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Article

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Gender diversity on corporate boards and earnings management: Evidence for European Union listed firms

Sandra Alves^{1*}

Abstract: Using a sample of 3,808 non-financial European Union listed companies from 2011 to 2020, this study extends previous research by empirically examining how board gender diversity affects the magnitude of earnings management. The results support the predicted (negative) relationship between female directors and earnings management. We also find that when a critical mass of three or more female directors is reached, they can have a voice, which can have a positive impact on earnings quality (less earnings management). The results based on this study offer useful information for regulators in European Union countries. The results also provide useful information to investors in evaluating the impact of board gender diversity on earnings quality. The major contribution of the current study is that in contrast to similar studies, we also present our evidence by country. In addition, we test the critical mass hypothesis to evaluate the ability of female directors to impact earnings management based on their numerical representation on the board of directors, an issue that has drawn reduced attention from empirical studies.

Subjects: Accounting; Corporate Governance

Keywords: Female directors; earnings management; discretionary accruals; critical mass theory

1. Introduction

Motivated by the increasing highlighting on gender diversity on European countries, this study examines the impact of board gender diversity on earnings management. Board gender diversity is considered crucial for value-creating boards (Huse, 2018). In recent years, there has been an increasing emphasis on gender diversity on corporate boards (Ararat & Yurtoglu, 2021; Dezsö & Ross, 2012). Accordingly, since 2005, regulators in different Union European countries have implemented mandatory female quotas for their listed companies. For example, Austria and Germany have a 30% female quota policy. France and Spain have a 40% female quota. Belgium has a 33% female quota. Italy had a 33.3% female quota until December 2018, increasing to 40% for the first general meeting in 2020. In Portugal, the proportion is subject to a minimum of 20% from the first elective general meeting after 1 January 2018 and to 33.3% from the first elective general meeting after 1 January 2020. The Netherlands had no quotas until the end of 2021, after January 2022 the female quota is at least 33%. Greece in July 2021 imposed a 25% gender quota for the boards of listed companies. On the other hand, countries like Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, Poland, Romania, Slovakia, Slovenia and Sweden have no quotas in place for women serving on boards. However, in these countries, firms are normally encouraged to disclose their gender

diversity policies on a “comply or explain” basis and set targets to drive growth in achieving gender diverse boards. Voluntary targets are normally proposed through corporate governance codes (Deloitte, 2022).

Previous research suggests that compared to male directors, female directors are more likely: to report fraudulent financial reporting to an anonymous reporting channel (Kaplan et al., 2009), to be more effective in countering fraud (Ho et al., 2015), to show lower tolerance towards opportunistic behaviour (Krishnan & Parsons, 2008; Srinidhi et al., 2011; Zalata et al., 2018); to be more ethical (Doan & Iskandar Datta, 2020); to be more risk-averse (Achour, 2021; Barber & Odean, 2001; Lenard et al., 2014); to be less over-investment (Saleh & Sun, 2021; Shin et al., 2020); to reduce the likelihood of restatement (Abbott et al., 2012); to reduce information asymmetry in equity markets (Abad et al., 2017); to enhance the disclosure clarity and the levels of corporate social responsibility (Cabeza-García et al., 2018; Ginesti et al., 2018; Issa & Fang, 2019); and to increase disclosure of risk information (Reguera-Alvarado & Bravo-Urquiza, 2020).

These features suggest that female directors are expected to supervise management effectively and thus increase earnings quality. In this sense, several empirical studies support the view that female board participation increases earnings quality because they are negatively associated with earnings management (Arun et al., 2015; Srinidhi et al., 2011). Therefore, we expect that firms with higher presence of female directors on the board to exhibit lower levels of earnings management. While we expect that the presence of female directors on company boards may contribute to reduce earnings management, women are under-represented at the director level. In fact, in this study, we note that women held only 23.7% of board seats in European Union listed firms. Really, prior studies suggest that female directors become effective for board performance when a critical mass is reached (Birindelli et al., 2019; Rossi et al., 2017; Srivastava et al., 2018; Torchia et al., 2011). Thus, female directors are likely to influence earnings quality decisions when they represent a significant number in the boardroom. Specifically, the aims of this paper are to test the effect of gender diverse board on earnings management and to analyse if different minorities of female directors (one woman, two women and at least three women) could influence earnings management practices. Therefore, our research questions are: (1) *Is there a negative relationship between the proportion of female directors on the board and earnings management?* (2) *Is the influence of female directors on earnings management more evident when there is a critical mass of female directors on the board of directors?*

The study sample includes 20 European Union countries (Austria, Belgium, Bulgaria, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovakia, Spain and Sweden) during the period 2011–2020. In order to investigate the association between gender diversity variables and earnings management practices, the dependent variable was measured using modified Jones model Dechow et al. (1995). Panel data analysis using ordinary least squares (OLS) is applied in all study models. We also consider the effects of using alternative definition for the earnings management and the potential endogeneity in order to check our results.

