Boardroom Gender Diversity and Earnings Management:

Evidence from Private Firms

Abstract

This paper examines the relationship between board gender diversity and earnings management (EM) practices in private firms, with particular attention to crisis-period dynamics during COVID-19. While existing research predominantly focuses on listed companies, we analyse a comprehensive dataset of 895,111 observations from 154,726 Belgian private firms spanning 2010-2021, enabling the first examination of pandemic effects in this context. We employ multiple measures of gender diversity, including female presence, proportion of female board members, and diversity indices. Our findings demonstrate that female presence and higher proportions of female board members significantly reduce earnings management. During the COVID-19 crisis, earnings management increased substantially but declined in the recovery period. Importantly, we find nuanced effects for board diversity: while diversified boards help mitigate earnings management increases during crises, they are associated with higher earnings management during economic recovery periods. These results highlight the complex, context-dependent relationship between gender diversity and financial reporting quality, particularly demonstrating that mixed-gender boards provide superior oversight during crisis periods. Our study contributes novel insights into earnings management in the understudied private firm context and provides the first comprehensive analysis of gender diversity effects throughout the pandemic.

1. Introduction

Gender diversity within the boardroom has become an increasingly important topic in the business world. For instance, in 2022, the European Council adopted the directive on gender balance on corporate boards[1], forcing listed companies of having boards on which members of the underrepresented sex hold at least 40 % of non-executive director positions or, alternatively, hold at least 33 % of all director positions, by 30 June 2026. Gender diversity is also part of the EU's ESG reporting requirements[2], which requires certain companies to disclose, among other things, diversity information.

The increased consideration for board diversity seems to be already having some effect when looking at the figures on board composition. The most recent numbers for 2024 show that 39% of all directors are female, which is a steady increase compared to 35% in 2022.[3]

The increase in female directors is likely to affect the overall functioning of firms' board of directors, as board composition is linked to corporate governance outcomes (Baysinger et al., 2019). One of the main functions of the board of directors is to serve as a control mechanism for monitoring managers. In that sense, the board of directors plays a crucial role in alleviating agency problems and reducing information asymmetry between the management, shareholders, and other external stakeholders. A central element in reducing information asymmetry is providing stakeholders with high quality accounting information. As earnings management (EM) is linked to lower financial information quality and increased information asymmetry (Beyer et al., 2019), an effective board of directors should monitor and mitigate EM practices by managers.

[1] Directive (EU) 2022/2381 of the European Parliament and of the Council of 23 November 2022 on improving the gender balance among directors of listed companies and related measures (http://data.europa.eu/eli/dir/2022/2381/oj).
[2] Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups (http://data.europa.eu/eli/dir/2014/95/oj).
[3] Spencer Stuart. (2024). *Belgium board index: Board composition*. (https://www.spencerstuart.com/research-and-insight/belgium-board-index/board-composition)

Given the board's monitoring role, changes in board composition, particularly gender diversity, may significantly influence the oversight of managerial practices such as earnings management. The question thus arises if and how boards' gender diversity affects EM in firms. Recent studies have shown that the presence of women mitigates EM due to their diligence (Gavious et al., 2012), ethical considerations (Terjesen et al., 2015), risk adversity and heterogeneity in decision-making (Kyaw et al., 2015). However, conflicting views exist, stating there is no significant impact of gender diversity (Jurkus et al., 2011). Moreover, Pavlovic et al. (2018) argue that differences in the usage of EM originate from cultural differences unrelated to gender. Other studies demonstrate that board gender diversity is associated with reduced earnings management practices (see e.g. Gull, Ammar Ali, et al. 2018). However, these studies only focus on large, listed firms. Little is known about the effects of board diversity on EM practises in smaller private firms.

To address this gap in the literature, this study investigates the relationship between board gender diversity and earnings management practices in a large sample of Belgian private firms. We use a novel dataset, sourced from Belfirst, a database provided by Bureau van Dijk that houses information on Belgian companies, encompassing the information of both current and historical directors of Belgian private firms. We combine this data with financial statement information, supplemented by industry data and incorporation dates, collected through Companyweb, a company that specializes in collecting company information in Belgium. The final sample size consists of 895,111 observations, with 154,726 different companies.

Our study contributes to the literature in several ways. First, our analysis provides novel insights into the association between gender diversity within the boardroom and the usage of EM for the largely neglected group of private firms. As can be derived from the literature, conflicting views exist on how female members impact the usage of EM. Moreover, there are several reasons to expect that these previous findings in listed firms, might not carry over

consistently to the private firm setting. That is, there are large differences with regard to the composition, functioning and responsibilities of the board between private and listed firms. In the private firm setting, the board of directors is typically smaller, and the members often also function as owner/manager of the firm. These differences alter the nature of a private firms' board activities. Especially their function as control mechanism is affected, as the principal-agent problem is typically less pronounced in the private firm setting.

These structural differences have important implications for financial reporting incentives. The importance of financial statement information in reducing the information asymmetry between the firm and external stakeholders is different for private firms. Financial statements are typically the only source of credible information available for private firms, in contrast to listed firms. This could potentially impact the incentives for EM practices by managers. Previous research suggest that EM is more pervasive in private firms due to a lack of capital market incentives (Burgstahler et al., 2006). Ball & Shivakumar (2005) argue this is attributable to a lower demand for financial reporting since relevant information is communicated directly between managers and stakeholders than through the firm's financial reporting. Nevertheless, there is mounting evidence that EM in private firms is still a relevant issue for private firms' stakeholders and affects their access to credit (see e.g. Selleslagh & Ceustermans, 2024).

The generalizability of existing research to private firms is therefore problematic, despite private firms comprising the vast majority of all firms in the European Union and contribute a significant part of the Union's GDP.

Second, we exploit the unique timeframe of our sample, which spans the COVID-19 pandemic period. The role of gender differences in boardroom decision-making during economic crises remains largely unexplored, with only Li et al. (2023) examining gender-based variations in earnings management across different economic contexts. Research shows that

women portray different leadership styles, which have shown to outperform the ones of their male counterparties in certain crisis situations (Post et al., 2019; Sicard et al., 2021; Caprioli et al., 2001; Aroussi et al., 2024). The majority of the papers only covered 2019 and 2020, when the post-pandemic effect could not yet be precisely measured. To the best of our knowledge, our study addresses this gap by providing the first comprehensive examination of the relationship between earnings management and board gender diversity throughout the entire pandemic cycle, using data spanning 2010-2021.

Our results indicate that female presence and a higher proportion of female board members decrease the usage of EM. Furthermore, our results indicate that during the COVID period, the amount of EM increases, while this decreases after the peak of the crisis. Our results suggest that, during crisis situations, like the COVID period, firms with higher proportions of female board members are linked with more EM. However, a moderating relationship was found between gender diversity, measured with the Blau and Shannon index, and EM. This entails that mixed boards are best at responding to crises. That is, limiting our sample to multi-director boards, we find that earnings management decreases as board diversity increases.

2. Literature review

2.1. Earnings Management and Gender Diversity

Gender diversity within the boardroom has gained significant attention, culminating in the 2022 EU directive requiring listed companies to achieve substantial gender balance by 2026[4]. This regulatory push has intensified scholarly interest in understanding how gender diversity affects board effectiveness and corporate governance outcomes. Nowadays, nearly 39% of directors in Belgium are female, showing the implementation of the quota is effective.[5] Research has pointed out these measures serve as a step in deterring the "glass ceiling" effect, which prevents women from passing an artificial corporate barrier (Thiruvadi & Huang, 2011). However, women are known to have different characteristics compared to men, being more risk averse (Soana Hoffmann et al., 2019) and adhering more to ethical considerations, amongst other things (Pavlovic et al., 2018). Thus, the question arises of how this change in distribution and reasoning alters essential processes such as decision-making and efficiency, financial performance, and financial reporting (Alves, 2023).

