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Women on the board and firm performance: an analysis of the Portuguese case

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WOMEN ON THE BOARD AND FIRM PERFORMANCE: AN ANALYSIS OF THE PORTUGUESE CASE

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Resumo

A presente dissertação tem como principal objetivo dar resposta à seguinte questão: A presença de mulheres no conselho de administração impacta o desempenho das empresas? Adicionalmente, foi também avaliado se empresas com mulheres nos cargos de diretor geral ou de presidente do CA têm um melhor desempenho.

Os resultados gerais deste estudo revelam uma relação negativa entre a presença de mulheres no conselho de administração (CA) e o desempenho das empresas, sendo este medido através dos indicadores Retorno sobre o Ativo (ROA) e Retorno sobre o Capital Próprio (RCP). Esta associação negativa foi confirmada num modelo ajustado com variáveis de controlo adicionais. Apesar dos resultados encontrados, a relação evidenciou-se como sendo não-linear para diferentes níveis de desempenho. Uma maior percentagem de mulheres no CA exerce um impacto negativo e significativo no desempenho de empresas mais rentáveis e um impacto positivo e significativo em empresas menos rentáveis. Este é sem dúvida o maior contributo do presente estudo. Relativamente ao género do diretor geral da empresa, os resultados indicam um impacto positivo das mulheres na liderança no *RCP*; o género do presidente do CA não revelou ter qualquer impacto no desempenho das empresas. Ainda relativamente ao género do diretor geral, a relação é também não linear, sendo positiva em empresas menos rentáveis nas quais é uma mulher a assumir o cargo de diretor geral. Estes últimos resultados sugerem que as mulheres tendem a ver uma oportunidade de obterem o reconhecimento e reputação ambicionados em situações de risco que num contexto de maior rentabilidade não seriam tão facilmente atingidos.

Palavras-Chave: mulheres; conselho de administração; desempenho da empresa; diversidade; empresas não cotadas; Portugal**.**

Abstract

This dissertation aimed to answer the question: Does the presence of women on the board of directors impact firm performance? Additionally, it was evaluated whether there was an impact on performance when women occupy the CEO or Chairperson positions

The general results show a negative relationship between the presence of women on the board and firm performance, measured by Return on Assets (*ROA*) and Return on Equity (*ROE*), which were confirmed in an adjusted model with additional control variables. However, the relationship is not linear in the level of performance. A higher presence of women on the boards exerts a significant negative impact on performance in high-performing firms and a significant positive impact on low-performing firms. This is indeed a major contribution of the current study. Regarding the CEO gender, it was found that women-led companies have greater ROE; the gender of the Chairperson did not reveal any significant impact on firm performance. Also, in the case of CEO gender, the relationship is not linear in the level of performance, being positive in low-performing companies when the CEO is a woman. These last results suggest that women see an opportunity under risky situations to get the desired recognition and reputation that under ordinary circumstances may not be so easily perceived.

Keywords: women; board of directors; firm performance; diversity; non-listed companies; Portugal.

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1. Introduction

There is a worldwide concern about promoting gender equality (Belingheri et al., 2021). Unfortunately, the progress towards this goal is being made at a slow pace. According to the World Economic Forum (2022), considering the evolution over the last decades, it is anticipated that gender parity will only be achieved globally in approximately 132 years. In the business environment, the sluggish progress alerts organizations of a huge need to change. Data from the European Institute for Gender Equality (2022) shows that the percentage of women in the boardroom of the biggest European publicly traded firms increased from 13.8% to 32.3% in the last decade. Additionally, under the same period, the proportion of female Chief Executive Officers (CEOs) raised only by 5.4%.

Portugal occupies the 15th position in the ranking of the Gender Equality Index among the European Union (EU) countries, scoring 62.2% (European Institute for Gender Equality, 2021). Nevertheless, the presence of female managers on the board (30%), at the executive level (14%), and on committees (27%) is significantly lower than the average in the EU (European Women on Boards, 2021).

Some laws have been enacted in several countries to mitigate remaining discrepancies and ensure that women are more represented on corporate boards (Green & Homroy, 2018). In Portugal, Law 62/2017 started to be applied to the public sector and listed companies in 2018, establishing that boards must be represented by at least 33.3% of women. These laws are based on the premise that gender diversity will benefit the business and are perceived as ethical (Hedija & Němec, 2021). However, the economic implications can be adverse if this is only driven by legal and other external pressures (Green & Homroy, 2018).

With the growing concern about gender equality and diversity, particularly in the business context, researchers began to raise questions related to the impact of gender diversity on companies' performance. Therefore, several studies have been carried out and have aimed to provide an answer to this issue with a special focus on listed companies, like the research done by Reguera-Alvarado et al. (2017) and Marinova et al. (2016) that focused on this type of company due to the easier access to public information. Furthermore, the implementation of gender quotas also motivates research about this topic since these laws promote a greater presence of women on the board of directors (BoD).

It is important to note that empirical research about this topic is quite heterogeneous, showing no pattern in its results and conclusions. To add meaningful insights to the investigation done in this area, this dissertation intends to provide new empirical evidence and help clarify the relationship between the presence of women on the BoD and firm performance. Thus, this study applied the suitable methodology for the Portuguese case of non-listed companies, contributing to a better understanding of this relationship in an environment poorly investigated. Additionally, it is noteworthy that these firms have different motivations and fewer legal impositions regarding board diversity, given the fact that the law of gender quotas is not mandatory for non-listed companies. Due to limited public information about the board composition of those companies, a survey was developed and sent to the firms in the dataset. Therefore, it was possible to check the robustness of the results.

