jt}) we split it into three components. First, we introduce (η_j) to control for the impact of the unobserved industry specific effects in the model. Second, we add a time specific effect (d_t) to control for the macroeconomic variables that also interfere with the results over the time period of the study.[14] Finally, we consider the remaining part of the error term (ε_{jt}) a random disturbance (υ_{jt}).

[14] We do not tabulate the coefficients of time periods later in the results.

To ensure that the assumptions of the estimator hold and that the model is valid we initially test whether the GMM estimator properly addresses the problem of endogeneity. For this purpose, we use the Hansen test for over-identifying restrictions. It takes a χ^2 distribution and checks for the orthogonality between the instrumental variables (IV_{jt}) and the error term (ε_{jt}). The model uses multiple lags of the right-hand side variables as instruments, which make it over-identified. Consequently, if we accept Hansen's null hypothesis that the instrumental variables (IV_{jt}) and the error term (ε_{jt}) are uncorrelated, we guarantee that the instruments are valid and the estimator is appropriate. We present the results of Hansen test in Table 7 which shows that the instruments are valid.

Additionally, we implement Arellano and Bond (1991) test to check for the validity of the model. It takes the shape of a normal distribution with N (0,1). It mainly examines the serial correlation in the first difference residual (υ_{jt}) over different periods (s) by using the (m_j) statistic [$E(\upsilon_{jt}\ \upsilon_{is})=0$, while $t \neq s$]. We accept first order serial correlation in the model because the estimator takes the first difference to eliminate the individual specific effects (η_i). However, we reject second order serial correlation (m_2) in the residual because it indicates a problem in the model. We present the results of the AB test in Table 7 which confirms that no second order serial correlations exist in the model.

We use the Wald test (z) to check for the joint significance of the reported coefficients in the model. If we reject the null hypothesis that states no relationship between the dependent and explanatory variables, we make sure that the model is jointly significant. We present the results of the Wald test in Table 7 which support the joint significance of the reported coefficients. In addition, we test for the combined influence of market concentration ($Concentration_{jt}$) and corporate governance ($Governance_{jt}$) by using a linear restriction test (LRT) that examines the significance of ($\propto_2+\propto_3$) and the results also appear in Table 7.

Finally, we perform a propensity score matching analysis following Armstrong et al. (2010). For different levels of market concentration (high and low), we form matching pairs of industries with similar propensity scores based on certain observable attributes[15] and governance levels. For this purpose, we split industries based on their governance scores into quintiles (from 1 to 5 with the first quintile representing the lowest governance level and the fifth quintile representing the highest governance level) in both the treatment and control groups. Therefore, we develop a logistic propensity score model of the conditional probability of facing high level of concentration (the treatment group) by industries of similar levels of corporate governance and observable attributes, matched to observations with the closest propensity score that did not receive the treatment (matching without replacement). In the second stage we compare earnings management measures between the treatment and control

[15] The matching is based on the average firm size covariate for each industry and year which has been previously identified in the control variables section.

groups by measuring the average effect of the treatment on the treated group (ATT). The results appear in Table 8 and 9.

5. Results

5.1 Market concentration and earnings management

We start by examining the relationship between market concentration, represented by the Herfindahl-Hirschman index (HHI), and accrual and real earnings management. Panel A in Table 5 presents the result from testing the difference between high and low market concentration subsamples in using accrual and real earnings management. The subsamples were established based on the classification of the United States Department of Justice that considers industries with HHI scores above 2,500 points as highly concentrated and those with HHI scores below 2,500 points as low concentrated markets.

Table 5 about here

Panel A of Table 5 presents the two-tailed t-test for the difference in means of accrual and real earnings management between concentrated and non-concentrated markets. In particular, Panel A shows that firms which operate in high concentrated markets exhibit a significantly higher level of both accrual and real earnings management as compared to firms operating in low concentrated markets. Panel B and Panel C of the same table confirm the previous results by using the concentration ratio (CR4) and the Hall Tideman Index (HTI) dummies as alternative measures of market concentration. As the United States Department of Justice does not distinguish between high and low concentration levels for those two measures, we use the median value as the cut-off point. However, no inference can be made from this test before controlling for factors that can cause variation in earnings management behaviour between the two identified subsamples. To overcome this, we perform a propensity score matching analysis between the high and low concentration subsamples to confirm the previous differences in using accrual and real earnings management.

Table 6 reports the results from the propensity score matching analysis and shows consistent evidence to those in Table 5. Firms operating in high concentrated markets still exhibit a higher level of both accrual and real earnings management as compared to firms operating in low concentrated markets, even after considering a major control factor (average firm size for each industry and year) that affects the level of earnings management. The results supports hypothesis *H1a* that predicts firms in more concentrated industries to engage in more earnings management. Panel B and Panel C of the same table confirm the previous results by

using the concentration ratio (CR4) and the Hall Tideman Index (HTI) dummies as alternative measures of market concentration.