Literature states that female directors show characteristics within a business environment that bring about an enhancing effect. They are likely to reduce group thinking (Belaounia et al., 2020), question topics that arise in meetings (Lat et al., 2017; Srinidhi et al., 2020) and participate in board discussion (Anderson et al., 2011). Moreover, their attendance (Adams & Ferreira, 2009) and engagement (Ararat & Yurtoglu, 2021) in committees outperform their male counterparties, resulting in an improved level of business efficiency and monitoring. Likewise, the quality of the decision-making process seems to be elevated since

[4] Directive (EU) 2022/2381 of the European Parliament and of the Council of 23 November 2022 on improving the gender balance among directors of listed companies and related measures (http://data.europa.eu/eli/dir/2022/2381/oj).
[5] Spencer Stuart. (2024). *Belgium board index: Board composition*. (https://www.spencerstuart.com/research-and-insight/belgium-board-index/board-composition)

women turn to less aggressive investment policies, which can be observed in environments where male CEO overconfidence is cumbersome (Chen et al., 2019).

The differences in efficiency, monitoring and decision-making can successively alter a firm's performance, both financially and non-financially. Conflicting views and evidence are present in current literature about the relationship between gender diversity and firm performance, some stating a positive effect (Gavious et al., 2012), while others show a negative or insignificant effect. Terjesen et al. (2016) found evidence of better financial performance and profitability (Krishnan & Parsons, 2008), arguing the public has an enhanced view of the firm's ethical behaviour when female directors are present. In addition, the more risk-averse attitude associated with female directors, which counterbalances the excessive risk-taking by male-dominated boards, is an explanatory factor as well for improved firms' performance (Belaounia et al., 2020). The same remarks were made for the banking industry, where gender diversity strengthens corporate governance through responsible thinking and thus improves technical efficiency (Boadi et al., 2022). Furthermore, research conducted on listed Chinese companies offered insight into improved stock liquidity, attributable to higher quality decision-making and enhanced communication with female participation (Ye et al., 2021).

Aside from financial metrics, companies with a higher presence of women score better on corporate social responsibility (Shaukat et al., 2016) and are more aware of environmental implications (Liu, 2018). Other factors play an important role in moderating the relationship between gender diversity and firm performance (Belaounia et al., 2020). First, in countries with a lack of gender equality, females do not have the same access to proper education and professional background for filling in boardroom positions. Secondly, when there is a biased attitude against women, their voices and opinions will not be properly heard.

On the other hand, the meta-analysis of Post & Byron (2015) stated that, even though more female directors result in better accounting returns, market performance is insignificant

to gender diversity. Others even found that there is no significant relationship between firm performance and gender diversity (Jurkus et al., 2011; Matsa & Miller, 2013).

When conducting research about EM and gender diversity in specific, similar contradictions as stated earlier can be witnessed. The majority however finds evidence of a deterring effect when higher female participation is present (Kyaw et al., 2015; Orazalin, 2020; Roy & Alfan, 2022), resulting in higher quality earnings and more informative financial statements (Saona Hoffmann et al., 2019), which is a decisive factor for stakeholders and investors (Jurkus et al., 2011). They achieve this by limiting the levels of real activities manipulation (Luo et al., 2017) and adopting more conservative accounting policies (Arun et al., 2015) as a result of their psychological differences. This is visible through less involvement in the manipulation of financials for personal gain (Zalata et al., 2018), reductions in the probability of qualification due to error (Pucheta-Martinez et al., 2016) and less fraudulent financial reporting (Capezio & Mavisakalyan, 2016; Kaplan et al., 2009). Also, the presence of a female CEO or CFO seems to mitigate EM (Gavious et al., 2012; Gul et al., 2018). However conflicting evidence has been found, some stating only the gender of the CFO is relevant (Peni & Vabamaa, 2010) or that the economic context influences the behaviour of female CEOs and CFOs (Li et al., 2023).

Others however did not find significant results (Jurkus et al., 2011), stating that differences in EM potentially arise from cultural differences such as politics, religion, attitude, and age (Pavlovic et al., 2018). Moreover, the decrease in EM might vanish as female CEOs are rewarded with higher levels of equity-based compensation (Harris et al., 2019).

Not only do females on the board of the company itself have an impact, but also women on the audit committees might affect the usage of EM. Their presence has been shown to restrain EM due to more external governance present in the audit committee, which is in line with literature stating that women are more risk averse, cautious about public perceptions, and

ethical compared to men (Thiruvadi & Huang, 2011; Gavious et al., 2012). However, others (Sun et al., 2011) found no evidence of this relationship, arguing women might be unable to convince the entire committee of their opinion.

2.2. Earnings Management during Crisis

Much research has been conducted to explore the behaviour of firms during periods of financial crisis, which has shown a significant impact on the usage of EM (Cimini, 2015). This is important since EM is negatively associated with earnings quality, meaning that high EM leads to low earnings quality and vice versa. Earnings quality, in turn, is responsible for determining future revenue and growth prospects. Thus, being an important factor for potential investors (Persakis & Iatridis, 2015).

Literature states that companies tend to decrease the usage of EM during the crisis period (Filip & Raffournier, 2014) thus increasing their earnings quality. Arthur et al (2015), who researched firms' behaviour before and during the global financial crisis of 2008, argued that this is because firms want to ameliorate investor confidence so that the negative impact of the crisis is minimised afterwards. The effect of managerial incentives has been proven significant by other authors as well (Chintrakarn et al., 2018; Turegun, 2020), stating that management experiences less motivation to report favourable figures since lower revenue can be easily attributed to poor economic conditions. The market appears to be more accepting of low performance, decreasing motivation even more (Turegun, 2020). Furthermore, Cimini (2015) specifies that this decline is partially attributable to the fact that financial figures are put under more scrutiny by auditors during periods of uncertainty, thus companies turn to more conservative ways of accounting. The same evidence of deterring EM has been found for listed companies during the Asian financial crisis, where companies audited by the 6 biggest audit firms showed less EM (Ming Chia et al., 2007). Also in Europe, similar results have been found,

stating that *"Auditors play an important role in ensuring high quality in financial reports especially in crisis periods"* (Dimitras et al., 2015).

On the other hand, there is evidence in the literature stating that companies engage more in EM during crises. The 'big bath' accounting technique, which is used for income-decreasing EM, has been shown to be very present during crises (Kjaerland et al., 2021; Saleh & Ahmed, 2005; Bugshan et al., 2022). Since less favourable figures during crises are less scrutinized by stakeholders, companies will lower revenues so they have the possibility to deliver improved financial statements afterwards. However, these results emerge from less severe crises such as oil shock, in which the increase of monitoring is less expressed. Other factors are at stake as well that strengthen this relationship. For example, companies that are close to violating debt covenants and have high debt leverage, make more use of income-increasing EM during crises (Kumar & Vij, 2017; Smith et al., 2001).

In the periods before and after a crisis, research shows companies tend to engage more in income-increasing EM. Monitoring by the government, auditors, and exchange boards is expected to decrease, as well as market expectations start increasing again (Turegun, 2020). This results in firms turning to methods of income-increasing EM, which is strengthened when managers' salary is based on the performance of the firm (Kumar and Vij, 2017).

2.3. Earnings Management during COVID

Besides the health consequences the COVID-19 pandemic has caused, enterprises also suffered from increased financial pressure (Yan et al., 2022). The reduced mobility caused by a series of lockdowns and social distancing resulted in a reduction in labour supply and economic consumption (Eichenbaum et al., 2021). Apart from the obvious consequences of human capital, the supply and normal flow of raw materials suffered as well, disrupting the entire supply chain and the manufacturing process (De Vito & Gomez, 2020), thus increasing the operating cycle length (Lin et al., 2023). These factors combined, gave rise to a serious plunge in profitability (Labadze & Srajeb, 2023), decreasing liquidity and increasing the risk of bankruptcy (Zhang & Hu, 2022).