This paper contributes to the prior literature in several ways. First, it extends previous literature by empirically examining how female presence affects the level of earnings management for firms listed in 20 European Union countries. To our knowledge, there is no paper in the previous literature that specifically analyses this association in 20 twenty European Union countries. The major contribution of the current study is that in contrast to similar studies, we also present our evidence by country. In addition, we test the critical mass hypothesis to evaluate the ability of female directors to impact earnings management based on their numerical representation on the board of directors, an issue that has drawn reduced attention from empirical studies (Joecks et al., 2013; Konrad et al., 2008; Rossi et al., 2017; Srivastava et al., 2018; Torchia et al., 2011). Furthermore, this paper represents the first known study examining the association between female directors and accruals management in some European Union countries, such as Cyprus,

Lithuania and Slovakia. Second, this paper also contributes to the literature by extending the research into the effects of female directors on portfolio firms' earnings management beyond the US and the UK environments. Third, unlike in the US or UK, in most European countries, ownership tends to be concentrated. Therefore, the separation between shareholders and managers is largely less clear in European countries. Forth, as point out by La Porta et al. (1999), normally, directors are direct agents of the controlling owners of the firm, and may collude with managers, too (La Porta et al., 1999; Young et al., 2008). This setting can affect the board effectiveness to monitor earnings management activity. In fact, "the majority controlling shareholders may use earnings management to camouflage the reported earnings and hide expropriation from minority shareholders" (Jaggi et al., 2009, p. 286). Therefore, board gender diversity may be an important mechanism for countervailing the lack of independence and supervisory effectiveness of the board in European Union listed firms. Finally, as our study presents evidence of the impact of female directors on earnings quality, it will be of relevance to shareholders, investors, executives, supervisors, and standard setters.

Using discretionary accruals as a proxy for earnings management, the results support the predicted (negative) relationship between female directors and earnings management for a sample of 3,808 non-financial European Union listed companies. Overall, we also find that when a critical mass of three or more female directors is reached, they can have a voice, which can have a positive impact on earnings quality (less earnings management).

The remainder of the paper is organized as follows. Section 1 briefly presents the existing literature and formulates our testable hypothesis. Next, the variable measurement and research design are described in section 3.2.2. Subsequently, section 4, reports the main results. Finally, section 5 summarises and concludes this paper.

2. Theoretical framework and testable hypothesis

2.1. Female boards and earnings management

Numerous researchers attempt to offer a comprehensive definition of earnings management. However, as highlighted by Grimaldi et al. (2020), the complexity of earnings management makes it a challenging task to provide a fully inclusive definition. Several researchers have offered comparable definitions that emphasize the opportunistic nature of earnings management practices and view them as problematic, with the potential to distort a company's true financial performance (Fan et al., 2019b; Zhou et al., 2020). According to Healy and Wahlen (1999, p. 368) "earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company, or to influence contractual outcomes that depend on reported accounting numbers". Walker (2013, p. 446) defines earnings management as "the use of managerial discretion over (within GAAP) accounting choices, earnings reporting choices, and real economic decisions to influence how underlying economic events are reflected in one or more measures of earnings".

The function of the board of directors is to monitor and discipline a firm's management, thereby ensuring that managers pursue the interests of shareholders (Jensen & Meckling, 1976). Therefore, the board of directors' performs an important oversight role in controlling the quality and reliability of financial reporting (Dechow et al., 1996). The effectiveness of the board is a function of the composition of the board (Fama & Jensen, 1983). Thus, a more diverse board (including gender diversity) may result in improved board effectiveness.

A gender diversity board represents a valuable set of resources for companies. Female directors could influence management tasks positively through their skills, competence, and knowledge (Ferreira, 2010; Hillman et al., 2007). These features allow women directors to bring new and valuable perspectives into board discussion and reduce groupthink (Anderson et al., 2011;

Belaounia et al., 2020). Therefore, female directors can improve board effectiveness. In this sense, previous studies suggest that female directors are more likely: (a) to increase overall problem-solving capacity; (b) to establish interactions and external links with the environment; and (c) to increase the information provided by the board to managers (Carter et al., 2010; Dalton et al., 1998; Siciliano, 1996).

Female directors tend to put more emphasis on monitoring (Adams & Ferreira, 2009; Ararat & Yurtoglu, 2021; Farrell & Hersch, 2005), are more likely to be independent (Adams & Ferreira, 2009; Bøhren & Staubo, 2016; Dang et al., 2014), and have better board attendance records than male directors (Adams & Ferreira, 2009). Ararat and Yurtoglu (2021) found that female directors are more active in board committees. Lai et al. (2017) and Srinidhi et al. (2011) suggest that female directors are more likely to raise more questions than male directors. Therefore, it is expected that female directors enhance the level of monitoring and consequently improve the board's functioning and efficiency.

Female directors have been shown to improve the quality of decision making. For example, Levi et al. (2014) found that firms with more female directors are less acquisitive than those with fewer female directors. In addition, the authors found that female directors on a bidder board is associated with a lower bid premium. J. Chen et al. (2019) found that female directors are associated with less aggressive investment policies, better acquisition decisions and ultimately improved firm performance in industries where male CEO overconfidence is more prevalent. Mirza et al. (2020) found that female directors enhance firm's investment efficiency. They also find a negative relationship between female directors and overinvestment, which suggest that female board directors efficiently control overinvestment. Farooq et al. (2022) found a negative effect of boardroom gender diversity on investment inefficiency.

Studies also provide evidence that female directors are associated with more conservative and more risk averse (Arun et al., 2015; Belaounia et al., 2020; Zalata, Mansour Ntim, et al., 2019), lower probability of noncompliance with regulation and violations of securities law (Ararat & Yurtoglu, 2021), lower levels of information asymmetry in the market (Abad et al., 2017), higher dividend payouts as a monitoring device (J. Chen et al., 2017), higher firm performance (Belaounia et al., 2020; Erhardt et al., 2003), more effective norm change agents (Srinidhi et al., 2020) and more successful communication to investors (Joy, 2008).