Table 6 about here

The previous findings are interpreted together with those of Table 7 that presents the results from running the GMM regression of the model introduced in equation (5). The first column of this table shows that the average impact of being in the high market concentration subsample (using the HHIdummy) on using accrual earnings management ($\propto_1+\propto_3 =0.003 + 0.0000 = 0.003$) is significantly positive. The second and third columns of the same table confirm the previous results by using the concentration ratio (CR4) and the Hall Tideman Index (HTI) dummies as alternative measures of market concentration. The fourth column of Table 7 also shows that the average impact of being in the high market concentration subsample on using real earnings management ($\propto_1+\propto_3 =0.047 + 0.160 = 0.207$) is significantly positive. The fifth and sixth columns of the same table confirm the previous results by using the concentration ratio (CR4) and the Hall Tideman Index (HTI) dummies as alternative measures of market concentration. In this sense, we can say that the high concentrated subsample uses higher levels of accrual and real earnings management than the low concentrated one, which corroborates the results in Table 6. Overall, our results show that firms use more accrual and real earnings management in concentrated markets than those in non-concentrated markets.

Table 7 about here

The results contribute to the previous literature by documenting the impact of market concentration on using earnings management. Concentrated markets create more obstacles on communicating information due to the lower competition between information suppliers and thus decrease the motivation to communicate information. This situation leads to an increase in the level of information asymmetry between managers and shareholders and thus aggravates the moral hazard and adverse selection as it makes it more difficult for stakeholders to monitor management performance. In addition, while providing investors with more information is essential to reduce the cost of capital in competitive industries, being in a concentrated market gives firms greater bargaining power and, therefore, less need to reveal information. Furthermore, the absence of the disciplinary power of competition demotivates managers from making efforts due to the lower chances of being compared to others. Consequently, the propensity of managers to engage in earnings management increases in concentrated markets as they are more likely to obtain private gains without being detected.

The empirical evidence on the effect of market competition on earnings management has been mixed in the literature so far. Some of the previous studies, e.g., Datta et al. (2013), Markarian and Santalo (2014), Karuna et al. (2015), and Shi et al. (2018) document a positive effect of market competition on earnings management. On the other hand, studies like Marciukaityte and Park (2009), Chang et al. (2013), Balakrishnan and Cohen (2014), and Shi et al. (2018) find a negative influence of competition on earnings management. Within this mixed evidence, our results support the latter group of studies and document that both accrual and real earnings management are more likely to take place in concentrated markets, even when using alternative measures of market concentration.

5.2 The impact of corporate governance on earnings management in concentrated markets.

Column 1 of Table 7 reports the findings related to the impact of corporate governance on accrual earnings management at different levels of market concentration (using the HHIdummy) based on the model introduced in equation (5). The results show that in the absence of market concentration i.e., in more competitive markets, strong corporate governance is significantly effective in mitigating accrual earnings management ($\propto_2$ = -0.001). Similarly, in the presence of high market concentration, strict corporate governance continues to significantly mitigate accrual earnings management ($\propto_2+\propto_3$=-0.001+0.000 = -0.001), albeit the effect is marginally weaker if we consider more decimal points. The second and third columns of the same table confirm the previous results by using the concentration ratio (CR4) and the Hall Tideman Index (HTI) dummies as alternative measures of market concentration. Therefore, corporate governance mechanisms play a major role in preventing accrual earnings management in both concentrated and non-concentrated markets.

The results regarding the impact of corporate governance on real earnings management used at different levels of market concentration (using the HHIdummy) appear in the fourth column of Table 7. The results show that in the absence of market concentration i.e., in more competitive markets, strong corporate governance is significantly effective in mitigating real earnings management ($\propto_2$ = -0.097). However, in the presence of high market concentration, strict corporate governance induces more real earnings management ($\propto_2+\propto_3$=-0.097+0.160 = 0.063). The fifth and sixth columns of the same table confirm the previous results by using the concentration ratio (CR4) and the Hall Tideman Index (HTI) dummies as alternative measures of market concentration. In this sense, corporate governance mechanisms can prevent real earnings management only in competitive markets but they do not seem to be effective in concentrated ones.

The previous results suggest that the effect of corporate governance on earnings management is weaker in concentrated markets. This supports hypothesis H2b of the study and shows that managers in concentrated markets can take advantage of the higher information asymmetry and make benefit of their greater power in making decisions. As a result, they tend

to exercise more control over their firms, which makes monitoring their behaviour more difficult and less efficient; hence allows them to engage in more earnings management.

The results also suggest that there is trade-off between accrual and real earnings management activities in concentrated markets. Firms operating in highly concentrated markets engage in less accrual and more real earnings management under the impact of strong corporate governance. This can be explained by the different effect that corporate governance might have on the two types of earnings management in such markets. The reason is that although accrual and real earnings management serve a similar purpose in manipulating the financial statements, there are two important differences between the two types. First, accrual earnings management is more easily detectable than real earnings management and can generate litigation, while real earnings management cannot. Since there is a general framework that defines the acceptable accounting principles (GAAP), auditors can use a formal set of rules for judging which of the accrual management activities violates these principles. Detected violations can have severe penalties for firms. On the other hand, real earnings management entails changes in management decisions, which are not prohibited by any formal accounting regulatory framework. Second, accrual earnings management affects the way in which a firm's operations are presented, while real earnings management affects the operations themselves. Simply put, the former method affects the allocation of cash flows from given operations across different fiscal periods, while the latter changes the cash flows themselves as it alters the operations of the firm. As a result, real earnings management has more severe consequences for the firm than accrual earnings management as it involves suboptimal business decisions that have a negative impact on the firm's future profitability and valuation, which is more severe than that caused by the accrual method (Cohen and Zarowin 2010, Kothari et al. 2016).