In comparison with the behaviour witnessed during prior crises, where enterprises mainly decreased their usage of EM, research from the COVID-19 pandemic shows firms tend to primarily conduct income-increasing EM. Lassoued & Khanchel (2021) argue management of listed companies aims at curbing reported losses to restore investor and stakeholder confidence, which is in line with research from Iraq during the same period (Aljawaheri et al., 2021). Alongside this, they mention this misrepresentation might lead to long-term losses due to the manipulation of investor impressions. However, the elevated level of earnings leads to significant short-term benefits such as the ability to reach the desired level of dividend payments (Filipovic et al., 2022). The presence of a high-quality audit, governance quality (Taylor et al., 2023), and a larger board of directors (Hsu & Yang, 2022) seems to alleviate this relationship, thus increasing the quality of the financial figures.

On the contrary, alternative research presents significant results of income-decreasing EM, which contributes to a share of prior research on the global financial crisis in 2008 and the

Asian financial crisis of 1997 (Liu & Sun, 2022). Aspegren and Gillmert (2023), found similar results for Swedish listed firms, arguing firms take the big bath in order to push revenue in future accounting periods. Lastly, Uddin (2023) and Ali et al. (2021) found evidence of firms engaging in less EM during the COVID-19 period, which is in line with most of the results found for prior crises.

The differences in the results of the research mentioned above can be due to several factors. All datasets were based on listed firms and conflicting results arose from the same geographic region, meaning these cannot be the source of the unconformity.

However, periods show less similarity: some only contained data until the end of 2019 or 2020, while others also covered 2021. This might have a significant effect on the behaviour of enterprises since the economic outlook differed substantially among these years. When uncertainty about the duration of an economic recession arises, management has less incentive to use EM since it might not result in the predetermined benefits (Liu & Sun, 2022).

On the other hand, the contrasting views might be attributable to the different methods of measuring EM. Some turn to the measurement of discretionary accruals, while others look at real EM since research suggests this is under less scrutiny during periods of crisis and thus makes a better proxy (Lee & Lee, 2023). Xiao and Xi (2021) even found evidence of an increase in accrual-based EM, alongside a decline in real activity-based EM for Chinese firms during the same period, indicating the importance of measuring metrics.

Furthermore, the objectives and goals of management from the different companies have never been considered, since large datasets of listed companies were used. Hence, incorporating firm-specific objectives would be too cumbersome.

3. Hypothesis

This paper will investigate the relationship between EM and gender diversity in the boardroom during the COVID-19 crisis. After having constructed the literature review, the research question is divided into three hypotheses:

H1: "Increased gender diversity, as in the presence of women in the boardroom of non-listed companies, decreases EM."

H2: "EM is more present during the COVID-19 crisis and declines afterwards."

H3: "Women in the boardroom of non-listed companies have a moderating effect on EM during the COVID-19 crisis."

The reasoning behind these hypotheses can be naturally derived from the literature review. First of all, the majority of the literature states women have a moderating effect on EM within a company (Kyaw et al, 2015; Orazalin, 2020; Roy & Alfan, 2022). This entails their presence lowers the usage thanks to several factors such as their psychological characteristics such as risk adversity and ethical behaviour. Secondly, firms often turn to EM more in times of crisis in order to change their financial figures (Kjaerland et al., 2021). This can be a downward adjustment of the figures, for example when the management aims at taking a big bath (Saleh & Ahmed, 2005), or upward, for example when management wants to adhere to debt covenants (Kumar &Vij, 2017). However, we will neglect the direction and focus on the absolute use of earnings management. Lastly, the third hypothesis looks at how the relationship between EM and COVID-19 changes when gender diversity is introduced. As stated by the majority of the research that is known today, female presence might lead to a less pronounced reaction to changing macroeconomic conditions, meaning that also in times of crises, we expect less EM will be conducted.

This hypothesis contributes to the literature since the effect of gender diversity has not yet been researched in periods of economic downturn. Moreover, it will be tested on a dataset of non-listed companies based in Belgium. Since non-listed companies are under less scrutiny by auditors, need to comply with fewer reporting regulations, and have no quota laws to adhere to, it adds critical information about their behaviour. As stakeholders turn to financial figures in order to gain insight into the prospects of firms, a possible distorted view has to be taken into account.

4. Methodology

4.1. Dataset

The hypotheses are tested using a novel, Belgian-based dataset of private companies that integrates financial statement data with board composition ranging from 2010 to 2022. The financial data, supplemented by industry data and incorporation dates,is obtained from a proprietary private database provided by Companyweb, a company that specializes in retrieving financial statement information of Belgian legal entities based on filings from the National Bank of Belgium Information on both historical and current directors of the board was retrieved from Belfirst, specifically through Bureau van Dijk, which collect detailed information on Belgian companies. Since all limited liability corporations, regardless of their size, are obliged to report yearly financial statements at the National Bank of Belgium (NBB), this dataset holds a lot of potential value and information to be explored. However, not all limited liability companies have the same reporting requirements. Based on their headcount, annual turnover (excluding VAT) and balance sheet total, companies identify as large, small or micro-entities. Large companies have to report the full model, while small companies have to employ an abridged report and micro-entities have to use a micro model. This dataset of private companies is used to represent the Belgian market.

4.2. Data and sample breakdown

The proprietary dataset originates from two datasets from different timeframes containing data about financial statements and gender diversity. Observations are unique based on VAT and book year. Dataset 1 ranges from 2010 until 2021 and contains 1,286,809 observations. The second dataset encompasses data from 2017 until 2022, with a total amount of 957,505 observations. Before the data cleaning process, the two datasets are merged, leaving an amount of 2,244,314 observations.

As summarised in table 1, grouped under the category "*ineligible*", observations that are not representative are deleted from the dataset. To begin with, observations that stem from irrelevant industries are deleted. This is done based on their NACE code, which represents the activity performed by the company. First of all, observations from banks and insurance businesses are dropped because they have different requirements and regulations regarding financial reporting and are thus not representative of the research. Secondly, observations related to the economic activity of households for their personal benefit are deleted as well. Together, they accounted for 77,532 observations in the dataset. Besides the economic activity, the nature of the firm has to be considered. First, non-profit organisations are deleted since they do not have the same incentives for conducting EM compared to for-profit businesses. Also, observations from companies that are run by a legal entity are deleted, as they do not contain the required data for board members and their gender. This amounts to 18 observations.

Observations that lack an amount of total assets and numbers on the amount of board members are considered as missing and are deleted from the dataset, as they cannot be used in the regression. 2,066 lacked total assets, while 130,574 were short of gender data. Lastly, 430,651 duplicates are deleted due to an overlap in the two original datasets. This results in a final amount of 1,603,473 observations. After running the cross-sectional regression that calculates our EM proxy, which deletes observations that lack required data for the calculation, the sample size equals 919,384 observations. The regression created 24,273 missing values for discretionary accrual. Observations linked to these missing values are deleted, leaving a final sample size of 895,111 observations, which corresponds to 154,726 companies.

Table 1. Sample selection procedure.

Criteria	Drop	Data size	Firms
		2,244,314	
Ineligible	-77,550		
		2,166;764	216,013
Missing: Total assets	-2,066		
Missing: Gender	-130,574		
		2,034,124	210,047
Duplicates	-430,651		
		1,603,473	210,047
Delta calculation	-94,138		
		1,509,335	209,407
Cross-sectional regression	-589,951		
		919,384	157,679
Discretionary accruals	-24,273		
		895,111	**154,726**

Note: The initial dataset consists of private Belgian companies spanning from 2010 to 2022. Data is collected from Belfirst and Companyweb. 'Drop' indicates the number of deleted observations based on each criterion. 'Data size' refers to the number if observations in the sample. 'Firms' corresponds to the number of unique companies present in the dataset.

4.3. EM proxy

For the quantitative analysis of the dataset, abnormal discretionary accruals are measured as a proxy for EM through the Dechow & Dichev model (2002), which is extensively applied in the context of private companies (De Meyere et al., 2018; Selleslagh & Ceustermans, 2024). It focuses on the evolution of discretionary accruals (DA) which are subject to managerial subjection. They can be employed to reduce timing and mismatching problems in cash flows by making assumptions and estimations. For example, when a good has been delivered in one accounting period but not yet paid, an accrual is made to capture that income in the same accounting period. However, if the net receivables turn out to be lower than the estimate, an estimation error occurs. This creates meaningless noise since the closing entry encapsulates both the cash flow realisation and the correction of the realised estimation error (Dechow & Dichev, 2002). In this model, accrual quality decreases as the estimation errors increase.