In sum, this study aims to answer the following research question: Does the presence of women on the board of directors impact firm performance? From the general issue, it was evaluated whether there was an impact on performance when women occupy the CEO or Chairperson positions. The Two-Stage Least Square (2SLS) regression was the statistical technique applied, which allowed to overcome endogeneity problems.

The results of this dissertation indicate that the presence of women in the boardroom, measured as the percentage of the total board members, negatively affects Return on Assets (*ROA*) and Return on Equity (*ROE*). The robustness of this negative impact was corroborated in the adjusted model that comprised the additional control variables gathered from the survey. However, this study proves that this relationship is not linear, being different for low-performing and high-performing firms. More specifically, in low-performing firms, it was found a positive impact of women on *ROE,* while the negative effect on *ROA* and *ROE* was only detected in high-performing firms. Regarding the CEO's gender, a similar conclusion was reached. Among low-performing firms, organizations led by women tend to perform better, when evaluating their *ROA* and *ROE*. Finally, in terms of the Chairperson's gender, no significant association with firm performance was revealed.

The following chapters unfold as follows. After the introductory chapter, the literature review is presented in Chapter 2. In this, the relevance of the boardroom is

highlighted, and two important concepts are explored: board diversity and firm performance. In the end, the main findings of previous research are revealed, as well as the theories that underlay its results. Next, Chapter 3 contains the methodology applied to answer the research question. Thus, it discloses the data source and the data sample, and a list of the variables used in the model. The process of data collection is discussed in Chapter 4, and the descriptive statistics of the variables are interpreted. After that, in Chapter 5, the results of the 2SLS model are revealed, as well as the findings provided by the robustness tests conducted, followed by a critical interpretation. Finally, Chapter 6 covers the conclusion and suggests some subjects to be discussed in further research.

2. Literature review

This section aims to explore the extant literature related to the research topic. First, the main concepts are defined, and the theoretical frameworks most referenced by researchers are presented, ending with some empirical studies conducted in recent years.

2.1. Diversity on corporate boards

Role of corporate boards

Responsible for conducting and approving the company's decisions (Terjesen et al., 2016), the BoD assumes a central position, supervising management and guiding its activity (Srivastava et al., 2015).

According to Deloitte (2020, p. 2), "Boards have a critical role to play in directing and overseeing the organisations that they serve and, while maintaining appropriate separation from Management, should support executive leadership and share the burden.". As stated in the study of Banerjee et al. (2020), corporate boards are in charge of making decisions with great responsibility, being perceived as having a meaningful impact on the company's performance and reputation. Also, the changes in the environment in which firms operate are increasingly emphasizing the importance of corporate boards (Kolev et al., 2019). Notably, stakeholders are progressively seeking more transparency, diversity, and sustainability, which directly influences the role of corporate boards (Banerjee et al., 2020).

Due to their responsibility, corporate boards must understand the external environment in which firms operate, their goals and the corresponding business strategy (Ali et al., 2018). Consequently, the BoD plays a vital role in corporate governance.

Board diversity

The board composition can be diverse from company to company. It encompasses several characteristics, such as size, the proportion of non-executive members, directors' independence, ownership percentage, financial and accounting knowledge, number of annual meetings, and whether the CEO might be or not be the Chairperson.

Additionally, the emergence of different perspectives, background experiences, and knowledge that arose from unique individuals with distinct characteristics may lead to

"more innovation, more outside box thinking and better governance" (Viswanathan, 2020, p. 55). From the different sources of diversity, it is possible to highlight some demographic features, such as age, education level, nationality, and gender.

The research of Oliveira and Zhang (2022) found some interesting trends regarding age and gender diversity. In the period from 2000 to 2020, gender diversity increased but age diversity decreased. Additionally, the authors concluded that firms that are running their business for a longer time, tend to be more gender diverse. Despite that, age diversity is not so latent in older firms. Furthermore, gender diversity is more often perceived in larger firms with more independent directors.

Albeit there are several possibilities to interpret the diversity on boards, the present study considers the presence of women on corporate boards. Besides the advantages and incentives that firms increasingly receive to promote gender diversity, some challenges slow down the progress towards gender parity, particularly among the top management. Sometimes women have the right qualifications and knowledge to grow vertically in the firm, but they end up being stopped by discriminatory barriers (Babic & Hansez, 2021). This phenomenon is called the "glass ceiling effect" (Cotter et al., 2001). Additionally, during periods of economic crisis or poor performance, women are more often promoted than men. These situations describe the glass cliff hypothesis (Bruckmüller & Branscombe, 2010). Saridakis et al. (2022) found that in Portugal, this hypothesis is corroborated, especially in larger firms, because they are more affected by unfavourable financial conditions. One question that may arise is related to the reasons that lead women to accept this kind of promotion, knowing the risks and challenges they will face. The study of Glass and Cook (2016, p. 61) has empirical evidence that women "seek out higher risk positions in order to prove their mettle as leaders". According to the same authors, this initial risk can lead to more reputation, and women may be seen as "turnaround specialists". In a certain way, this propensity of women to accept these promotions seems to be justified by gender bias and the low representativeness of the female gender on the BoD.