Furthermore, it is also well established that females are more ethical (Doan & Iskandar Datta, 2020; Gul et al., 2009), are potentially more sensitive to the ethical implications of various issues (Bernardi et al., 2009) and better able to recognize unethical actions than men (Khazanchi, 1995). For example, Shaukat et al. (2016) find that the presence of women on the board is positively associated with corporate social responsibility orientation. Cumming et al. (2015) document that women are more effective in male-dominated industries in reducing both the frequency and severity of fraud. C. Liu (2018) finds evidence that greater female board representation is associated with a lower incidence of environmental misconduct. Thus, in the board of directors context, female directors may bring different ethical values, and hence, enhance board effectiveness.

Regarding the financial reporting quality, studies show that female directors on boards are likely to be uninvolved in manipulating financial reports for personal gain (Srinidhi et al., 2011; Zalata et al., 2018), reduces the probability of qualifications due to errors, non-compliance or the omission of information (Pucheta-Martínez et al., 2016), less associated with fraudulent financial reporting (Capezio & Mavisakalyan, 2016; Kaplan et al., 2009; Sun et al., 2017) and financial restatements (Abbott et al., 2012), increase voluntary disclosures in annual reports (Nalikka, 2009); reduce earnings management (Arun et al., 2015; Belaounia et al., 2020; Gavius et al., 2012; Orazalin, 2020; Peni & Vahamaa, 2010; Qi & Tian, 2012; Srinidhi et al., 2011; Zalata & Abdelfattah, 2021; Zalata, Ntim, et al., 2019) and increase financial reporting quality (Dobija

et al., 2021; Krishnan & Parsons, 2008; Luo et al., 2017; Pucheta-Martínez et al., 2016; Tee & Kasipillai, 2022).

In summary, existing literature suggest that female directors increase earnings quality as they enhance efficient allocation of resources, play a monitoring role, discipline the management, and reduce agency problem.

Therefore, we expect that the presence of female directors on company boards may contribute to reduce earnings management. We test the following hypothesis:

H1: *The proportion of female directors on the board is negatively related to earnings management.*

2.2. Critical mass of female directors on the board and earnings management

While we expect that the presence of female directors on company boards may contribute to reduce earnings management, women are under-represented at the director level. In fact, in this study, women held only 23.7% of board seats in European listed firms. Really, prior studies suggest that women only positively affect firm outcomes when sufficiently represented on boards (Abebe & Dadanlar, 2021; Konrad et al., 2008; Kramer et al., 2006). Concretely, since the board outcomes partly depend on how many women sit on it, women are likely to influence earnings quality decisions when they represent a significant number in the boardroom (Birindelli et al., 2019; Konrad et al., 2008; Rossi et al., 2017; Srivastava et al., 2018; Torchia et al., 2011).

As highlight by Y. Liu et al. (2014, p. 171), the critical mass hypothesis on board gender diversity posits that “one is a token, two is a presence, and three is a voice”. Thus, the critical mass hypothesis suggests that women are not likely to have a major impact on board discussions until they grow from a few token individuals into a significant minority of board directors; only as their numbers increase will women be able to exert more effectively influence on board discussions (Shahab et al., 2020; Y. Liu et al., 2014). Therefore, in the absence of a critical mass, female directors may be acting as mere tokens and have a limited impact (García-Meca et al., 2022; Schwartz-Ziv, 2017).

Previous studies suggest that female directors become effective for board outcomes when a critical mass is reached (Birindelli et al., 2019; Rossi et al., 2017; Srivastava et al., 2018; Torchia et al., 2011). So, female directors, as minorities in male-dominated corporate boards, may have little chance to exert influence on the board until they become a consistent or significant minority. Above that point, they could begin to improve board monitoring effectiveness (Belaounia et al., 2020; Masi et al., 2021; Torchia et al., 2011). In fact, numerous studies of female on corporate boards suggest that the critical mass of female directors is achieved when boards of directors have “at least three women” (Erkut et al., 2008; Konrad et al., 2008; Torchia et al., 2011).

Therefore, a critical mass of three or more female directors is critical to improving the corporate governance practices within firms (Konrad et al., 2008; Kramer et al., 2006; Shahab et al., 2020; Torchia et al., 2011; Zalata, Ntim, et al., 2019). Schwartz-Ziv (2017) finds that boards are more active when a critical mass of at least 3 women directors is in attendance. Specifically, Schwartz-Ziv (2017) finds that boards with at least three female directors are more likely to request an update and/or taking an initiative and take an initiative after board meetings. Thus, a critical mass of three or more females on the boards may be considered an important mechanism monitor for improving the quality and reliability of financial statements. In this sense, Luo et al. (2017) found that a firm with a critical mass of women serving on board may provide greater quality earnings. Fan et al. (2019a) document that when the number of women directors reaches three or more, bank earnings management declines.

The above discussion suggests that only after a given threshold of gender diversity, the influence of women directors can be more effective. Thus, we posit that an increased number of female corporate boards may result in an increased board monitoring effectiveness that substantially can contribute to reduce earnings management. Therefore, we expect that female directors contribute to mitigating earnings management when the critical mass of three women is achieved. This is reached by suggesting that with an increase in the number of female directors, from one or two women to at least three women, the level of earnings management will be smaller. Thus, beyond the representation of women in board of directors, we posit that their effect on earnings management may be conditional on whether there is a critical mass of female directors to representatively influence decision-making in the board of directors. That is, if female directors have effects on corporate decisions and earnings quality, those impacts should be more evidenced when the critical mass is reached. Thus, we test the following hypothesis:

H2a: *The presence of one woman (token) director on the board is not related to earnings management.*

H2b: *The presence of two women (presence) directors on the board is not related to earnings management.*

H2c: *The presence of the critical mass of women (voice) directors (at least three women) on the board is negatively related to earnings management.*

3. Methodology

3.1. Sample

The sample-selection process began by choosing from Amadeus, a database managed by Bureau Van Dijk and Informa DandB, S.A., all non-financial listed firms included in the main stock exchanges from all the European countries. As a second filter, we drop companies without data available, to measure the variable used in this study, for the period 2011–2020. Finally, we retain only countries with more than 20 firms that satisfy the two conditions above. Therefore, the analysis in this paper is based on a dataset consisting of 3,808 listed firms from 20 European Union countries for the period 2011–2020 and, thus 30,808 observations in total. Table 1 reports the sample composition and the women's minimum quotas by country.