The aforementioned differences imply that when managers decide on which of the two methods to employ, they are faced with a trade-off; real earnings management is not easily detectable and does not generate litigation, but its negative impact on the firm's long term value is more severe than that of accrual earnings management. Indeed, Zang (2012) finds that managers treat accrual and real earnings management as substitutes; the level of each type's activity decreases with its own expected costs and increases with the expected costs of the other. For example, firms employ less accrual and more real earnings management when the probability of being detected is higher, that is when auditors are more skilled (Zang 2012) or the scrutiny of accounting practice is higher (Cohen et al. 2008, Cohen and Zarowin 2010, Zang 2012). Likewise, firms employ less real and more accrual earnings management, when the impact on the firm's future performance is expected to be more severe, i.e., when the firm has low competitive power or is financially unstable (Zang 2012).

In this context, higher market concentration will increase the propensity of managers to substitute accrual with real earnings management activities when they are facing stricter corporate governance. In a highly concentrated industry, firms often enjoy high bargaining power with suppliers and customers and economies of scale. Thus, managers may consider the

impact of real earnings management on firm value to be less severe because any decline in the firm's future performance induced from the deviation from optimal business strategies could be mitigated by the competitive power of these firms. Simply put, managers may consider real earnings manipulation to be less costly in less competitive industries, and thus will be less reluctant to switch to real earnings management when stricter corporate governance makes accrual earnings management detection more likely.

While prior research finds that effective corporate governance mechanisms have primarily a positive effect on financial reporting quality (e.g., Beasly 1996, Klein 2002, He et al. 2003, Xie et al. 2003, Uzun 2004, Peasnell et al. 2005), our results show that they are generally less effective in concentrated markets. We find that corporate governance effectively mitigates accrual earnings management in both concentrated and non-concentrated markets, albeit to a weaker extent in the earlier. However, it can only mitigate real earnings management in non-concentrated markets but induces higher levels in concentrated ones. Accordingly, we provide new evidence on how corporate governance can trigger the trade-off between accrual and real earnings management in concentrated markets.

6. Additional Analysis

For robustness, we follow Armstrong et al. (2010) and perform a propensity score matching analysis for different levels of market concentration (high and low). We form matching pairs of industries with similar propensity scores based on certain observable attributes[16] and the same observed governance levels. For this purpose, we split industries based on their average governance scores into quintiles (from 1 to 5 with the first quintile representing the lowest governance level and the fifth quintile representing the highest governance level) in both the treatment and control groups. Therefore, we develop a logistic propensity score model of the conditional probability of facing high level of concentration (the treatment group) by industries of the same observable average firm attributes including corporate governance, matched to observations with the closest propensity score that did not receive the treatment (matching without replacement). In the second stage we compare earnings management measures between the treatment and control groups by measuring the average effect of the treatment on the treated group (ATT).

The results appear in Table 8 and 9 and support the previous findings in section 5.2. Table 8 shows no significant difference in using accrual earnings management between high and low market concentration subsamples at the same levels of corporate governance. Looking back at Table 7, we can confirm that strong corporate governance can equally mitigate accrual earnings management in both concentrated and competitive markets. In contrast, for real earnings management, Table 9 shows that there is more real earnings management in high

[16] Average firm size per industry and year is the main identified covariate.

market concentration subsample than in low market concentration subsample at the same levels of corporate governance (positive and significant ATT values appear clearly in Table 9 compared to those in Table 8). Taken together with the results of Table 7, we conclude that strong corporate governance cannot mitigate real earnings management in concentrated markets as it does in competitive ones. Once more, the reported results in Table 8 and 9 support hypothesis H2 of this study and confirm that stricter corporate governance in concentred industries increases the propensity of managers to substitute accrual with real earnings management activities.

Table 8 & 9 about here

7. Conclusion

This paper examines the difference between high and low concentrated markets in using accrual and real earnings management and the role of corporate governance in mitigating such activities. While the previous studies have mostly focused on the effect of market concentration on accrual earnings management, we examine both accrual and real earnings management and document that firms use more of the two activities in concentrated markets. The intensive use of earnings management can be attributed to some characteristics of concentrated markets such as the high information asymmetry, stronger bargaining power of firms and the lack of disciplinary effect of competition.

When incorporating corporate governance into the previous relation, we find that its mitigating effect on earnings management is generally weaker in concentrated markets compared to that in non-concentrated markets. We also provide new evidence to the literature regarding the role of governance in the trade-off between accrual and real earnings management in concentrated markets. The presence of effective corporate governance mechanisms - in the form of more tenured, qualified and independent board of directors - in concentrated markets is found to be associated with lower levels of accrual earnings management and higher levels of real earnings management. Switching to real earnings management takes place as accrual earnings management becomes more costly with the increase in its likelihood of being detected under a strong governance system, compared to real earnings management that becomes less costly with the increase in firms' competitive power in concentrated markets.

Finally, the findings of this research provide potential implications for different stakeholders. Regulators and auditors should work on preventing real earnings management in concentrated markets because of its negative impact on firm value, stakeholders, and the whole economy. This can be achieved by emphasizing on the role of the independent members of the board of directors in evaluating management accrual accounting choices and real

economic decisions. The results might also be of interest to potential investors to evaluate their investment chances in concentrated markets. Future research can build on the previous findings by investigating whether the extensive use of real earnings management in concentrated markets is associated with serious impact on firms' subsequent operating and stock return performance.