2.2. Firm performance

According to Golubeva (2021, p. 1013), firm performance "appears to be a multidimensional concept, meaning that it is composed of different theoretical and

empirical components that may (or may not) be related to one another". So, it is possible to measure it using different indicators that vary in nature. The research of Siepel and Dejardin (2020) highlights that companies tend to widely assess their performance by using the following measures: employment, turnover, profitability, productivity, research and development (R&D), and firm survival.

According to Sigo (2020), it is possible to split the measures of performance into two main categories: financial performance and strategic performance. One possible way to measure financial performance is through the calculation of accounting-based indicators, like Return on Assets (*ROA*) and Return on Equity (*ROE*), whose availability and comparability are the main advantages (Barauskaite & Streimikiene, 2021). Complementarily, market-based tools allow better prediction of prospects about company performance and stand out for their contemporaneity (Barauskaite & Streimikiene, 2021). On the other hand, strategic performance encompasses dimensions such as customer satisfaction, employee satisfaction, and environmental performance (Sigo, 2020).

This dissertation analyses the impact on firm performance of women's presence on boards assessed through the application of financial indicators. The choice of appropriate indicators will be explored in the next chapter.

2.3. Women on corporate boards and firm performance

While some authors found a positive, e.g., Kılıç and Kuzey (2016) or negative relationship, e.g., Tran et al. (2021) between the presence of women on boards and firm performance, others do not identify a statistically significant association between those variables, e.g., Marinova et al. (2016), which contributes to the ambiguity of the available knowledge on the research topic. As mentioned above, this is a reason that justifies the current research.

In this section, the main results of previous research are revealed, as well as the theoretical views related to them.

2.3.1. Studies showing a positive association between women on the board of directors and firm performance

The study conducted by Green and Homroy (2018), based on a sample of large European firms found a meaningful positive economic impact on *ROA* and Market-to-Book value in companies that have more women on key committees. Similarly, Reguera-Alvarado et al. (2017) detected improved economic performance in 125 Spanish non-financial firms originated by gender diversity. Terjesen et al. (2016, p. 478) analysed a sample of listed companies located in 47 countries distributed worldwide concluding that "firms with female directors have better financial performance", measured using Tobin's Q and *ROA*.

A study by Brahma et al. (2020) found that when boards have at least three women, the positive outcome on performance is unambiguous. This finding is in line with the critical mass theory, first introduced by Kanter (1977). The fundamentals of this theory are based on the idea that a significant impact on performance derived from gender diversity can only be perceived when boards are represented by a certain proportion of women. When women constitute a minority, they are commonly treated as female symbols, "tokens" and not valued on merit (Kanter, 1977). Additionally, in boards with only a woman, the dominant group may display intolerant behaviour or condescending attitudes toward her. She may not feel comfortable building up a strong position and going against the ideas of male directors in situations of disagreement (Yarram & Adapa, 2021).

Kılıç and Kuzey (2016), based on a sample of listed companies in Turkey, corroborated the hypothesis of a positive relationship between the presence of women directors and *ROA*, *ROE* and *ROS* (Return on Sales). The results of this empirical study are supported by the agency theory and resource dependence theory. On the one hand, board diversity can be perceived as a valuable source of cost reduction regarding agency issues and help firms mitigate conflicts with shareholders (Reguera-Alvarado et al., 2017). This occurs because women get more involved in the decision-making process, adopt a stricter oversight as CEO and tend to be more aligned with the pursuit of shareholders' interests than men (Adams & Ferreira, 2009). From the resource dependence theory point of view, diversity brings powerful insights to companies, not only through a broader range of knowledge but also by making them more agile to create strong relationships with other

stakeholders (Reguera-Alvarado et al., 2017). Companies promoting women's presence and embracing diversity on their boards may enhance their reputation and be seen as more attractive to the market (Navarro-García et al., 2020). Furthermore, the decision-making process may also be positively impacted by considering the different perspectives brought by women that can ultimately drive the firm performance to better results (Hedija & Němec, 2021).

Moreno-Gómez et al. (2018) investigated the impact of gender diversity on boards, and in the top management team, including the CEO position. Considering a sample of Colombian firms, they concluded that there is a positive association between these independent variables and accounting-based indicators, namely, *ROA* and *ROE*. The theory that supports this study is the upper echelon theory. According to this theory, the companies' performance reflects the values and features of the upper management (Hambrick, 2007). Personal experiences and behaviours drive executives to make different decisions with dissimilar impacts on performance (Hambrick, 2007). Moreover, once female and male directors differ in terms of characteristics, the idea that board diversity can produce effects on firm performance is supported by this theory (Hedija & Němec, 2021). Moreno-Gómez et al. (2018) argue that when women run the company as CEO, their leadership is more long-term oriented, and focused on enhanced cooperation between all firm levels which benefits firm performance.

2.3.2. Studies showing no relationship between women on the board of directors and firm performance

The research performed by Marinova et al. (2016), based on 186 listed firms from the Netherlands and Denmark, found no relation between board diversity and Tobin's Q. Likewise, the findings of a study conducted by Hedija and Němec (2021), using data from some Czech travel agencies and tour operators, showed no significant effect on *ROA* and *ROS* originated from the gender composition of the board. The authors point out that the masculine culture that characterizes the Czech Republic may lead women directors to have a male style of management, not allowing companies to fully benefit from gender diversity.