3.2. Research design

3.2.1. Measuring female director

Following previous studies (e.g. Arioglu, 2020; Arun et al., 2015), we use the proportion of females on the board of directors to compute the existence of females on boards of directors. Thus, *B_Women* is measured as the number of women board members divided by the total number of board directors.

Previous studies of female on corporate boards suggest that the critical mass of female directors is achieved when boards of directors have “at least three women” (Erkut et al., 2008; Konrad et al., 2008; Torchia et al., 2011). Thus, we use three dummy variables: one woman (takes a value “1” if boards have only one woman, “0” otherwise); two women (takes a value “1” if boards have two women, “0” otherwise); three women—critical mass - (takes a value “1” if boards have at least three women, “0” otherwise).

3.2.2. Measuring earnings management

According to Walker (2013) the level of discretionary accruals is the most common method used to detect earnings management. Among the different models for calculating the level of discretionary accruals, this study employs the modified Jones model developed by Dechow et al. (1995) as

Table 1. Sample composition and the women's minimum (no) quota by country

	Country	Number of observations	Quotas in the period 2020
1	Austria	370	30%
2	Belgium	1010	33.33%
3	Bulgaria	1430	No quotas
4	Croatia	840	No quotas
5	Cyprus	330	No quotas
6	Denmark	1120	No quotas
7	Finland	1290	No quotas
8	France	6070	40%
9	Germany	3600	30%
10	Greece	1190	No quotas ¹
11	Ireland	230	No quotas
12	Italy	2750	33.33%
13	Lithuania	230	No quotas
14	Netherlands	590	No quotas ²
15	Poland	6000	No quotas
16	Portugal	420	33.33%
17	Romania	3180	No quotas
18	Slovakia	570	No quotas
19	Spain	730	40%
20	Sweden	6130	No quotas
Total		38080	

Note: The table presents the final sample, which includes 38,080 observations in 20 countries between 2011 and 2020.

a proxy for measuring earnings management, which is the most frequently used to calculate accruals (Arioglu, 2020; Arun et al., 2015; Belaounia et al., 2020; Peasnell et al., 2005; Warfield et al., 1995).

The modified Jones' model consists of regressing total accruals (TACC) on three variables: the change in revenues (ΔRev), the change in receivables (ΔRec) and the level of gross property, plant and equipment (PPE). All variables and the intercept are divided by lagged total assets in order to avoid problems of heteroskedasticity.

3.2.3. Control variables

Following previous studies, we include several control variables that may influence managers' accounting choices. These control variables are: board size (B_Size) is the number of members on the board; BIG4 is auditor quality, measured as 1 for the biggest four auditors and 0 otherwise; profitability (ROA) is the firm's return-on-assets; leverage (Leverage) calculated as the ratio between the book value of all liabilities and the total assets of the firm and firm size (Size) measured as the natural logarithm of market value of equity (Arun et al., 2015; DeFond & Jambalvo, 1994; Jiang et al., 2008; Peasnell et al., 2000; Watts & Zimmerman, 1990).

3.3 Summary statistics

Table 2 presents the sample descriptive statistics for the percentage of Female Directors on Board variable by country and all countries.

Table 2. Summary of Descriptive Statistics

Country	% of Female Directors on Board			
	Mean	Median	Min.	Max.
Austria	0.204	0.188	0.000	0.600
Belgium	0.205	0.190	0.000	0.600
Bulgaria	0.283	0.210	0.000	1.000
Croatia	0.217	0.190	0.000	1.000
Cyprus	0.099	0.095	0.000	0.301
Denmark	0.207	0.194	0.000	0.538
Finland	0.257	0.230	0.000	0.667
France	0.315	0.301	0.000	1.000
Germany	0.186	0.174	0.000	0.750
Greece	0.118	0.087	0.000	0.571
Ireland	0.196	0.191	0.000	0.400
Italy	0.265	0.291	0.000	1.000
Lithuania	0.149	0.095	0.000	0.607
Netherlands	0.247	0.227	0.000	0.563
Poland	0.190	0.147	0.000	1.000
Portugal	0.213	0.210	0.000	0.600
Romania	0.252	0.197	0.000	1.000
Slovakia	0.205	0.191	0.000	1.000
Spain	0.212	0.209	0.000	0.500
Sweden	0.256	0.230	0.000	0.714
All countries	0.237	0.201	0.000	1.000

Note: The table shows descriptive statistics for female directors in the sample.

The descriptive statistics show that the mean (median) of Female Directors on Board in European Union listed firms is 23.7% (20.1%) with the minimum of 0.0% and the maximum 100%. This suggests that women continue to be under-represented in the corporate boards of European Union publicly listed companies. France has the highest share of female seats on boards of the publicly listed companies at 31.5%. Cypriot and Greek listed companies have the lowest share of females in the board of directors, at just 9.9% and 11.8%, respectively.