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Appendix - Measurement of earnings management

We select Stubben's Model (2010) to calculate accrual earnings management because it focuses on discretionary revenues which are the largest component of earnings in most firms (Stubben, 2010). Using revenues as an estimate of discretion reduces measurement error and makes the model less biased and more specified than other accrual models due to three reasons (Demerjian et al., 2013). First, discretionary revenues reflect receivables' accruals, rather than aggregate accruals. Receivable accruals, in turn, are more directly related to revenues than other working capital accruals. Second, the model focuses on reported revenues rather on cash revenues. While this results in understating discretionary revenues estimate, it is unlikely to overestimate discretion for firms that are less expected to collect their credit revenues by the year end e.g. growth firms. Finally, the model examines receivable accruals for the fourth quarter separately because they are less likely to be collected before the year end. As a result, it prevents overstating discretion when the revenues of the fourth quarter are relatively high or understating discretion when the revenues of the fourth quarter are relatively low (Stubben, 2010). According to Stubben's Model (2010), discretionary revenues are estimated using the following cross sectional OLS regression for each industry-year group with at least 6 observations.

$$\frac{\Delta AR_{it}}{A_{avg}} = \alpha + \alpha_1 \frac{1}{A_{avg}} + \beta_1 \frac{\Delta R1\_3_{it}}{A_{avg}} + \beta_2 \frac{\Delta R4_{it}}{A_{avg}} + \varepsilon_{it} \quad \text{(A1)}$$

In equation (A1), *AR* represents accounts receivable; A_{avg} represents average total assets calculated as the average of total assets at the beginning of the year plus total assets at the end of the year; *R1_3* represents revenues in the first three quarters; and *R4* represents revenues in the fourth quarter. We scale all variables by average total assets (A_{avg}) to avoid heteroskedasticity problems. The residual (ε_{it}) from the regression is the measure of discretionary revenues (*DiscRev*) that represents accrual earnings management (*AccrualEM*). We decile rank the measure for better comparability and to avoid outliers biasing our results.

We select Gunny's Model (2010) to measure real earnings management as it captures more aspects of real earnings management activities compared to other models (Gunny, 2010; Demerjian et al., 2013). The model measures four components of real earnings management activities which include reducing discretionary research and development expense (REM_{RD}) as in equation (A2), decreasing discretionary selling, general, and administrative expense (REM_{SGA}) as in equation (A3), timing of fixed asset sales to report gain (REM_{Asale}) as in equation (A4), and overproduction (REM_{Prod}) to cut prices or decrease the cost of goods sold (COGS) as in equation (A5) (Gunny, 2010).According to Gunny's Model (2010), the following cross sectional regressions for each industry-year group with at least 6 observations are used to estimate real earnings management proxies.

$$\frac{RD_t}{A_{avg}} = \alpha_0 + \alpha_1 \frac{1}{A_{avg}} + \beta_1 MV_t + \beta_2 Q_t + \beta_3 \frac{INT_t}{A_{avg}} + \beta_4 \frac{RD_{t-1}}{A_{avg}} + \varepsilon_t^{R\&D} \quad \text{(A2)}$$

$$\frac{SGA_t}{A_{avg}} = \alpha_0 + \alpha_1 \frac{1}{A_{avg}} + \beta_1 MV_t + \beta_2 Q_t + \beta_3 \frac{INT_t}{A_{avg}} + \beta_4 \frac{\Delta S_t}{A_{avg}} + \beta_5 \frac{\Delta S_t}{A_{avg}} * DD + \varepsilon_t^{SG\&A} \quad \text{(A3)}$$

$$\frac{GainA_t}{A_{avg}} = \alpha_0 + \alpha_1 \frac{1}{A_{avg}} + \beta_1 MV_t + \beta_2 Q_t + \beta_3 \frac{INT_t}{A_{avg}} + \beta_4 \frac{ASales_t}{A_{avg}} + \beta_5 \frac{ISales_t}{A_{avg}} + \varepsilon_t^{Asset} \quad \text{(A4)}$$

$$\frac{PROD_t}{A_{avg}} = \alpha_0 + \alpha_1 \frac{1}{A_{avg}} + \beta_1 MV_t + \beta_2 Q_t + \beta_3 \frac{S_t}{A_{avg}} + \beta_4 \frac{\Delta S_t}{A_{avg}} + \beta_5 \frac{\Delta S_{t-1}}{A_{avg}} + \varepsilon_t^{Production} \quad \text{(A5)}$$

In the previous equations, *RD* represents R&D expense; *SGA* represents sales and general admin (SG&A) expense; *GainA* represents income from asset sales; *PROD* represents cost of goods sold (COGS) plus change in inventory; *A* represents total assets; *MV* represents the natural logarithm of market value; *Q* represents Tobin's Q; INT represents internal funds; *S* represents total sales; *DD* represents an indicator variable that reflects the sticky cost behaviour for the intentional reduction in SG&A when the demand drops, which equals 1 when total sales decrease between t-1 and t, and zero otherwise; *ASales* represents the sales of long-lived assets; and *ISales* represents the sale of long-lived investment. To keep the relation between *GainA*, *ASales*, and *ISales* monotonic in equation (A4), we make all their signs negative when *GainA* is negative according to Gunny (2010). We scale all variables by average total assets (A_{avg}).