Although the study of Gordini and Rancati (2017) shows a positive effect, this only occurs when the presence of women is measured as a percentage of the total number of

board members or using the Blau and Shannon Indexes as performance measures. When considering only the boards with more than one woman, the results indicate no significant impact. The authors suggest that, given the high number of family firms in Italy, many companies may appoint a woman to the board because she belongs to the family or only to comply with the laws of gender quotas.

2.3.3. Studies showing a negative relationship between women on the board of directors and firm performance

By analysing Western European financial institutions, Tran et al. (2021) confirmed the negative relationship between *ROA* and the proportion of women on the board, measured as the percentage of female directors on corporate boards, and they also found a negative link between chairwomen and Tobin's Q. The authors argue that firms with a chairwoman are perceived by investors as having limited future growth potential, which harms their performance. Also, women tend to take fewer risks than men, which can lead them not to take advantage of good investment opportunities and compromise performance. The authors detected this negative effect in an industry male-dominated.

The investigation of Saidat et al. (2019) found a negative impact originated by female directors in the case of *ROA* and Tobin's Q of non-family Jordanian firms. The authors highlight the cultural restrictions that women face in that country. In this context, women are not encouraged to aspire to reach top management positions, a fact that justifies their low representativeness on the boards.

For the Indian context, the study developed by Jadiyappa et al. (2019) shows that when the CEO is a woman, she negatively impacts *ROA* and *ROE*. The authors suggest that this negative impact is related to the low social standing of Indian women.

The research done by Tahir et al. (2021) reached the same conclusion when analysing the impact of women directors on the *ROA* of Pakistan firms. The authors mentioned the vase theory of feminism and the liberal and social feminism theories to explain this negative impact. The vase theory of feminism defends that female directors are often viewed as "useless vases" in the sense that they may feel inhibited from actively getting involved in governance issues and may be perceived as having insufficient knowledge or professional background (Zhang et al., 2016). The same authors pointed out

that female executives harm firm performance because they tend to spend more time in domestic activities, reducing their capacity and energy to perform their work in business or due to a lack of crucial skills.

In sum, these results indicate that the negative impact of women tends to arise in very specific geographic contexts, particularly in developing countries and in industries characterized by being male-dominated, such as the financial sector.

2.3.4. Moderators of the relationship between women on the board of directors and firm performance

Some authors have included moderating variables in their studies, also known as interactive terms. They aimed to understand if these moderators affect the link between the presence of women on the board and the performance of companies.

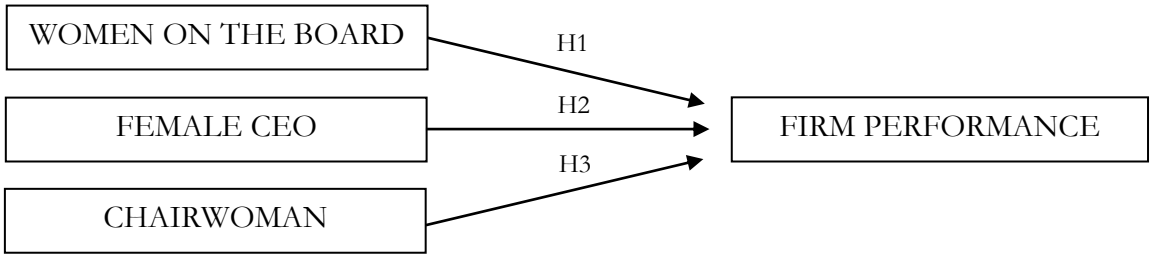
When using firm size as a moderator, Li and Chen (2018) concluded that in smaller companies, women had the best conditions to impact company performance. Gallucci et al. (2015) studied the interaction of female ownership. The results of their research claim that when women own fewer shares than men, the effect of their presence on board on performance is more positive. The authors consider that this effect occurs because women tend to be more risk averse, and when men held the majority of the shares, that intrinsic characteristic of women is surpassed in a certain way. A different approach was considered in the study of Kweh et al. (2019), which concluded that the interaction between board independence and board gender diversity is not significant.

2.4. Hypotheses development

Although there are mixed conclusions regarding the impact of women on the boards, the hypotheses were formulated in the affirmative sense, because it is the predominant position in the literature review. Thus, this dissertation aims to understand if the presence of women in the boardrooms, measured as a percentage of the total number of board members, positively impacts firm performance (Hypothesis 1). Additionally, Hypothesis 2 and Hypothesis 3 assess whether the fact that companies have a woman in

leadership as CEO and Chairman of the board of directors has a favourable impact on company performance. Figure 1 illustrates the hypotheses developed.

Figure 1 – Hypotheses development



Hypothesis 1 (H1): The percentage of women on corporate boards is positively related to firm performance.

Hypothesis 2 (H2): A woman being the CEO positively impacts firm performance.

Hypothesis 3 (H3): A woman being the Chairperson positively affects firm performance.