In recent years, there has been an increasing emphasis in promoting diversity and inclusion policies. However, our results are not consistent with promotion. In fact, our results suggest that the introduction of mandatory (voluntary) quotas does not necessarily result in gender balance boards.

3.4. Regression models

To study the relationship between female director and earnings management, we use the following OLS regression model:

$$DACC_{it} = \beta_0 + \beta_1(B_Women_{it}) + \beta_2(B_Size_{it}) + \beta_3(BIG4_{it}) + \beta_4(ROA_{it}) + \beta_5(Leverage_{it}) + \beta_6(Size_{it}) + \varepsilon_{it} \quad (1)$$

To test the effects that the different sizes of the minority group (one woman, two women and three women) on earnings management, we use the following OLS regression model:

$$DACC_{it} = \beta_0 + \beta_1(one_Women_{it}) + \beta_2(two_Women_{it}) + \beta_3(three_Women_{it}) + \beta_4(B_Size_{it}) + \beta_5(BIG4_{it}) + \beta_6(ROA_{it}) + \beta_7(Leverage_{it}) + \beta_8(Size_{it}) + \varepsilon_{it} \quad (2)$$

Where:

$DACC_{it}$ = earnings management of firm i for period t.

B_Women_{it} = number of women board members divided by the total number of board members of firm i for period t.

One_Women_{it} = dummy variable: 1 if boards have only one woman and 0 otherwise.

Two_Women_{it} = dummy variable: 1 if boards have only two women and 0 otherwise.

$Three_Women_{it}$ = dummy variable: 1 if boards have at least three women and 0 otherwise.

B_Size_{it} = number of members on the board of firm i for period t.

$BIG4_{it}$ = dummy variable: 1 if the auditor is a Big4 and 0 otherwise.

ROA_{it} = ratio between the net income and the total assets of firm i for period t.

$Leverage_{it}$ = ratio between the book value of all liabilities and the total assets of firm i for period t.

$Size_{it}$ = logarithm of market value of equity of firm i for period t.

ε_{it} = residual term of firm i for period t.

β_0 is a constant, β_1 to β_8 are the coefficients.

4. Empirical results and discussion

We began with a pooled OLS model, a random-effects model and a fixed-effects model and we ran different tests to check the suitability of each model. On one hand, we compared the results of the pooled OLS model to those of the random-effects model by means of the Breusch-Pagan test for random effects. This test revealed that using the pooled regression model was preferable to the random-effects model. On the other hand, we estimated a fixed-effects model, and the F-test is not significant, which revealed that using pooled regression was preferable to the fixed effects. Consequently, the pooled OLS model is appropriate. We also calculated variance inflation factor (VIF) scores to test multicollinearity. None of the VIF scores (the highest calculated VIF is 5.636) exceeds 10 suggest that multicollinearity is not an issue in interpreting the regression results.

Tables 3 and 4 present OLS regression estimates for the models 1 and 2, respectively, developed in Section 4 by country and all countries.

Results reported in Table 3 indicate that for Austria, Bulgaria, Croatia, France, Germany, Italy, the Netherlands, Poland, Portugal, Romania, Spain and Sweden the estimated coefficients of B_Women are statistically significant and have the expected signs. This suggests that as the percentage of female directors on boards increases, the sample firms engage in smaller earnings management, consistent with the idea that female directors are effective in monitoring managerial behaviour. Therefore, these results indicate that the presence of female directors on boards matters in terms of earnings management. Consequently, these results suggest that the earnings quality is higher for companies with more female directors. To France, Germany, Spain, Poland, Italy and Sweden,

Table 3. OLS Regression Results of Model 1

		Dependent variable: DACC				
		Independent variable: <i>B_Women</i>		Control variables	Adjusted R-squared	F-statistic
Countries	N	Coefficient	t test			
Austria	370	−0.497	−1.949*	Yes	24.20%	12.551***
Belgium	1010	0.209	0.567	Yes	10.85%	1.678*
Bulgaria	1430	−0.172	−0.935*	Yes	12.60%	2.366**
Croatia	840	−0.115	−1.915**	Yes	26.40%	13.204**
Cyprus	330	0.299	3.497***	Yes	44.45%	20.827***
Denmark	1120	−0.226	−1.655	Yes	42.45%	19.534***
Finland	1290	−0.089	−2.245	Yes	22.38%	9.862***
France	6070	−0.018	−3.254***	Yes	34.86%	15.740***
Germany	3600	−0.025	−2.183**	Yes	13.05%	8.011**
Greece	1190	−0.186	−0.706	Yes	10.35%	2.577*
Ireland	230	0.187	0.439	Yes	23.07%	9.778**
Italy	2750	−0.255	−4.112***	Yes	16.12%	11.416***
Lithuania	230	0.098	0.848	Yes	10.47%	4.212*
Netherlands	590	−0.186	−1.914*	Yes	20.83%	11.751***
Poland	6000	−0.454	−3.776***	Yes	15.43%	19.305***
Portugal	420	−0.206	−2.568**	Yes	39.26%	6.979***
Romania	3180	−0.128	−2.780***	Yes	18.56%	9.250***
Slovakia	570	−0.051	−0.715	Yes	9.80%	3.999*
Spain	730	−0.265	−1.890**	Yes	33.10%	9.533***
Sweden	6130	−0.289	−3.122***	Yes	30.35%	19.041***
All countries	38080	−0.107	−3.103***	Yes	40.11%	25.513***

This table presents regression results of model (1), where the dependent variable is DACC, which is calculated by Modified Jones Model. The dependent variable, *B_Women*, is the number of women board members divided by the total number of board members.