The residuals ($\varepsilon_t^{R\&D}$, $\varepsilon_t^{SG\&A}$, ε_t^{Asset}, $\varepsilon_t^{Production}$) from the regressions represent the measures for the R&D, SG&A, fixed assets' sale, and production components of real earnings management (REM_{RD}, REM_{SGA}, REM_{Asale}, REM_{Prod}) respectively. However, we multiply the first and second residuals by negative one so that cutting the discretionary expense reflects an increase in real earnings management. Finally, we decile rank the four measures for better comparability and to avoid the effect of the outliers.

Similar to Demerjian et al. (2013) we perform a principal component analysis with varimax rotation to obtain an overall estimate for real earnings management. This step prevents the inclusion of highly correlated variables in our measure. As a result, we obtain two real earnings management factors according to the following equations:

$$REM_{RD\_SGA} = (0.59\,REM_{RD}) + (0.63\,REM_{SGA}) + (0.13\,REM_{Asale}) + (0.12\,REM_{Prod}) \tag{A6}$$

$$REM_{AssetSale\_Prod} = (-0.21\,REM_{RD}) + (0.17\,REM_{SGA}) + (0.75\,REM_{Asale}) + (-0.55\,REM_{Prod}) \tag{A7}$$

The first factor represents discretionary reduction in R& D and SG&A expenses. The second factor reflects the sale of fixed assets to report gains and overproduction to cut prices or to decrease the cost of goods sold. As the first factor explains most of the variance in the dataset, we use it for the discussion of real earnings management (*RealEM*) results in this paper.

Table 1 Calculation of the variables

Variable	***Calculation***
$AccrualEM$	The residual from using Stubben's Model (2010) as explained in the 'Variable Definitions' section above.
$RealEM$	The first component generated by using Gunny's Model (2010) that represents the discretionary reduction in R&D and SG&A expenses as explained in the Appendix.
$HHIdummy$	Market concentration measured as a dummy that takes a value of 1 if the Herfindahl-Hirschman Index (HHI) score is above 2,500 points and zero otherwise (According to the United States Department of Justice, we classify industries with HHI scores above 2,500 points as highly concentrated and those with HHI scores below 2,500 points as low concentrated markets). The Herfindahl-Hirschman index; calculated as HHI=$\sum_{i=1}^{N} \omega_i^2$ where ω is market share for firm *i* measured by its sales divided by total industry sales; and N is the number of firms per year-industry.
$CR4dummy$	Market concentration measured as a dummy that takes a value of 1 if the concentration ratio (CR4) score is above the median value and zero otherwise. The concentration ratio; calculated as $CR4 = \sum_{i=1}^{4} \omega_i^2$ where ω is market share for firm *i* measured by its sales divided by total industry sales. The ratio takes into account the largest four firms in the industry only.
$HTIdummy$	Market concentration measured as a dummy that takes a value of 1 if the Hall Tideman index (HTI) score is above the median value and zero otherwise. The Hall Tideman index; calculated as HTI=$1/[(2\sum_{i=1}^{N}(k*\omega))-1]$ where ω represents market share, N is the number of firms per year-industry, and k represents firm rank according to market share..
Tenure	The time on board for the director at a selected annual report date.
Qualifications	The total number of educational qualifications (undergraduate and above) for the director at a selected annual report date.
Independence	The number of the independent non-executive directors divided by the total directors at the annual report date.
$FirmSize$	The natural log of the firm's assets as of the end of year *t*.
$CashFlowVolatility$	The standard deviation of (cash from operations / average assets) over at least three of the last five years (*t*–4, *t*).

$OperCycle$	The operating cycle is the natural log of average sales turnover plus days in inventory over at least three of the last five years (*t*–4, *t*).
$Losses$	Loss history is the percentage of years reporting losses in net income before extraordinary items over at least three of the last five years (*t*–4, *t*).
$MgrlAbility$	This measure represents how efficiently managers generate revenues from the available firm resources according to the approach of Demerjian, Lev, and McVay (2012). The variable was directly obtained from *https://community.bus.emory.edu/personal/PDEMERJ/Pages/Home.aspx*.
$NationalAuditor$	An indicator variable equals one for firms audited by national audit firms in year *t*; zero otherwise.
$LitigationInd$	Litigious industry indicator that equals one for firms in industries with SIC Codes: 2833-2836 (biotechnology), 3570-3577 and 7370-7374 (computers), 3600-3674 (electronics), and 52(X)-5961 (retailing).
MB	The market to book ratio that equals the firm's market capitalization divided by book value for year t.
$SalesGrowth$	Current year's sales less prior year's sales less the increase in receivables all scalded by prior year's sales and decile ranked by industry and year.
$Segments$	The natural log of 1+ the number of firm's business segments in year t.

Notes: This table presents the detailed calculations for each of the control variables identified in our model as discussed in the (Variable Definitions) section above.