3. Methodology

3.1. Statistical model

Given the research nature, it is crucial to apply a statistical model to answer the questions previously presented. Considering the previous studies presented in the literature review, the model's construction is indirectly supported by the agency theory, resource dependence theory, and upper echelons theory. The equation used to estimate the relationship between firm performance and the presence of women on the board is stated as follows:

$$\text{Firm performance} = \alpha + \beta_1 WOB + \beta_2 CEOGEND + \beta_3 CHAIRPGEND + \beta_4 \text{Control Variables} + \varepsilon_1 \quad (1)$$

where Firm performance is measured by *ROA*, and *ROE*, alternatively; *WOB*, *CEOGEND* and *CHAIRPGEND* are the variables related to the women's presence on the board. Complementarily, an adjusted model was considered that differs from the previous one in the sense that it comprises additional control variables, as shown in Equation (2):

$$\text{Firm performance} = \alpha + \beta_1 WOB + \beta_2 CEOGEND + \beta_3 CHAIRPGEND + \beta_4 \text{Control Variables} + \beta_5 \text{Additional Control Variables} + \varepsilon_2 \quad (2)$$

All these variables are presented and defined in the next section.

3.2. Variables

3.2.1. Dependent variables – firm performance

The empirical research carried out to date measures firm performance using essentially two types of indicators: market-based indicators, e.g., Reguera-Alvarado et al. (2017) and Pucheta-Martínez and Gallego-Álvarez (2020), and accounting measures, e.g., Hedija and Němec (2021) and Tahir et al. (2021). For the first type, the referenced studies use Tobin's Q. However, once this dissertation analyses non-listed companies, it is not possible to consider that variable. Regarding the second type, two indicators that reflect past operating performance were selected and can be seen in Table 1.

Table 1 - Dependent variables

Variables	Abbreviation	Definition
Return on Assets	*ROA*	The ratio between EBIT and total assets.
Return on Equity	*ROE*	The ratio between net income and shareholder's equity.

ROA is calculated as the ratio between Earnings Before Interest, and Taxes (EBIT) and total assets; *ROE* is obtained by dividing net income by shareholders' equity. These two variables were used by Moreno-Gómez et al. (2018), Jadiyappa et al. (2019), and Kubo and Nguyen (2021). However, *ROA* tends to be more often adopted and selected by the authors when compared to *ROE*, because it is a measure that does not suffer the effect of the capital structure and taxation.

3.2.2. Independent variables – women on the board

The independent variables selected to provide a measurement of women's presence on the board, and to test the hypotheses presented above, are shown in Table 2.

Table 2 - Independent variables

Variables	Abbreviation	Definition
Percentage of women on the board	*WOB*	The proportion of women on corporate boards.
CEO gender	*CEOGEND*	Dummy variable: 1, when the company's CEO is a woman; 0, otherwise.
Chairperson gender	*CHAIRPGEND*	Dummy variable: 1, when the Chairperson is a woman; 0, otherwise.

First, the percentage of female representatives was considered. This measure is widely used in the studies of this field by various authors, namely Reguera-Alvarado et al. (2017) and Gordini and Rancati (2017). Second, a dummy variable was defined, returning 1 when the company is led by a female CEO. This variable is presented in some studies, such as the research developed by Kubo and Nguyen (2021), Tahir et al. (2021), and Moreno-Gómez et al. (2018). At last, the gender of the Chairperson was also introduced as a

dummy variable likewise the solution adopted by Tran et al. (2021). Considering the mixed findings presented in the literature review, it is not possible to predict the signal that these variables will take in the results of this study.

3.2.3. Control variables

To assure the validity of the study and limit the potential impact of other variables in the results, control variables were added to the model. It should be pointed out that the following variables were chosen based on previous empirical studies and considering their availability in the database.

Table 3 displays those variables and groups them into three categories: firm-related, board-related, and general context.

Table 3 - Control variables

Variables	Abbreviation	Definition
Related to the firm		
Firm size	*FSIZE*	Natural logarithm of total assets in year t.
Firm age	*FAGE*	The number of years of the firm's existence at year t.
Leverage	*LEVDA*	The ratio between total liabilities and total assets.
	LEVDE	The ratio between total debt and equity.
Sales growth	*SGROW*	Sales geometric growth rate over last 3 years.
Related to the board		
Board size	*BSIZE*	The total number of members on the board.
CEO duality	*CEODUAL*	Dummy variable: 1, when the CEO is the Chairperson; 0, otherwise.
Related to the general context		
Industry dummies	*IND*	Dummy variable for each industry: 1, when the company operates in the respective industry.[1]
Year dummies	*YEAR*	Dummy variable: 1, when the data is related to year t; 0, otherwise.

[1] Companies were classified to the respective industry using the first level of the nomenclature proposed by the National Institute of Statistics (INE). Table 8 (Chapter 4) includes a list of the industries considered in the sample.

Starting with the variables related to the firm, firm size and firm age must be considered. The study developed by Sritharan (2015) found a positive link between firm size and firm performance, measured by *ROA*, pointing out that bigger companies have more ability to benefit from economies of scale and, thus, have superior economic performance. Despite that, it is also possible to find empirical studies that found a negative and significant association between these two variables, like the study of Shehata et al. (2017).

Regarding firm age, the results of the study conducted by Mallinguh et al. (2020) suggest that investors trust more in older enterprises, due to their greater experience operating in the market, which contributes to better performance. However, there is empirical evidence of a negative impact on companies' performance enhanced by firm age, sustaining the argument that "as firms become older, they often try to codify decision-making procedures, what makes them very bureaucratic, reduces organizational flexibility and ability for prompt changes." (Pervan et al., 2017, p. 5).