*** Significant at the 1-percent level; ** Significant at the 5-percent level; * Significant at the 10-percent level.

the results are consistent to those of previous studies. Lakhal et al. (2015), Allemand et al. (2017), Gull et al. (2018) and Damak (2018), using French data, find that female directors' presence is associated with less earnings management practice. Panzer and Muller (2015), Saona et al. (2020), Dobija et al. (2021) and Marchini et al. (2017), using German, Spanish, Polish and Italian data, respectively, find similar results. Paiva et al. (2020) and Vieira and Madaleno (2019), using Portuguese data find that the presence of women on board decreases earnings management practices. Gavana et al (2022), for a sample of Italian firms, find that the presence of women on the board, exerts a lowering effect on the propensity to manipulate earnings using discretionary accrual. For a Swedish sample, Schönander and Zweigbergk (2020) document that women board members have a decreasing effect on earnings management.

In contrast, the results suggest, for Cyprus, an unfavourable impact of women directors on earnings quality. In fact, a positive relationship between female directors and earnings management, suggest that firms with female directors have more earnings management than those with males. This result could be an outcome of the gender equality policy in Cyprus. Cyprus is a country without gender quota. The share of women on boards of the Companies Listed in the Cyprus Stock Exchange is lower. As a result, the presence of a lower number of female directors on the board may not be sufficient to constrain the level of earnings management, because their voice is weaker.

Table 4. OLS Regression Results of Model 2

Dependent variable: DACC													
	Independent variable: One woman		Independent variable: Two women		Independent variable: Three women		Control variables	Adjusted R-squared	F-statistic				
	Coef.	t test	Coef.	t test	Coef.	t test							
Countries													
Austria	-0.132	-0.625	-0.201	-2.089*	-0.399	-3.092**	Yes	23.03%	11.425***				
Belgium	0.109	0.473	0.189	0.499	-0.178	-1.007	Yes	11.05%	2.808*				
Bulgaria	-0.045	-0.382	-0.078	-0.399	-0.203	-2.632**	Yes	13.10%	2.489**				
Croatia	-0.077	-0.819	-0.101	-0.987	-0.351	-2.156**	Yes	23.45%	12.738**				
Cyprus	0.099	0.987*	0.123	1.098	-0.299	-1.087*	Yes	38.24%	16.855***				
Denmark	-0.022	-0.536	-0.078	-0.637	-0.066	-0.601	Yes	42.45%	19.534***				
Finland	-0.027	-0.234	-0.066	-0.324	-0.123	0.907*	Yes	22.38%	9.862***				
France	-0.010	-0.154	-0.099	-0.518	-0.186	-2.828***	Yes	32.17%	14.923***				
Germany	-0.078	-0.167	-0.100	-0.767	-0.199	-3.088***	Yes	16.88%	10.109**				
Greece	-0.071	-0.961	-0.152	-0.871	-0.201	-3.192***	Yes	18.29%	8.718**				
Ireland	0.029	0.422	-0.166	-0.829	-0.183	-2.720**	Yes	19.58%	8.938**				
Italy	-0.088	-0.105	-0.120	-0.728	-0.192	-3.721***	Yes	20.25%	13.733***				
Lithuania	0.025	0.099	0.045	0.193	-0.202	-0.339	Yes	9.15%	3.938*				
Netherlands	-0.100	-0.899	-0.167	-1.829*	-0.201	-2.928***	Yes	25.02%	13.733***				
Poland	-0.082	-0.542	-0.191	-0.675	-0.212	-3.022***	Yes	18.32%	17.535***				
Portugal	-0.100	-0.671	-0.129	-1.722*	-0.224	-2.982***	Yes	32.25%	9.783***				
Romania	-0.088	-0.572	-0.099	-1.621*	-0.127	-2.698***	Yes	21.52%	10.726***				
Slovakia	-0.034	-0.432	-0.044	-0.498	-0.098	-0.657	Yes	9.35%	4.001*				
Spain	-0.120	-0.568	-0.099	-0.767	-0.207	-3.003***	Yes	34.60%	11.235***				
Sweden	-0.078	-0.201	-0.099	-0.318	-0.199	2.679**	Yes	22.50%	17.569***				
All countries	-0.067	-0.102	-0.254	-0.722	-0.255	-3.102***	Yes	38.39%	22.896***				

This table presents regression results of model (2), where the dependent variable is DACC, which is calculated by Modified Jones Model. The dependent variables are: One Woman, is a dummy variable that equals 1 if boards have only one woman and 0 otherwise; Two Woman is a dummy variable that equals 1 if boards have only two women and 0 otherwise; Three Woman is a dummy variable that equals 1 if boards have at least three women and 0 otherwise. *** Significant at the 1-percent level; ** Significant at the 5-percent level; * Significant at the 10-percent level.

Results reported in Table 3 also indicate that, for Belgium, Denmark, Finland, Greece, Ireland, Lithuania and Slovakia there is no statistically significant relationship between female directors and earnings management. In this sense, for example Dieu (2019) using Finnish data, also finds a negative but statistically not significant relationship between female directors and earnings management. For a Greek sample, Kalantonis et al. (2021) find a negative relationship, but statistically insignificant, between the percentage of female board members and earnings management.