The calculation for non-discretionary accruals is as follows:

$$\frac{WCA_{i,t}}{TotalAssets} = \alpha_0 + \alpha_1 \frac{CFO_{i,t-1}}{TotalAssets_{i,t}} + \alpha_2 \frac{CFO_{i,t}}{TotalAssets_{i,t}} + \alpha_3 \frac{CFO_{i,t+1}}{TotalAssets_{i,t}} + \varepsilon_{i,t}$$

where:

WCA = working capital accruals

CFO = cash flow from operations in year t, t-1 and t+1

A cross-sectional regression is performed, with industry classification based on the two-digit NACE code. Cash flow from operations from year t-1, t and t+1 are regressed against working capital accruals from firm i in year t, and all variables are scaled against total assets. The residuals are measured by $\varepsilon_{i,t}$, and its absolute value accounts for the EM proxy.

WCA is calculated as the change in current assets minus the change in cash and minus the change in total liabilities, plus the change in short-term debt. Cash flow from operations is computed as the difference between net income before extraordinary items (NIBE) and total accruals. Lastly, total accruals are calculated as the difference between WCA and amortization expenses (Dep).

$$WCA_{i,t} = \Delta CurrentAssets_{i,t} - \Delta Cash_{i,t} - \Delta CurrentLiabilities_{i,t} + \Delta Debt_{i,t}$$

$$CFO_{i,t} = NIBE_{i,t} - TotalAccruals_{i,t}$$

$$TotalAccruals_{i,t} = WCA_{i,t} - Dep_{i,t}$$

4.4. Gender diversity

Gender diversity is measured based on different proxies of which the significance will be calculated in the analysis. First of all, the proportion of women (PROP FEMALE) on the board will be employed. This will be calculated as the amount of women on the board divided by the total amount of board members. This straightforward proxy has the shortcoming that it is equal to one when the board consists of only women, portraying a homogenous board. To correct this mistake, two indexes which measure variety and diversity are used: the Blau index and the Shannon index (Abad et al., 2017).

The Blau index (Blau, 1977) is calculated as follows:

$$Blau\ index = 1 - \sum_{i=1}^{n} p_i^2$$

With p_i equal to the proportion of male and female directors and n the number of categories, which equals 2 when considering gender. The Blau index is zero when no female directors are present and 0.5 when the division is equal.

The Shannon index (Shannon, 1948) is calculated as follows:

$$Shannon\ index = -\sum_{i=1}^{n} p_i * \ln(p_i)$$

Similar to the Blau index, the Shannon index reaches its lowest value when the board is composed solely of male directors. However, the maximum value of equal distribution is 0.693. Since the logarithm of 0 does not exist, we determine that the Shannon index returns a value of zero when p_i equals zero (Campbell & Minguez-Vera, 2008). Both the Blau and Shannon indexes check for diversity, but the Shannon index is more sensitive to small changes in the board composition due to the usage of a log in the calculation (Martin-Ugedo & Minguez-Vera, 2014).

Both indexes are continuous variables that will measure gender diversity. However, these indices can project a higher percentage of female board members when the absolute amount of females stays the same. This occurs when the amount of total board members decreases due to a reduction in the number of male board members. To control for this event, a dummy variable will be introduced that measures the presence of women on the board (Susak et al., 2023). This variable will equal one when at least one female board member is present and zero when none can be found.

4.5. Control variables

Lastly, we add firm characteristics as control variables that might affect the level of EM (Arun et al, 2015). Previous research (Lee et al., 2006) suggests that firm profitability is positively correlated with EM. Thus, ROA will be incorporated as a proxy, calculated as net income divided by total assets. Besides profitability, growth potential is also included as a control variable since firms with high growth prospects tend to manage earnings downwards in order to obtain better figures in the future (AlNajjar & Riahi-Belkaoui, 2001). GROWTH is calculated as intangible assets divided by total assets (Van Caneghem & Van Campenhout, 2012). Research on the effect of financial leverage on EM shows mixed results. Some (Smith et al., 2001; Nalarrreason et al., 2019) state firms use more EM as leverage increases, while others found that there is a negative association (Jelinek, 2007). Therefore, leverage (LEV) will be added and calculated as total debts divided by total assets. Company size (CS) also has inconclusive results, some portraying income-decreasing EM due to increased scrutiny (Richardson, 2000), while others show larger firms tend to use income-increasing practices to fulfil market expectations (Nalarreason et al., 2019). As a proxy for company size, the natural logarithm of total assets will be incorporated into the calculation. Besides size, company age is taken into account, even though research shows this has no significant impact (Susanto & Agness, 2019).

In order to test the three proposed hypotheses, interaction terms and two dummy variables for the COVID period will be added. The dummy named COVID equals zero during the pre-COVID period, which is up to and including 2019, and one when the financial figures originate from during COVID, which is the year 2020. 2021 is considered as post-pandemic since Belgian BBP was positive and recovered during this year. A dummy variable will be introduced for the post-pandemic period, set to one when the fiscal year is 2021. The interaction

terms will measure how gender impacts EM during and after COVID-19, thus is computed as each gender proxy multiplied by the COVID dummy that is being studied.

The variables can be summarised in the following table:

Table 2. Regression variables.

Abbreviation	Variable	Definition
EM	EM	Residual based on the accruals model (Dechow & Dichev, 2002)
PROP_FEMALE	Proportion of female board members	Gender proxy calculated as the total number of female board members divided by the total number of board members.
GEN	Gender diversity	Dummy variable that equals 1 when at least 1 female board member is present
BI	Blau Index	Index indicating gender diversity, calculated using the formula presented in section 4.4.
SI	Shannon Index	Index indication gender diversity, calculated using the formula presented in section 4.4.
ROA	Firm profitability	Net income divided by total assets
GROWTH	Growth	Intangible assets divided by total assets
LEV	Financial leverage	Total debts divided by total assets
CS	Company size	Natural logarithm of total assets
AGE	Firm age	The number of years since the foundation of the company
INDUS	Industry	Variable based on the NACE code.
COVID	COVID year	Dummy variable that equals 1 when reports originate from 2020.
PCOVID	Post COVID crisis	Dummy variable that equals 1 when reports originate from 2021.
(P)COVID*PROP_FEMALE (P)COVID*GEN	Gender diversity during and after COVID	Interaction terms measuring the effect of gender diversity

(P)COVID*BI (P)COVID*SI	during and after the COVID period with: - COVID = dummy during covid - PCOVID = dummy after covid - PROP_FEMALE = proportion of female board members - GEN = dummy measuring gender diversity - BI = Blau Index - SI = Shannon Index

4.6. Model specification

First, a baseline model is ran encompassing all the control variables, for firm i at time t, against the EM proxy as the dependent variable:

$$EM_{i,t} = \alpha_0 + \beta_1 ROA_{i,t} + \beta_2 GROWTH_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CS_{i,t} + \beta_5 AGE_{i,t} + \beta_6 INDUS_i$$

Next, the association between gender diversity and EM will be measured through ordinary least squares (OLS) ran in STATA18 (Arun et al, 2015). The four different proxies for gender diversity are added to the baseline model and regressed separately to control for multicollinearity.

$$EM_{i,t} = \alpha_0 + \beta_1 ROA_{i,t} + \beta_2 GROWTH_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CS_{i,t} + \beta_5 AGE_{i,t} + \beta_6 INDUS_i + \beta_7 PROP\_FEMALE_{i,t} + \beta_8 GEN_{i,t} + \beta_9 BI_{i,t} + \beta_{10} SI_{i,t}$$

Thirdly, the association between EM and COVID is measured by adding the COVID dummies to the baseline model. COVID covers the dummy variable during the crisis, while PCOVID refers to the post-crisis period. Also, they are regressed separately to measure their individual effects.