Thus, in the current study, no specific signal is associated with firm size and firm age, taking into consideration that they may have a positive or negative impact on performance.

To avoid multicollinearity problems, leverage was defined in two different ways. The first definition (*LEVDA*) is the ratio between total liabilities and assets, and the second (*LEVDE*) is the debt-to-equity ratio. *LEVDA* will be applied in the model of *ROE*, and *LEVDE* in the model of *ROA*. Evaluating its effect on performance, Ibhagui and Olokoyo (2018) showed a negative effect enhanced by leverage on *ROA* and *ROE*, particularly in small firms. Thus, it is expected a negative sign of leverage.

Bennouri et al. (2018) demonstrate a significant positive association between sales growth and performance measures. Similarly, Eka (2018) confirms that this measure of operational performance contributes to better firm performance. Taking this evidence into consideration it is expected that sales growth positively impacts firm performance in the current study.

Regarding the control variables associated with board characteristics, the board size and CEO duality were introduced.

As the study by Guest (2009) suggests, larger boards can negatively impact firms once they may face more challenges ensuring good communication between their members. Arosa et al. (2013) reached the same conclusion when analysing Small and Medium Enterprises (SMEs) in Spain, highlighting the lack of coordination and rigidity in the decision-making process that may arise on boards with more people. This negative association was also a result of the investigation done by Merendino and Melville (2019). The authors conclude that as the number of members increases, the greater the probability of having members with relationships with other companies, a factor that can harm performance. However, Alqatan et al. (2019) found a positive association between board size and *ROA*, which may be the result of a wider range of backgrounds and expertise that favours the decision-making process. So, board size may take either a negative or positive form in this study.

CEO duality might decrease firm performance, especially when the decisions of the CEO are based on personal interests, as concluded by Mubeen et al. (2021). Besides that, when the CEO is the Chairperson, the company may benefit from a variety of advantages, such as the internal knowledge that the CEO acquires daily and the easier coordination between the management and shareholders which can enhance performance (Pucheta-Martínez & Gallego-Álvarez, 2020). This last idea is supported by the stewardship theory. According to this theory, when the CEO is in charge of leading the company and also the board of directors, he/she may feel motivated to achieve good results and act like a good steward, which may result in more status and success (Bansal & Thenmozhi, 2021). Again, no specific signal is expected for this variable, considering the mixed results of previous studies.

Finally, to control possible industry and time-related effects, the corresponding dummy variables were added to the model. One problem that was considered when creating these variables was the dummy variable trap. To avoid that as well as perfect multicollinearity, a given year and given industry dummies were treated as the benchmarks, as done by Brahma et al. (2020). In practice, there are five-year dummies and fifteen industry dummies which represent one less the number of values that each variable can take on.

3.2.4. Additional control variables – adjusted model

In addition to the control variables mentioned in the previous section, it is important to consider other variables that can also affect the performance of companies. The variables shown in Table 4 are related to very specific information about the board, which is difficult to access in public databases. Thus, these will only be considered in an adjusted model, referred to in the robustness tests, that uses data collected with a questionnaire.

Table 4 – Additional control variables

Variables	Abbreviation	Definition
Annual meetings	*AMEETS*	Returns the total times that the board of directors meet annually on average.
Board age	*BAGE*	Average age of board members.
Board education level	*BEDUC*	Percentage of board members with a higher degree.
Board independence	*BIND*	Proportion of directors on board that are independent of internal management.
Board previous experience	*BPEXP*	Percentage of members who had previous similar experiences in other companies.
Board ownership	*BOWN*	Percentage of members who own company shares.

First, the number of times that the board meet within a year (*AMEETS*) was taken into consideration. The research elaborated by Saadaoui (2021) grounded in data from French companies pointed to a positive impact of the frequency of meetings held on corporate boards on *ROA*. Contrarily, the results of Johl et al. (2015) pointed out a negative and significant effect of the number of board meetings on that performance measure.

Additionally, board age (*BAGE*) was calculated as the average of the board members' age, and the education level (*BEDUC*) corresponds to the proportion of directors that have a higher degree. Fernández-Temprano and Tejerina-Gaite (2020) studied the impact of these two variables and found that the performance of Spanish non-financial firms is positively influenced by age diversity, and negatively affected by educational level. Contrarily, the results of EmadEldeen et al. (2021) suggest that the directors' age has a negative influence on performance. The study of Kurniawati and

Henny (2021) found that the education background can positively impact financial performance, but the age of the board does not play a significant effect.

Two other controls that were added are related to the independence (*BIND*) and previous experience (*BPEXP*) of the board members as done by Green and Homroy (2018). In terms of ownership, the variable was defined as the percentage of shares held by board members (*BOWN*). Li et al. (2021) found a positive and significant association between this percentage and some performance measures. However, the results of the research done by Shan (2019) reveal a negative link between these variables.

Similar to what happened with most of the other control variables presented in the previous section, it is difficult to foresee the impact generated by these variables on performance.

3.3. Statistical technique

At this stage, it is important to highlight that many researchers found problems of endogeneity in their research, such as Bennouri et al. (2018) and Green and Homroy (2018). In the current study, this problem was addressed by applying the 2SLS technique, following the methodology presented in the studies of Reguera-Alvarado et al. (2017), Gordini and Rancati (2017), Marinova et al. (2016) and Dwaikat et al. (2021). To test endogeneity empirically in the proposed model, the Hausman test was performed, considering *WOB* as the so-called endogenous variable. To do so, following the procedure proposed by Hill et al. (2021), in a first step it was necessary to find a suitable instrumental variable (IV). On the one hand, the IV has to be correlated with *WOB*, but in another hand, the only effect of this variable in performance (measured by *ROA* and *ROE*) has to be through *WOB*.