The lack of impact of female directors on earnings management could be an outcome of the gender equality policy. This result may also be consequence of the fact that some companies appoint a few female directors, not because of their potential to contribute but only to be seen as doing so or in response to institutional pressures. In addition, since in these countries the publicly listed corporate boards are male-dominated, in board decision-making, female directors may have little chance to exert influence on the firm simply due to the high number of male directors on the board (Belaounia et al., 2020; Torchia et al., 2011). In this context, female directors' opinions and characteristics might not be respected greatly by male board members. Accordingly, they may not be given the opportunity to expose their valuable qualities into more effective monitoring. Moreover, women may accumulate less human capital and less experience of top positions, and hence fail to realize the presumed benefits of female directors (Wrigh et al., 1995).

Considering all countries, our results are consistent with the studies done by Belaounia et al. (2020), Kyaw et al. (2015) and Saona et al. (2018), which find that a more female presence on the board of directors leads to less earnings manipulation in European countries.

Table 4 presents the results of our second hypothesis, which emphasizes the importance of a critical mass of female directors on the board. Based on previous research (Erkut et al., 2008; Konrad et al., 2008; Torchia et al., 2011), we expect that the impact of women representation is more manifested when there are at least three female directors on the board. Except for Cyprus, the results suggest that a presence of one female director on the board has no effect on earnings management. This finding is in line with the critical mass hypothesis which suggests that one female director representation on the board may serve as mere token and thereby limit women to contribute towards decision-making. To Austria, the Netherlands, Portugal and Romania, the results suggests that a presence of two female directors on corporate boards is associated with lower levels of earnings management. However, for the other countries studied, the results suggest that a presence of two female directors on the board has no effect on earnings management. This result is also in line with the critical mass hypothesis. Only two women on the board may not necessarily lead to female directors having an impact on earnings management because they tend to be minorities in the board (Adams & Ferreira, 2009; Konrad et al., 2008; Masi et al., 2021). Significantly, our results suggest that female directors representation influences earnings management when there are three or more females on the board. In general, these results support the view (i.e., H2) that female directors' influence on earnings management is more evidenced when there is a critical mass (at least three women) of women on the board (Abebe & Dadanlar, 2021; Kanter, 1977; Kramer et al., 2006; Smith & Parrotta, 2018; Torchia et al., 2011), and thus, supporting the critical mass hypothesis.

Overall, our results support the modifications in the laws that have been instituted in various countries to enhance the proportion of female directors by exhibiting evidence that gender diverse boards have a positive impact on earnings quality. In addition, the results also indicate that female presence on boards does make a more pronounced impact on earnings management when a critical mass of three is accomplished.

4.1. Additional analyses

We test the impact of using alternative definition for the earnings management variable on the regression results. Discretionary accruals are determined using the Jones model instead of the modified Jones model.

Previous studies (e.g. Armstrong et al., 2014; X. Chen et al., 2015) find that a firm's earnings management influences the features of its board structure. Thus, the endogeneity issue is that female on boards may be the result of firm earnings management. Therefore, our variable related to female may be not exogenous, and consequently, our results may be biased (Wintoki et al., 2012). To address the potential endogeneity problem, we estimate a simultaneous equation system of female directors and earnings management using the 2SLS method. In the first stage, we estimate an OLS model with female directors as the dependent variable on a set of determinants (of women directors appointment) previously identified in the literature (e.g. Adams & Ferreira, 2009; J. Chen et al., 2017; Oyotode Adebile & Ujah, 2021; Saeed et al., 2016) and use the coefficient estimates to obtain the predicted level of female directors (*B_Women_Predicted*).

Table 5. OLS Regression Results of Model 1 – Alternative earnings management proxy

		Dependent variable: DACC				
		Independent variable: B_Women		Control variables	Adjusted R-squared	F-statistic
Countries	N	Coefficient	t test			
Austria	370	−0.299	−2.451**	Yes	24.01%	12.522***
Belgium	1010	−0.019	−0.881	Yes	10.96%	3.345*
Bulgaria	1430	−0.099	−1.099**	Yes	12.04%	2.257**
Croatia	840	−0.299	−1.999**	Yes	22.88%	12.563**
Cyprus	330	0.217	1.203	Yes	36.35%	16.141***
Denmark	1120	−0.082	−0.323	Yes	21.34%	14.443***
Finland	1290	−0.022	−0.424	Yes	25.23%	10.846***
France	6070	−0.199	−3.008***	Yes	33.57%	19.353***
Germany	3600	−0.154	−2.109**	Yes	18.25%	12.785**
Greece	1190	−0.109	−1.762*	Yes	14.08%	7.947**
Ireland	230	−0.198	−2.029**	Yes	16.34%	9.452**
Italy	2750	−0.203	−3.833***	Yes	21.09%	14.008***
Lithuania	230	−0.033	−0.923	Yes	7.013%	3.137*
Netherlands	590	−0.198	−2.048**	Yes	24.78%	14.743***
Poland	6000	−0.198	−1.998**	Yes	21.87%	19.653***
Portugal	420	−0.209	−2.845***	Yes	30.53%	10.981***
Romania	3180	−0.109	−1.985**	Yes	18.23%	11.344***
Slovakia	570	−0.182	−0.344	Yes	8.40%	3.342*
Spain	730	−0.198	−3.332***	Yes	35.23%	15.248***
Sweden	6130	−0.104	−1.254*	Yes	15.87%	13.973***
All countries	38080	−0.253	−3.679***	Yes	41.54%	26.764***

This table presents regression results of model (1) where the dependent variable is DACC, which is calculated by Jones Model. The dependent variable, *Bwomen*, is the number of women board members divided by the total number of board members.