$$EM_{i,t} = \alpha_0 + \beta_1 ROA_{i,t} + \beta_2 GROWTH_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CS_{i,t} + \beta_5 AGE_{i,t} + \beta_6 INDUS_i + \beta_7 (P)COVID_{i,t}$$

Lastly, the interaction terms for gender diversity and COVID are added and regressed separately to measure their association:

$$EM_{i,t} = \alpha_0 + \beta_1 ROA_{i,t} + \beta_2 GROWTH_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CS_{i,t} + \beta_5 AGE_{i,t} + \beta_6 INDUS_i + \beta_7 PROP\_FEMALE_{i,t} + \beta_8 GEN_{i,t} + \beta_9 BI_{i,t} + \beta_{10} SI_{i,t} + \beta_{11} (P)COVID * PROP\_FEMALE_{i,t} + \beta_{12} (P)COVID_{i,t} * GEN_{i,t} + \beta_{13} (P)COVID_{i,t} * BI_{i,t} + \beta_{14} (P$$

5. Results

5.1. Descriptive statistics

The summary statistics of the variables that will be included in the regression are displayed in Table 3 and discussed. All continuous variables have been winsorized at the 1st and 99th percentile to correct for outliers.

Table 3. Summary statistics.

	Mean	P10	P50	P90	Sd
EM	0.1291737	0.0144337	0.0775268	0.2876127	0.16698
DA	-0.0002394	-0.153504	-0.0127201	0.2004146	0.194997
ROA	0.0502865	-0.0843648	0.0449298	0.2310503	0.1919447
Growth	0.0131481	0	0	0.0038674	0.0595735
Leverage	0.6671927	0.128012	0.5879644	1.03334	0.6414669
Size (log)	12.52913	10.83267	12.56401	14.18137	1.318524
Age	14.20802	5	12	27	9.206968
Board size	1.316754	1	1	2	0.5853529
Female board members	0.3270332	0	0	1	0.5064964
Male board members	0.989708	0	1	2	0.584567
Female proportion	0.2273315	0	0	1	0.3686943
Blau Index	0.0794331	0	0	0.5	0.1811594
Shannon Index	0.1106175	0	0	0.6931472	0.2521113

Note: table 3 displays the summary statistics of all relevant variables that will be employed in the regression. EM is calculated as the absolute value of discretionary accruals (DA). DA is calculated through the Dechow & Dichev Model (2002), as explained in section 4.3. Return on assets (ROA) is computed as net income divided by total assets. Growth equals intangible assets divided by total assets. Leverage is calculated as total debts divided by total assets. Size is determined as the logarithm of total assets. Age is the number of years the company is in business. Board size equals the total amount of members on the board. Female board members equal the number of board members minus the amount of male board members. Female proportion is calculated as female board members divided by board members. Blau and Shannon index represent gender diversity and are calculated as represented in section 4.4.

When looking at the descriptive statistics, we can already identify the business environment and some relevant trends. The average value of EM is above zero, meaning that companies in the dataset tend to manage earnings. DA shows us that this is usually done in a downward direction, as the mean is negative. As the ROA of the average company in the dataset is positive, the net income is generally above zero, portraying that companies are profitable. However, growth opportunities are considered to be small. Leverage is estimated at roughly 0.66, meaning that companies in the dataset are solvent. Nevertheless, some have total debt exceeding total assets, as P90 is larger than 1. The size of the companies is stable with total

assets of 276,000 euros, which is a low but valid number since the dataset consists of mainly non-listed, small enterprises. Furthermore, the average age of companies is 14 years. As the median is below this average value, some much older companies push the mean upward. The board-specific parameters show that they are usually composed of only one member. Females are visibly less present compared to men, since the average is 0.33 and 0.98 for female and male respectively. The percentiles reveal the same trend, showing that females are not present in at least 50% of the observations, while male board members are.

Digging deeper into female presence reveals a more detailed picture of the distribution. First of all, in one-third of the cases, or 277,700 observations, there is at least one female board member present, meaning that two-thirds of the dataset consists of observations with a completely male-dominant board. Roughly 15% of the entire dataset, or 132,992 observations, consists of boards with solely women. Important to mention is that the average size of these boards is 1,06; while the average size of the boards in the dataset is 1,32. When females are present in the board, the average size increases to 1.64, indicating that women usually work together with a male board member. Moreover, the proportion of female board members rises to 74%, compared to 23% for all boards, if we assume female presence. This indicates that the boards with female presence usually are smaller compared to the boards in which men are present.

Besides the distribution of females across companies, an analysis is made of the distribution across the years present in the dataset. As can be seen in Table 4 below, there is an increasing trend of both female presence and the proportion of female board members. Moreover, the total amount of board members increases as well, so the increase in female presence cannot be attributable to male participants leaving the board. This trend seems to be consistent over the years and indicates that gender equality is rising.

Table 4. Female distribution over time.

Book year	Proportion of female	Female presence	Board size	EM
2012	0.1987	0.2693	1.2707	0.126461
2013	0.2194	0.2963	1.2826	0.1200552
2014	0.2220	0.3007	1.2898	0.1185363
2015	0.2239	0.3038	1.2980	0.116253
2016	0.2252	0.3059	1.3045	0.1155489
2017	0.2270	0.3085	1.3106	0.1154575
2018	0.2296	0.3129	1.3198	0.1200032
2019	0.2307	0.3163	1.3333	0.1255958
2020	0.2334	0.3211	1.3507	0.1749704
2021	0.2343	0.3285	1.3599	0.1548666

Note: this table represents the distribution of females in boards over the years in the final population. Female proportion is calculated as the number of female board members divided by the total amount of board members. 'Female presence' is a dummy variable that equals one when at least one female board member is present. The number represents in what proportion of firms the dummy equals one. 'Board size' indicates the mean of the total number of board members across the years. EM is calculated as the absolute value of discretionary accruals.

Furthermore, we want to analyse whether a difference in the usage of EM related to gender can already be distinguished when looking at summary statistics. First of all, a decline in the use of EM is visible in Table 4, together with an increase in female presence. When we look at the t-test of the female dummy (Table 5) a clear decline can be seen between boards with and without female presence. With a solely male board, EM is estimated at 0.132, while this is 0.124 for boards with female presence. As a lower number of EM indicates less EM and improved accrual quality, this might be the first indicator of a moderating effect of female presence. Moreover, the t-test turns out to be significant at the 1% level. When looking at boards that consist solely of women, EM seems to increase again with a value of 0.130, as can be observed in Table 6. Still, less EM is conducted compared to male-dominant boards. This observation is significant only at the 10% level, possibly attributable to the limited data from women-only boards. These statistics give a first indication that the predetermined hypotheses could be accepted, as female presence comes with less earning management.

Table 5. ttest female dummy.

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]	
0	617 411	0.1315073	0.00025152	0.1690866	0.1310856	0.1391291
1	277 700	0.1239852	0.0003076	0.1620782	0.1233824	0.124588
Combined	895 111	0.1291737	0.0001765	0.16698	0.1288277	0.1295196
Diff		**0.0075211**	0.0003814		0.0067745	0.0082698

Diff = mean(0) -mean(1) t = 19.7200
H0: diff = 0 Degrees of freedom = 895109

Ha : diff < 0	Ha : diff != 0	Ha: diff > 0
Pr(T < t) = **1.0000**	Pr(|T| > |t|) = **0.0000**	Pr(T > t) = **0.0000**

Note: ttest which shows that female presence diminishes the usage of EM. Female presence is measured though a dummy variable which equals one when there is at least one female.

Table 6. ttest only female dummy.