Table 2 Expected and actual signs of the control variables

Variables	*AccrualEM*		*RealEM*	
	Predicted sign	Actual sign	Predicted sign	Actual sign
$FirmSize_{jt}$	+/-	-	+/-	+
$CashFlowVolatility_{j,t-4,t}$	+/-	+	+/-	-
$OperCycle_{j,t-4,t}$	+/-	-	+/-	+
$Losses_{j,t-4,t}$	+/-	-	+/-	-
$MgrlAbility_{jt}$	+/-	+	+/-	+
$NationalAuditor_{jt}$	-	-	+/-	+
$LitigationInd_{jt}$	+/-	-	+/-	-/+
MB_{jt}	+/-	-	+/-	-
$SalesGrowth_{rk\,jt}$	+/-	+	+/-	+
$Segments_{jt}$	+/-	+	+/-	-

Notes: This table presents the signs we expect and actually get for all control variables identified in our model and discussed in the (Variable Definitions) section above.

Table 3 Descriptive statistics

Variables	Mean	Median	Std Dev	P25	P75
AccrualEM	0.000	0.000	0.052	-0.011	0.019
RealEM	0.000	0.000	1.000	-0.673	0.835
HHI	0.391	0.335	0.235	0.222	0.509
CR4	0.361	0.314	0.212	0.206	0.475
HTI	0.367	0.318	0.235	0.203	0.483
Tenure	8.067	5.890	7.965	2.654	9.956
Qualifications	2.354	1.967	1.097	1.0080	3.567
Independence	0.770	0.697	0.869	0.664	0.856
TotalAssets	1,979.325	2,082.263	96.330	16.678	579.566
CashFlowVolatility	0.499	0.107	4.608	0.059	0.208
OperCycle	152.534	147.124	88.345	73.566	196.563
Losses	0.366	0.365	0.191	0.231	0.491
MgrlAbility	0.000	00.001	0.143	-0.089	0.086
NationalAuditor	0.291	0.250	0.225	0.125	0.428
LitigationInd	0.078	0.000	0.268	0.000	0.000
MB	4.096	1.951	67.321	1.155	3.346
SalesGrowth	0.563	0.554	0.180	0.55	0.567
Segments	1.453	1.445	0.546	0.916	1.914

Notes: The table presents the descriptive statistics of all the variables identified in our model for 6,873 industry-year observations obtained from Compustat from 1989 to 2016. Variables are defined in the (Variable Definitions) section above. We present the untransformed variables for ease of interpretation.

Table 4 Correlation table

	Accrual EM	*Real EM*	*HHI*	*CR4*	*HTI*	*Tenure*	*Qualifications*	*Independence*
Accrual EM								
Real EM	-0.29**							
HHI	0.218***	0.059***						
CR4	0.216*	0.127*	0.950*					
HTI	0.259*	0.046*	0.858*	0.883*				
Tenure	-0.112	-0.393**	0.034*	0.279*	0.395**			
Qualifications	-0.353***	-0.496***	0.031*	.053	0.389**	0.110***		
Independence	-0.287***	-0.592***	0.062*	0.246**	0.109	0.103***	0.097***	

Notes: This table presents the correlation matrix for 6,873 industry-year observations obtained from Compustat from 1989 to 2016 between the measures of accrual earnings management measured by Stubben's Model (2010), real earnings management measured by Gunny's Model (2010), market concentration measured by the Herfindahl-Hirschman Index (HHI), Concentration Ratio (CR4) and Hall Tideman Index (HTI), and the board of directors' characteristics that include: tenure measured as the time on board for the director at a selected annual report date, qualifications measured as the total number of educational qualifications (undergraduate and above) for the director at a selected annual report date, and independence measured as the number of independent non-executive directors divided by total directors at the annual report date. Variables are defined in the (Variable Definitions) section above. Pearson correlation coefficients are presented. To control for the multicollinearity between the different variables we make sure that all VIF factors are less than 10. VIF factors, however, are not tabulated. *, **, *** denotes a statistical coefficient at the 10, 5 and 1 percent alpha level, respectively.

Table 5 The difference between high and low market concentration subsamples in using accrual and real earnings management

Panel A: Using Herfindahl-Hirschman index (HHI) as a measure of market concentration

Variables	High concentration subsample mean	Low concentration subsample mean	Significance of difference test
$AccrualEM_{jt}$	0.567	0.557	***
$RealEM_{jt}$	0.077	-0.163	***

Panel B: Using Concentration Ratio (CR4) as a measure of market concentration

Variables	High concentration subsample mean	Low concentration subsample mean	Significance of difference test
$AccrualEM_{jt}$	0.565	0.557	***
$RealEM_{jt}$	0.115	-0.229	***

Panel C: Using Hall Tideman Index (HTI) as a measure of market concentration

Variables	High concentration subsample mean	Low concentration subsample mean	Significance of difference test
$AccrualEM_{jt}$	0.566	0.553	***
$RealEM_{jt}$	0.063	-0.329	***

Notes: This table presents the results of the two-tailed t-test of the difference of means between high and low market concentration subsamples in using accrual and real earnings management for 6,873 industry-year observations obtained from Compustat from 1989 to 2016. Market concentration is measured as follows: (Panel A) uses the Herfindahl-Hirschman index (HHI) and classifies industries with HHI scores above 2,500 points as highly concentrated and those with HHI scores below 2,500 points as low concentrated markets according to the United States Department of Justice, (Panel B) uses the Concentration Ratio (CR4) and classifies industries with CR4 scores above the median value as highly concentrated and those with CR4 scores below the median value as low concentrated markets, (Panel C) uses the Hall Tideman Index (HTI) and classifies industries with HTI scores above the median value as highly concentrated and those with HTI scores below the median value as low concentrated markets. Accrual earnings management is measured by Stubben's Model (2010) and real earnings management is measured by Gunny's Model (2010). Variables are defined in detail in the (Variable Definitions) section above. *, **, *** denotes the significance at 0.10, 0.05, and 0.01, respectively.