*** Significant at the 1-percent level; ** Significant at the 5-percent level; * Significant at the 10-percent level.

Table 6. 2SLS Regressions Results of Model 1

		Dependent variable: DACC				
		Independent variable: <i>B_Women_Predicted</i>		Control variables	Adjusted R-squared	F-statistic
Countries	N	Coefficient	t test			
Austria	370	−0.399	−1.837*	Yes	22.30%	12.453***
Belgium	1010	−0.234	−0.645	Yes	11.08%	1.642*
Bulgaria	1430	0.034	0.471	Yes	11.98%	1.411**
Croatia	840	−0.187	−1.999**	Yes	23.67%	13.029**
Cyprus	330	0.289	3.078**	Yes	50.11%	19.737***
Denmark	1120	−0.196	−1.098	Yes	40.78%	17.873***
Finland	1290	−0.101	−2.098	Yes	21.76%	9.233***
France	6070	−0.029	−3.349**	Yes	30.76%	14.764***
Germany	3600	−0.044	−2.938***	Yes	10.54%	7.290**
Greece	1190	−0.099	−1.834*	Yes	9.50%	2.078*
Ireland	230	0.106	0.376	Yes	20.65%	9.078**
Italy	2750	−0.378	−3.908***	Yes	17.98%	10.654***
Lithuania	230	0.103	0.873	Yes	10.03%	3.987*
Netherlands	590	−0.202	−1.988*	Yes	19.43%	10.647***
Poland	6000	−0.389	−3.320***	Yes	15.09%	17.873***
Portugal	420	−0.178	−2.302**	Yes	31.76%	6.154***
Romania	3180	−0.099	−2.292***	Yes	16.03%	8.676 ***
Slovakia	570	−0.011	−0.292	Yes	8.96%	3.762*
Spain	730	−0.789	−2.099**	Yes	30.45%	8.783***
Sweden	6130	−0.022	−0.099	Yes	28.06%	17.983***
All countries	38080	−0.178	−3.099***	Yes	37.15%	23.876***

This table reports the regression results from the 2SLS, where the dependent variable is DACC, which is calculated by Modified Jones Model. The dependent variable, *B_Women_Predicted*, is the predicted percentage of female directors on board obtained on first-stage regression results.

*** Significant at the 1-percent level; ** Significant at the 5-percent level; * Significant at the 10-percent level.

The results (Table 5) of the regression, using alternative variable to measure earnings management, remain qualitatively similar to those reported in Table 3, which indicates that the results are robust.

We then include the *B_Women_Predicted* as the measure of *B_Women* in the models. The main results (Table 6) remain qualitatively similar to those reported in the Table 3.

5. Summary and conclusions

In recent years, there has been an increasing emphasis on gender diversity on corporate boards (Ararat & Yurtoglu, 2021; Dezsö & Ross, 2012). Thus, motivated by the increasing highlighting on gender diversity on European countries, this study examines the impact of board gender diversity on earnings management. We also test the critical mass hypothesis to evaluate the ability of female directors to impact earnings management based on their numerical representation on the board of directors, an issue that has drawn reduced attention from empirical studies (Joecks et al., 2013; Konrad et al., 2008; Rossi et al., 2017; Srivastava et al., 2018; Torchia et al., 2011).

In line with our first hypothesis, we find a negative relationship between female directors and earnings management. This result suggests that the programs recently employed in various European countries to increase the presence of female directors in firm boards may have favorable

effects on earnings quality by reducing earnings management. In addition, consistent with our second hypotheses, the results also indicate that female directors are more effective in mitigating earnings management when a critical mass of three women on the board is reached.

This study makes numerous contributions to both theory and practice. First, this paper corroborates legislating to reach a greater presence of female directors and suggests the beneficial effect (higher earnings quality) of incorporating female directors. Second, we test the critical mass of female directors in the context of earnings management. The results suggest that different numbers of female on the board may have different impacts on earnings quality. Consequently, firms with less than three women on their board should ponder adding female directors to their boards. Third, the findings also provide useful information to corporate boards, policymakers, and investors. The results are likely of interest to corporate boards who are interested in improving their effectiveness. Our results suggest that female directors have a positive impact on earnings quality. Additionally, it also suggests a minimum of women that a board should reach to obtained benefits of gender diversity. The findings also provide useful information to policymakers and investors in evaluating the consequences of increasing the presence of female directors in the boards of listed firms. In fact, this study suggests that the inclusion of females in the board of directors increases earnings quality of the firms, which ensures and entrusts investors. So, this study suggests that policymakers should highlight the benefits of including female on corporate boards to the stakeholders. Fourth, knowing the effect of female directors on earnings quality makes an important role in informing enhancing global reforms demanding further women representation within corporate boards to enhance financial reporting efficiency.

The findings of the present study are also subject to some limitations. First, although we control for some board-governance factors and for firm characteristics, our study can still have omitted factors. In this sense, it will be interesting to control other board-governance factors and firm characteristics (e.g. ownership structure, independent directors, investment opportunities). Second, this study uses only discretionary accruals to measure earnings management. Therefore, for future research it would be also interesting to examine the relationship between female directors and other proxies of earnings management (e.g. earnings smoothing or loss avoidance). Third, since this paper suggests that more female directors on the boards leads to decrease on earnings management, it could be interesting to test what the specific attributes may contribute to this outcome (e.g. experience, expertise, skills, busyness, multiple directorships). Hence, future research may study specific attributes of female on corporate boards. Fourth, the sample of this study is constituted only of listed companies. Hence, our findings may not be generalized to small and non-listed firms. For future research, it would be also interesting to replicate the analyses using data from European Union SMEs.

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Notes

1. In July 2021 imposed a 25% gender quota for the boards of listed companies.
2. 33% applied as from 1 January 2022.

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