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]	
0	762 119	0.1290472	0.0001908	0.1665571	0.1286732	0.1294211
1	132 992	0.1298986	0.0004645	0.1693819	0.1289883	0.130809
Combined	895 111	0.1291737	0.0001765	0.16695	0.1288277	0.1295196
Diff		**-0.0008515**	0.0004962		-0.0018241	0.0001211

Diff = mean(0) -mean(1) t = -1.7159
H0: diff = 0 Degrees of freedom = 895109

Ha : diff < 0	Ha : diff != 0	Ha: diff > 0
Pr(T < t) = **0.0431**	Pr(|T| > |t|) = **0.0862**	Pr(T > t) = **0.9569**

Note: ttest which shows the increasing effect on EM when the board consist of solely women. The dummy variable equals one when the board consists of only female board members.

When discussing the presence of diversity in the dataset, it is equally important to consider how women are distributed across different formats of annual statements, which can be seen in Table 7. Since the dataset consists of privately owned companies, there are three possible formats based on their size: the full model, the abridged model and the micro model. Approximately 53.5% of the observations in the dataset report following the abridged model, 45.6% the micromodel and less than 1% of the cases use the rules for the full model. When looking at the female presence linked to these different formats, there are no big differences that can be distinguished: 30.9% of the observations reporting with the abridged procedure include female board members, 26.3% and 31.2% for the full model and micro model respectively. As mentioned earlier, female presence is associated with smaller boards. Since the smallest board usually report though the micro model, this distribution is in line with the prior

observed trend. Also, the proportion of females seems to be more or less equally distributed with 22.2% for the abridged model, 15.4% for the full model and 23.5% for the micromodel. Once again, these distributions are reasonable since companies reporting with the full model consist of the largest boards, thus female proportion is the lowest in these cases.

As we looked into the distribution of female presence across different formats, it is equally relevant how formats might influence EM, which can also be seen in Table 7. From these statistics, we can observe that the more regulation a company is subject to, the less EM is conducted. The lowest value, 0.097, is observed for companies reporting with the full model. For the abridged model and micro model, we identify an average of 0.117 and 0.144 respectively. When considering the data across different formats, we see no decreasing link between female board members and EM. However, these figures do indicate the moderating effect of appointing an auditor, as large firms are obligated to appoint an auditor in Belgium[6].

Table 5. Female distribution across reporting formats.

	Full	**Abridged**	**Micro**
Female presence	0.263	0.309	0.312
Proportion female	0.154	0.222	0.235
EM	0.0978957	0.1173472	0.143633

Note: table showing the distribution of female board members across the different formats of financial reporting (full model, abridged model and micro model). 'Female presence' is a dummy variable that equals one when at least one female board member is present. The number represents the proportion of firms where the dummy equals one for the different formats. The female proportion is calculated as the number of female board members divided by the total amount of board members. EM is calculated as the absolute value of discretionary accruals.

Also, the impact of COVID can be analysed through descriptives as a first point of reference. As can be seen in table 8 below, there is a significant difference, at the 1% level, between the usage of EM in the pre-COVID years and during the COVID period. If financial

[6] *Verplichte aanstelling van een commissaris*. (n.d.). https://www.ibr-ire.be/nl/ons-beroep/opdrachten/wettelijke-permanente-opdrachten/verplichte-aanstelling-van-een-commissaris

statements originate before 2019, the average usage of EM is 0.121, while this increases to 0.175 during 2020.

Table 6. ttest during COVID dummy.

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	763 762	0.1212977	0.0001746	0.1525477	0.1209556	0.1216398
1	131 349	0.1749704	0.0006306	0.2285595	0.1737343	0.1762064
Combined	895 111	0.1291737	0.0001765	0.16698	0.1288277	0.1295196
Diff		**-0.0536726**	0.0004955		-0.0546439	-0.0527014

Diff = mean(0) -mean(1) t = -1.2e+02
H0: diff = 0 Degrees of freedom = 895109

Ha : diff < 0	Ha : diff != 0	Ha: diff > 0
Pr(T < t) = **0.000**	Pr(|T| > |t|) = **0.0000**	Pr(T > t) = **1.000**

Note: ttest showing that the usage of EM increases during COVID. COVID is measured through a dummy variable that equals one when the financial reports originate from the book year 2020.

When considering solely the observations from book years 2020 and 2021, we can analyse how EM changes during the recovery from the crisis. As can be seen in table 9, there is a significant decrease in the usage of EM. The mean declines to 0.155, where it was 0.175 during 2020.

Table 7. ttest after covid dummy.

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
0	131 349	0.1749704	0.0006306	0.2285595	0.1737343	0.1762064
1	47 854	0.1548666	0.0008609	0.1883366	0.1531791	0.1565541
Combined	179 203	0.1696019	0.0005167	0.2187246	0.1685892	0.1706146
Diff		**0.0201038**	0.0011669		0.0178166	0.0223909

Diff = mean(0) -mean(1) t = 17.2281
H0: diff = 0 Degrees of freedom = 179201

Ha : diff < 0	Ha : diff != 0	Ha: diff > 0
Pr(T < t) = **1.000**	Pr(|T| > |t|) = **0.0000**	Pr(T > t) = **0.000**

Note: ttest which shows that the usage of EM decreases after covid. Covid is measured through a dummy variable that equals zero when the financial reports originate from the book year 2020 and one when the book year is 2021.

The same trend is visible when we look at the average amount of EM conducted over the book years in the dataset (Table 4). In the years up to 2017, a decreasing trend can be distinguished. As female presence rises through the years, this could be an indication of the

moderating effect that women might have on EM. After 2017, the average value increases, with a maximum reached in 2020, considered as the most significant year of crisis[7].

Lastly, we want to check the correlation between independent variables, which is shown in table 10. The highest correlation can be found between ROA and leverage, with a value of -0.36, which is unsurprising since they both have total assets in the denominator. Besides ROA and leverage, correlations are small thus we can conclude that no multicollinearity is present and will not cause problems for the regression.

Table 10. Pearson correlation table with all pairwise correlation coefficients.

	EM	ROA	Leverage	Size	Age	Growth
EM	1					
ROA	-0.1067***	1				
Leverage	0.3532***	-0.3594***	1			
Size	-0.3389***	0.1391***	-0.2731***	1		
Age	-0.0894***	-0.0636***	0.0540***	0.1657***	1	
Growth	-0.0134***	0.0232***	-0.0454***	0.0331***	0.1809***	1
Female Dummy	-0.0208***	0.0046***	-0.0072***	0.0343***	0.0293***	0.0377***
Proportion Female	-0.0119***	0.0099***	-0.0024*	-0.0059***	-0.0373***	0.0515***
Blau Index	-0.0279***	0.0071***	-0.0119***	0.0914***	-0.0010	-0.0080***
Shannon Index	-0.0279***	0.0073***	-0.0120***	0.0918***	-0.0008	-0.0080***

Note: EM is calculated as the absolute value of discretionary accruals (DA). DA is calculated through the Dechow & Dichev Model (2002), as explained in section 4.3. Return on assets (ROA) is computed as net income divided by total assets. Leverage is calculated as total debts divided by total assets. Size is determined as the logarithm of total assets. Age is the number of years the company is in business. Growth equals intangible assets divided by total assets. Female dummy is a dummy variable measuring female presence, equalling one when at least one female board member is present. Female proportion is calculated as female board members divided by board members. Blau and Shannon index represent gender diversity and are calculated as represented in section 4.4.
*** Correlation is significant at 0.01 level.
** Correlation is significant at 0.05 level.
* Correlation is significant at 0.10 level.

The gender proxies on the other hand, are highly correlated. As they aim at measuring the same given, this is expected. The Blau Index and Shannon Index are the least correlated

[7] *Overzicht Van De Belgische Economie - Conjunctuurnota Van Mei 2021*, 2021

with the proportion of females. This is due to the fact that both indexes aim at measuring diversity, while the proportion does not. The maximum value for the indexes represents equal diversity, whereas the proportion shows a completely undiversified board at maximum value. Furthermore, because the dataset contains less female presence than male presence, the female dummy correlates more with the Blau and Shannon Index compared to the proportion.

Table 11. Pearson correlation table of the gender proxies.