Table 6 The impact of the treatment (high market concentration) on using accrual and real earnings management compared to a control group with similar propensity scores (low market concentration)

Panel A: Using Herfindahl-Hirschman index (HHI) as a measure of market concentration

Variables	T	C	Matched pairs	ATT
$AccrualEM_{jt}$	High concentration	Low concentration	1,536	0.009***
$RealEM_{jt}$	High concentration	Low concentration	1,630	0.216***

Panel B: Using Concentration Ratio (CR4) as a measure of market concentration

Variables	T	C	Matched pairs	ATT
$AccrualEM_{jt}$	High concentration	Low concentration	1,211	0.008***
$RealEM_{jt}$	High concentration	Low concentration	1,292	0.283***

Panel C: Using Hall Tideman Index (HTI) as a measure of market concentration

Variables	T	C	Matched pairs	ATT
$AccrualEM_{jt}$	High concentration	Low concentration	876	0.012***
$RealEM_{jt}$	High concentration	Low concentration	970	0.282***

Notes: This table presents the results from the propensity score matching analysis for the effect of market concentration on the use of accrual and real earnings management for 6,873 industry-year observations obtained from Compustat from 1989 to 2016. Market concentration is measured as follows: (Panel A) uses the Herfindahl-Hirschman index (HHI) and classifies industries with HHI scores above 2,500 points as highly concentrated and those with HHI scores below 2,500 points as low concentrated markets according to the United States Department of Justice, (Panel B) uses the Concentration Ratio (CR4) and classifies industries with CR4 scores above the median value as highly concentrated and those with CR4 scores below the median value as low concentrated markets, (Panel C) uses the Hall Tideman Index (HTI) and classifies industries with HTI scores above the median value as highly concentrated and those with HTI scores below the median value as low concentrated markets. Accrual earnings management is measured by Stubben's Model (2010) and real earnings management is measured by Gunny's Model (2010). Variables are defined in detail in the (Variable Definitions) section above. Market concentration represents the treatment. The matched pairs are established for the treatment (T) and control (C) groups by comparing industries with similar propensity scores based on certain observable industry attributes. ATT is the average effect of the treatment (high concentration) on the treated group. *, **, *** denotes the significance at 0.10, 0.05, and 0.01, respectively.

Table 7 The effect of market concentration on the relation between corporate governance and earnings management

	(1)			(2)		
Variables	$AccrualEM_{jt}$			$RealEM_{jt}$		
$HHIdummy_{jt}$	0.003***			0.047*		
$CR4dummy_{jt}$		0.002***			0.114***	
$HTIdummy_{jt}$			0.004***			0.124***
$Governance_{jt}$	-0.001***	-0.001***	-0.002***	-0.097***	-0.067**	-0.116***
$HHIdummy_{jt}$*$Governance_{jt}$	0.000*			0.160***		
$CR4dummy_{jt}$*$Governance_{jt}$		0.000**			0.202***	
$HTIdummy_{jt}$*$Governance_{jt}$			0.001**			0.211***
$AccrualEM_{jt-1}$	0.016***	0.024***	0.017***			
$RealEM_{jt-1}$				0.042***	0.017***	0.037***
$FirmSize_{jt}$	-0.000***	-0.000***	-0.000***	0.031***	0.050***	0.041***
$CashFlowVolatility_{j,t-4,t}$	0.000***	0.000***	0.000***	-0.001***	-0.009***	-0.002***
$OperCycle_{j,t-4,t}$	-0.001***	-0.001***	-0.001***	-0.016	0.084***	0.011
$Losses_{j,t-4,t}$	-0.002***	-0.005***	-0.001***	0.042	-0.294***	0.054
$MgrlAbility_{jt}$	0.004***	0.001**	0.006***	0.360***	0.497***	0.144*
$NationalAuditor_{jt}$	-0.004***	-0.000	-0.004***	0.296***	0.174**	0.384***
$LitigationInd_{jt}$	-0.003***	-0.00101	-0.004***	0.243**	-0.180***	0.172*
MB_{jt}	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
$SalesGrowth_{rk\,jt}$	0.652***	0.633***	0.657***	-0.223	2.282***	0.895***
$Segments_{jt}$	0.002***	0.003***	0.001***	0.024	-0.232***	0.049
$t(\propto_2+\propto_3)$	12.788	8.070	9.299	6.241	15.428	2.157
Hansen	216.260	204.160	206.590	220.270	209.630	213.300
m1	-8.960	-8.560	-9.020	-10.060	-9.620	-10.160
m2	0.440	0.870	0.530	0.100	-0.280	0.040
z	766.000	177.270	718.390	209.020	373.010	196.900