Taking this into account, the IV chosen was the percentage of exports (*EXP*), which is the ratio between exports and total turnover. The rationale for choosing this variable is related to the fact that companies that sell more across the border, tend to be more exposed to various stakeholders. They may exert more pressure on companies to include more women in their management, which influences *WOB*. This justification is similar to the one proposed by Reguera-Alvarado et al. (2017), albeit these authors used a dummy variable related to the presence (or absence) of the company in IBEX-35, arguing

that companies listed there have more prominence. Once this dissertation evaluates only non-listed companies, the percentage of exports is considered a good indicator of their visibility.

Having the IV chosen, the first step was to regress the following model:

$$WOB = \alpha + \beta 1 EXP + \beta 2 CEOGEND + \beta 3 CHAIRPGEND + \beta 4 \text{Control Variables} + \nu \quad (3)$$

By performing the Hausman test, it was confirmed that *WOB* is an endogenous variable. This result alerts the fact that the OLS (Ordinary Least Square) estimator would be inconsistent and biased. To accomplish the set goal, it was necessary to first regress Equation (3), and then substitute the variable *WOB* with the estimated W*OB* (*EST_WOB*) obtained in (3). Thus, the final equation that was used to understand whether the presence of women on the board produces effects on company performance is the one given below.

$$\text{Firm performance} = \alpha + \beta_1 EST\_WOB + \beta_2 CEOGEND + \beta_3 CHAIRPGEND + \beta_4 \text{Control Variables} + \mu \quad (4)$$

4. Data collection and descriptive statistics

4.1. Data source and data collection

The data used in this study was collected from SABI, a financial database with detailed information about Portuguese companies. The data regarding the variables related to the gender of directors was obtained by considering the names and pronouns presented in the database. After attributing the respective gender to each person, it was possible to compute the proportion of female directors on the board. Complementarily, the role description indicated the CEO and the Chairperson by company, making it easy to allocate the respective gender. Only the board of directors' actual members were considered.

Due to the lack of specific information about the BoD members, a survey was sent to the companies in order to fill this gap. The answer rate was around 9.5%. The survey can be consulted in Appendix 1. Questionnaire questions were designed to collect the data needed to introduce the additional control variables into the model.

4.2. Data sample

The sample is assembled as a panel dataset. The time frame goes from 2015 to 2020, and the observations are the medium and large Portuguese companies. Panel data, in addition to being more explanatory and ensuring greater consistency of the statistical model when compared to cross-sectional or time series data, also allows for controlling unobservable heterogeneity (Uribe-Bohorquez et al., 2018).

The steps given to achieve the final data sample are presented in Table 5.

Table 5 – Sample size

Steps	**Number of Companies**
(1) Portuguese non-listed companies.	772,065
(2) Medium and large companies.	2616
(3) Companies with information available about the BoD.	1293
(4) Excluding companies with negative equity.	1248
(5) Final matched sample by size, year and industry.	1130

First, Portuguese-listed companies were disregarded, once this dissertation aims to study the business environment in which the law of gender quotas is not mandatory. Second, only medium, and large enterprises were considered, i.e., companies with at least 50 employees and 10 million euros of turnover[2]. These two conditions had to be satisfied in all the sample years. Third, an aspect that restricted the sample size was the board composition because many companies don't have available information about the name of the board members in the database. Given the personal nature of that information, it is difficult to access it. Lastly, companies that registered negative equity during the selected period were deleted once this did not reflect an ordinary situation of corporate governance (Urionabarrenetxea et al., 2016) and could affect the test of the relationship between women on boards and firm performance.

Additionally, the data sample was split into two subsamples based on the percentage of women on the board. The first subsample comprised the companies with no women on the board, and the second those that had at least a woman on the board. The observations from the two subsamples were matched, considering their proximity in terms of firm size by year and industry. In short, in the final matched sample, for each observation of a firm with no women on its board, there is a corresponding observation of a firm with women on its board. The application of this procedure unbalanced the data, leading to a different number of firms per year, as shown in Table 6.

Table 6 – Number of observations per year

	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**Total**
Number of observations	888	908	912	986	960	934	5588

The same procedure was applied in the adjusted model, i.e., the model that comprises additional control variables gathered from the survey. This procedure led to a total of 380 observations, distributed over the period as shown in Table 7.

[2]These criteria are based on the classification of Small, Medium and Large Enterprises from the National Institute of Statistics (INE).

Table 7 – *Number of observations per year – adjusted model*

	2015	2016	2017	2018	2019	2020	Total
Number of observations	58	60	58	68	66	70	380

The categorization of each company according to its core business was done using the nomenclature of Statistics Portugal (2007). Table 8 illustrates the number of companies and observations for each industry in the general model.