	Proportion female	**Blau Index**	**Shannon Index**	**Female dummy**
Proportion female	1			
Blau Index	0.3112***	1		
Shannon Index	0.3108***	0.9999***	1	
Female dummy	0.9194***	0.6538***	0.6542***	1

Note: Female dummy is a dummy variable measuring female presence, equalling one when at least one female board member is present. Female proportion is calculated as female board members divided by board members. Blau and Shannon index represent gender diversity and are calculated as represented in section 4.4.
*** Correlation is significant at 0.01 level.
** Correlation is significant at 0.05 level.
* Correlation is significant at 0.10 level.

5.2. Regression results

After winsorizing the outcome and control variables, the baseline model is run clustered across each unique value of VAT, thus for each unique company in the dataset. Table 12 shows the results of the baseline model in column (1). The output shows that all control variables that are included in the regression are significant, thus necessary to include to correctly portray the significance of the gender and COVID variables. *ROA* and *leverage*, which are a proxy for firm profitability and financial leverage respectively, have a positive impact on EM. In other words, higher profitability and increased leverage intensify the usage of EM based on this dataset. The other control variables *size*, *age* and *growth* represent a negative, significant association. Thus, the larger, older or higher growth opportunities are, the less EM will be conducted by companies in the dataset. The overall R^2 equals 30.02%, meaning that the baseline regression explains 30.02% of the distribution in EM through the distribution in the control variables. This value is relatively low, however not surprising since EM is a difficult component to estimate and has to be measured through a proxy. Moreover, it is in line with R^2 found in other research concerning EM and gender diversity (Kyaw et al., 2015; Alves, 2023)

In order to test the first hypothesis, which states that increased gender diversity has a moderating effect on EM, every gender proxy is regressed against EM together with all control variables. As each gender proxy aims at measuring gender diversity, they are regressed separately against EM in order to control for multicollinearity, as portrayed in Table 12. In line with the hypothesis, all proxies for gender diversity have a negative coefficient, portraying an inverse association. This entails that higher female presence reduces the usage of EM. However, not all proxies are as significant. Both the dummy variable (column 2) and the proportion of females (column 3) are significant at the 1% level. When looking at the change in R^2 compared to the baseline regression, the proportion of female board members is a better explainer for the variation in EM. R^2 does not change substantially when adding the gender proxies: it increases

to 30.04% for the dummy variable and 30.05% for the proportion of females. The Wald test however, does show that the regression improves significantly, at the 1% level, when including both proxies. The Blau and Shannon index, column (4) and (5) respectively, turn out to be insignificant when looking at the entire dataset. However, these indexes aim at measuring diversity within a board. Since the largest part of the observations in the dataset are companies that consist of only one board member, measuring diversity becomes impossible. In these cases, both indexes equal to zero, which misrepresents the data since diversity cannot be achieved. To measure the impact of diversity, we restricted our regression analysis to observations with two or more board members, as shown in columns (6) and (7) of Table 12. Both diversity indices are statistically significant at the 1% level, indicating that earnings management decreases as board diversity increases. Although this reduces our sample to 239,833 observations from 46,405 companies, focusing on multi-director firms provides a more robust test of board diversity effects.

The second hypothesis, namely that the COVID crisis increases EM and decreases afterwards, is tested based on adding two COVID dummies. The 'during Covid dummy' equals one when financial figures originate from 2020, while the 'after Covid dummy' corresponds to one when the book year is equal to 2021. The impact of the COVID pandemic alone can be found in column (2) of Table 13, which show a positive significant association at the 1% level during 2020, meaning that the second hypothesis can be accepted. A clear increase in the usage of EM can be witnessed. However, comparable with the gender proxies, R^2 increased with a very small amount of 0.11% but the Wald test shows a significant contribution with a value of 895. Table 14 displays the effect after the COVID pandemic and shows that the amount of EM decreases significantly in 2021 (column 2). R^2 does not change, but the Wald test shows a significant contribution as well.

However, interacting the gender proxies with the COVID dummies reveals interesting results. Table 13 shows the output of the interaction terms during COVID. Firstly, female presence (column 3) turns out to have no significant impact on EM during COVID. The proportion of females (column 4), on the other hand, shows a significant increase at the 1% level in EM, which is the exact opposite of the expected effect. However, both the Blau and Shannon indexes (respectively column 5 and 6) show adverse results, meaning that increased diversity decreases the amount of EM. Even though the t-test in the regression is significant, the Wald-test shows that both indexes do not contribute significantly to the regression, so output should be considered carefully. The value of the VIF's show no multicollinearity is present, so this cannot be the reason behind the difference in the two tests. However, it could be due to the size of the sample being too small reducing statistical power, or due to model specification issues. To conclude, these results indicate that solely female presence or higher proportions of female board members are insufficient during crisis situations. However, a mixed board is optimal at mitigating EM during a crisis.

When considering the post-COVID period by itself, other trends are revealed, as displayed in Table 14. First off, both female presence (column 3) and proportion (column 4) significantly decrease the usage of EM when the economy recovers, returning to the original observation. However, the Blau and Shannon indexes (respectively column 5 and 6) portray that increased diversity strengthens the usage of EM. Once again, the same remarks can be made regarding the insignificance of the Wald test. When restricting the analysis to multi-director boards, no significant relationships are observed during or after the COVID crisis. These results are therefore omitted from the tables.

Table 12. Regression results of the gender proxies.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Female dummy	Proportion female	Blau index	Shannon index	Blau index	Shannon index
Female dummy		-0.0051487***					
Proportion female			-0.0080761***				
Blau Index				-0.0016982		-0.009338***	
Shannon Index					-0.0011591		-0.0066001***
ROA	0.019088***	0.0190283***	0.019033***	0.0190807***	0.019081***	0.0282118***	0.028208***
Leverage	0.0774746***	0.0774974***	0.0774566***	0.0774847***	0.0774842***	0.0757689***	0.0757722***
Size	-0.0339929***	-0.0339272***	-0.0340188***	-0.033968***	-0.0339691***	-0.0315298***	-0.0315283***
Age	-0.0067645***	-0.0068874***	-0.0068986***	-0.0067766***	-0.006776***	-0.0046657***	-0.0046654***
Growth	-0.0758627***	-0.0755477***	-0.0752904***	-0.0758818***	-0.0758806***	-0.0347213***	-0.0347064***
Industry	Included	Included	Included	Included	Included	Included	Included
Year	Included	Included	Included	Included	Included	Included	Included
Number of obs. (firms)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)	239 833 (46 405)	239 833 (46 405)
R^2	0.3002	0.3004	0.3005	0.3002	0.3002	0.2815	0.2815
F-value	740.29***	734.35***	734.61***	733.47***	733.46***	190.69***	190.67***
Wald test		120.65***	180.38***	2.22	2.00	31.01***	29.98***

Note: EM (EM) is calculated as the absolute value of discretionary accruals (DA). DA is calculated through the Dechow & Dichev Model (2002), as explained in section 4.3. 'Female dummy' is a dummy variable measuring female presence, equalling one when at least one female board member is present. Female proportion is calculated as female board members divided by board members. Blau and Shannon index represent gender diversity and are calculated as represented in section 4.4. Return on assets (ROA) is computed as net income divided by total assets. Leverage is calculated as total debts divided by total assets. Size is determined as the logarithm of total assets. Age is the number of years the company is in business. Growth equals intangible assets divided by total assets.

*** Correlation is significant at the 0.01 level.

** Correlation is significant at the 0.05 level.

* Correlation is significant at the 0.10 level.

Table 13. Regression results during Covid.