Notes: This table presents the results from the system generalized method of moments regressions for the effect of market concentration on the relation between corporate governance and earnings management in the following order: (1) accrual earnings management measured by Stubben's Model (2010), and (2) real earnings management measured by Gunny's Model (2010). Each coefficient represents the change in earnings management based on a one unit change in the determinant. The sample includes 6,873 industry-year observations obtained from Compustat from 1989 to 2016. We measure market concentration with three dummy variables that classify industries into highly concentrated and low concentrated markets using the Herfindahl-Hirschman index (HHI), Concentration Ratio (CR4) and Hall Tideman Index (HTI). Corporate governance index (Governance) is measured using the principal component analysis technique for directors' tenure, qualifications, and percentage of independent directors. The t values of the linear restriction tests (LRT) reflect the joint significance of the explanatory and moderating variables under the null hypothesis H_o:$\propto_2+\propto_3=0$. Hansen test for over-identifying restrictions takes the shape of χ^2 distribution and checks for the orthogonality between the instrumental variables (IV_{jt}) and the error term (ε_{jt}). The AB test (Arellano and Bond, 1991) examines the serial correlation in the first difference

residual (υ_{jt}) by using the (m_j) statistic and takes the shape of a normal distribution with N(0,1). m_1 and $m_2$values represent the results of the 1st and 2nd order serial correlation tests respectively. The Wald test (z_1) checks for the joint significance of the reported coefficients in the model. *, **, *** denotes significance at 0.10, 0.05, and 0.01, respectively.

Table 8 The impact of the treatment (high market concentration) on using accrual earnings management (AccrualEM) by industries with similar propensity scores and governance levels

Panel A: Using Herfindahl-Hirschman index (HHI) as a measure of market concentration

T	C	Matched pairs	ATT
5	5	164	0.000
4	4	251	0.000
3	3	205	-0.000
2	2	206	0.000
1	1	160	0.000

Panel B: Using Concentration Ratio (CR4) as a measure of market concentration

T	C	Matched pairs	ATT
5	5	136	0.000
4	4	179	0.000
3	3	158	-0.000
2	2	145	0.000
1	1	109	0.000

Panel C: Using Hall Tideman Index (HTI) as a measure of market concentration

T	C	Matched pairs	ATT
5	5	118	0.000
4	4	152	0.000
3	3	116	-0.000
2	2	93	0.000
1	1	49	0.000

Notes: This table presents the results from the propensity score matching analysis for the effect of market concentration on the relation between corporate governance and accrual earnings management. Market concentration represents the treatment and measured with three dummy variables that classify industries into highly concentrated and low concentrated markets using the Herfindahl-Hirschman index (HHI), Concentration Ratio (CR4) and Hall Tideman Index (HTI). The matched pairs are established for the treatment (T) and control (C) groups by comparing industries with similar propensity scores based on similar observable average firm attributes and governance levels. We split industries based on their average governance index into quintiles (from 1 to 5) in both the treatment and control groups. Corporate governance index (Governance) is measured using the principal component analysis technique for three factors that include directors' tenure, qualifications, and independence. Accrual earnings management is measured by Stubben's Model (2010). Variables are defined in detail in the (Variable Definitions) section above. The matches were derived from a sample of 6,873 industry-year observations obtained from Compustat from 1989 to 2016. ATT is the average effect of the treatment (high concentration) on the treated group. *, **, *** denotes the significance at 0.10, 0.05, and 0.01, respectively.

Table 9 The impact of the treatment (high market concentration) on using real earnings management (RealEM) by industries with similar propensity scores and governance levels

Panel A: Using Herfindahl-Hirschman index (HHI) as a measure of market concentration

T	C	Matched pairs	ATT
5	5	164	0.487***
4	4	251	0.145*
3	3	205	-0.046
2	2	206	0.036
1	1	160	-0.173

Panel B: Using Concentration Ratio (CR4) as a measure of market concentration

T	C	Matched pairs	ATT
5	5	136	0.633***
4	4	179	0.213**
3	3	158	-0.006
2	2	145	0.094
1	1	109	-0.148

Panel C: Using Hall Tideman Index (HTI) as a measure of market concentration

T	C	Matched pairs	ATT
5	5	118	0.671***
4	4	152	-0.097
3	3	116	-0.105
2	2	93	0.158*
1	1	49	0.034

Notes: This table presents the results from the propensity score matching analysis for the effect of market concentration on the relation between corporate governance and accrual earnings management. Market concentration represents the treatment and measured with three dummy variables that classify industries into highly concentrated and low concentrated markets using the Herfindahl-Hirschman index (HHI), Concentration Ratio (CR4) and Hall Tideman Index (HTI). The matched pairs are established for the treatment (T) and control (C) groups by comparing industries with similar propensity scores based on similar observable average firm attributes and governance levels. We split industries based on their average governance index into quintiles (from 1 to 5) in both the treatment and control groups. Corporate governance index (Governance) is measured using the principal component analysis technique for three factors that include directors' tenure, qualifications, and independence. Real earnings management is measured by Gunny's Model (2010). Variables are defined in detail in the (Variable Definitions) section above. The matches were derived from a sample of 6,873 industry-year observations obtained from Compustat from 1989 to 2016. ATT is the average effect of the treatment (high concentration) on the treated group. *, **, *** denotes the significance at 0.10, 0.05, and 0.01, respectively.