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	During Covid dummy	Female dummy	Proportion female	Blau index	Shannon index
During Covid dummy		0.019707***	0.0196359***	0.0193122***	0.0202479***	0.0202445***
Female dummy			-0.0049609***			
Proportion female				-0.0081291***		
Blau Index					-0.0003005	
Shannon Index						-0.0001566
CD x FD			0.0010983			
CD x PF				0.0033125***		
CD x BI					-0.0063399***	
CD x SI						-00045255***
ROA	0.0195657***	0.0195956***	0.0195545***	0.0195568***	0.0195908***	0.019591***
Leverage	0.0775234***	0.0774453***	0.0774662***	0.0774286***	0.0774535***	0.077453***
Size	-0.0338286***	-0.0338992***	-0.0338348***	-0.0339194***	-0.0338813***	-0.0338825***
Age	-0.0063765***	-0.0063966***	-0.0065005***	-0.0065088***	-0.0064051***	-0.0064045***
Growth	-0.0811044***	-0.0778708***	-0.0776159***	-0.07736***	-0.07788***	-0.0778788***
Industry	Included	Included	Included	Included	Included	Included
Number of obs (firms)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)
R^2	0.2985	0.2996	0.2997	0.2998	0.2996	0.2996
F-value	726.53***	794.63***	779.84***	780.37***	779.00***	779.00***
Wald test		895.00***		165.56***	0.06	0.03

Note: EM (EM) is calculated as the absolute value of discretionary accruals (DA). DA is calculated through the Dechow & Dichev Model (2002), as explained in section 4.3. 'During Covid dummy' equals one when financial statements originate from 2020. 'Female dummy' (FD) is a dummy variable measuring female presence, equalling one when at least one female board member is present. Female proportion (FP) is calculated as female board members divided by board members. Blau (BI) and Shannon index (SI) represent gender diversity and are calculated as represented in section 4.4. Interaction terms of the covid dummy and each gender proxy are taken. Return on assets (ROA) is computed as net income divided by total assets. Leverage is calculated as total debts divided by total assets. Size is determined as the logarithm of total assets. Age is the number of years the company is in business. Growth equals intangible assets divided by total assets.
*** Correlation is significant at the 0.01 level.
** Correlation is significant at the 0.05 level.
* Correlation is significant at the 0.10 level.

Table 14. Regression results after Covid.

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	After Covid dummy	Female dummy	Proportion female	Blau index	Shannon index
After Covid dummy		-0.0039106***	-0.0025249**	-0.0009287	-0.0054557***	-0.0054617***
Female dummy			-0.0040944***			
Proportion female				-0.006305***		
Blau Index					-0.0018957	
Shannon Index						-0.0012995
CD x FD			-0.0035212*			
CD x PF				-0.0114403***		
CD x BI					0.0173151***	
CD x SI						0.012467***
ROA	0.0195657***	0.0196869***	0.0196432***	0.0196519***	0.0196957***	0.0196961***
Leverage	0.0775234***	0.0775233***	0.0775433***	0.0775095***	0.0775287***	0.0775281***
Size	-0.0338286***	-0.0338152***	-0.0337574***	-0.0338343***	-0.0338027***	-0.033804***
Age	-0.0063765***	-0.0063336***	-0.0064286***	-0.0064389***	-0.0063421***	-0.0063414***
Growth	-0.0811044***	-0.081217***	-0.0810713***	-0.0809358***	-0.0812389***	-0.0812373***
Industry	Included	Included	Included	Included	Included	Included
Number of obs (firms)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)	895 078 (154 720)
R^2	0.2985	0.2985	0.2986	0.2988	0.2985	0.2985
F-value	726.53***	727.30***	713.36***	713.71***	713.13***	713.13***
Wald test		16.14***		107.13***	2.69	2.44

Note: EM (EM) is calculated as the absolute value of discretionary accruals (DA). DA is calculated through the Dechow & Dichev Model (2002), as explained in section 4.3. 'After Covid dummy' equals one when financial statements originate from 2021. 'Female dummy' (FD) is a dummy variable measuring female presence, equalling one when at least one female board member is present. Female proportion (FP) is calculated as female board members divided by board members. Blau (BI) and Shannon index (SI) represent gender diversity and are calculated as represented in section 4.4. Interaction terms of the covid dummy and each gender proxy are taken. Return on assets (ROA) is computed as net income divided by total assets. Leverage is calculated as total debts divided by total assets. Size is determined as the logarithm of total assets. Age is the number of years the company is in business. Growth equals intangible assets divided by total assets.

∗∗∗ Correlation is significant at the 0.01 level.

∗∗ Correlation is significant at the 0.05 level.

∗ Correlation is significant at the 0.10 level

6. *Discussion and Conclusion*

This study researched the effect of gender diversity on EM before and during the COVID-19 period. Past research has shown that women can mitigate EM in listed companies, mainly due to characteristics such as risk adversity (Kyaw et al., 2015) and adhering more to ethical considerations compared to men (Terjesen et al., 2016). Moreover, the European Council adopted the directive on gender balance on corporate boards[8], forcing listed companies of having boards on which members of the underrepresented sex hold at least 40 % of non-executive director positions or, alternatively, hold at least 33 % of all director positions, by 30 June 2026. Hence, it is important to consider the impact women have on business related aspects, such as EM. This study contributes to the literature by researching non-listed companies, with smaller boards and less stringent regulation. Moreover, it tries to capture the effect during and after the COVID-19 crisis.

The effect is measured on a Belgian dataset of private owned companies from 2010 until 2021. Based on the literature review, three hypotheses are tested. The first hypothesis aims to disclose the effect of gender diversity on EM and states that female presence decreases the usage of EM. Subsequently, the effect of COVID is demonstrated through the second hypothesis, stating that EM increases during the COVID period. Lastly, the third hypothesis addresses the joint effect, namely whether female presence can moderate the increased use of EM during the COVID-19 period. Discretionary accruals are calculated as a proxy for EM by use of the Dechow and Dichev model (2002) and OLS is employed to determine the relationships.

[8] Directive (EU) 2022/2381 of the European Parliament and of the Council of 23 November 2022 on improving the gender balance among directors of listed companies and related measures (http://data.europa.eu/eli/dir/2022/2381/oj).

The results show that female presence, as well as higher proportions of female board members decreases EM, which is in line with existing research (Kyaw et al., 2015; Orazalin, 2020; Roy & Alfan, 2022). The two proxies for gender diversity, the Blau and Shannon index, do not portray significant results. This can be attributed to the distribution of the number of board members in the dataset, which is usually limited to one or two board members. However, when we only consider the boards that consist of two or more board members, both indexes are significant. During the COVID-crisis, EM increases significantly, which is in line with the major part of current research (Lassoued & Khanchel, 2021; Aljawaheri et al., 2021; Filipovic et al., 2022; Taylor et al., 2023). Female presence does not mitigate this effect. However, when the proportion of female board members increases, EM does as well, which is the opposite of the expected effect. Increased diversity on the other hand, measured through the Blau and Shannon index, is able to moderate this relationship, indicating that highly diversified boards are better at mitigating EM in crisis situations. In the period after the COVID-crisis, EM decreases again, which is the adverse effect of what was witnessed after the financial crisis of 2008 (Turegun, 2020). Both the female dummy and the proportion of female board members have a significantly negative association, meaning that the initial effect is restored when the crisis resolves. However, both diversity indexes show a positive correlation, indicating an increase in EM in the post-pandemic period when the board is more diversified. To conclude, we can observe some mitigating impact of female presence on EM, revealing the importance of both mere female presence and gender diversity in different circumstances. However, the result are somewhat inconsistent during COVID-19. The reason behind this inconsistency offers new field of research to be discovered.

As limitations are inherent to scientific research, this thesis also has its shortcomings. First and foremost, the results are limited to the Belgian setting, and thus cannot be generalised over different countries. The impact of cultural differences (Pavlovic et al., 2018) and religion (Du

et al., 2015) on financial reporting could play a substantial role in difference across countries, hence should not be neglected. Secondly, the employed dataset consists of small and medium enterprises, thus leaving the initial question unanswered for large and listed companies, which could be an interesting analysis for future research. Moreover, due to the small boards is the calculation of the Blau and Shannon index since diversity can be measured better on larger numbers. Thirdly, the model used for calculating discretionary accruals can influence the obtained values. Other commonly used models, such as the Modified Jones Model (Dechow et al., 1995) should be considered for the same analysis. Also, certain control variables, such as audit quality (Ming Chia et al., 2007), were not taken into account since there is no access to this information in the employed dataset.

7. References

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