Table 8 – Number of companies and observations per industry

Industries	Abbreviation	Number of companies	Number of observations
Manufacturing	*MANUF*	497	2678
Wholesale and retail trade	*RETAIL*	248	1238
Construction	*CONSTRUCT*	70	354
Transport and storage	*TRANSPORT*	67	312
Information and communication	*COMMUN*	49	214
Water, sanitation, waste management and depollution	*WATER*	39	174
Administrative and support services activities	*ADMIN*	38	146
Accommodation, catering and similar	*ACCOM*	29	112
Education	*EDUC*	28	98
Public administration	*PADMIN*	25	92
Agriculture, animal production, hunting, forestry, and fishing	*AGRO*	16	80
Electricity, gas, steam, hot and cold water and cold air	*ELECT*	9	34
Artistic, performing, sporting and recreational activities	*ARTISTIC*	5	22
Extractive industries	*EXTRACT*	3	10
Financial and insurance activities	*FINANCE*	4	12
Other service activities	*OTHER*	3	12
Total		**1130**	**5588**

The table shows that the majority of companies operate in the sectors of manufacturing and wholesale and retail trade.

4.3. Descriptive statistics

In this section, the main descriptive statistics are discussed. Thus, the mean, median, standard deviation (std. deviation), minimum and maximum are presented for the previously defined variables.

It is essential to highlight that variables related to the board, such as Board Size (*BSIZE*), CEO Gender (*CEOGEND),* Chairperson Gender (*CHAIRPGEND*), CEO Duality (*CEODUAL*) and the Percentage of Women on the Board (*WOB*), are constant across the period. These variables were collected from SABI, and this database only contains the most recent data available, making it not possible to identify differences across the years. Thus, it was assumed that they didn't change significantly during the selected period. The remaining variables vary each year. In addition, the sample was divided into firms with and without women on the board, which led to the subsamples *WOB*>0 and *WOB*=0, respectively.

To lessen the effect of outliers, the winsorizing technique was applied as done by Arvanitis et al. (2022). This procedure was applied to performance measures and continuous firm-related indicators, namely, *SGROW*, and *LEV*. Hence, 3% of the highest and lowest values of those variables were replaced with the immediately closest value. All values discussed next are based on the winsorized values of those variables.[3]

4.3.1. Descriptive statistics - firm performance

Table 9 shows the descriptive statistics of firm performance indicators.

Table 9 – Descriptive statistics of ROA and ROE

Variables	N	Mean	Median	Std. Deviation	Minimum	Maximum
ROA	5588	6.71*	5.29	7.13	-30.79	43.10
WOB=0	2794	6.88	5.40	7.52	-30.79	43.10
WOB>0	2794	6.54	5.17	6.71	-17.13	43.10
ROE	5588	10.89***	9.42***	19.37	-270.03	85.47
WOB=0	2794	11.36	10.19	20.64	-270.03	85.47
WOB>0	2794	10.41	8.82	18.00	-127.60	85.47

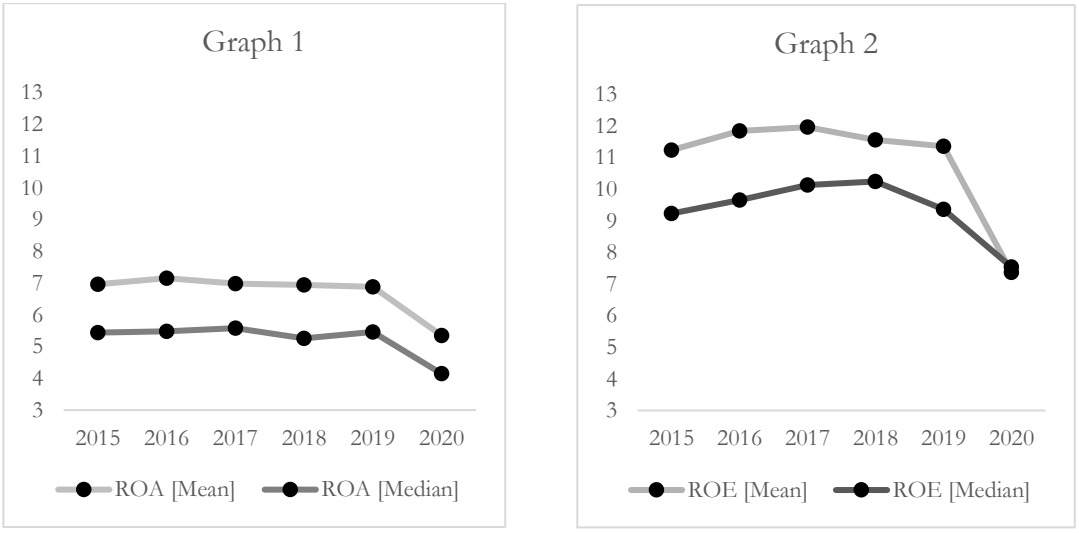
(***), (**) and (*) indicate that the differences between the means (or the medians) of the two subsamples are statistically different at less than 1%, 5% and 10% significance levels.

[3] As a robustness test, the analysis was also performed using the non-winsorized data and the results were not qualitatively different.

As can be observed, *ROA* has a mean and a median of 6.71 and 5.29, respectively. These values are lower than *ROE*, being the mean and median correspondingly 10.89 and 9.42. Once *ROE* addresses the leverage effect, it is expected that its values are higher compared to *ROA*. It should be highlighted that *ROE* is more spread out around the mean once its standard deviation is higher than *ROA*. Both variables have a positively skewed distribution, meaning that values are more concentrated on the left tail. The descriptive statistics for the two subsamples indicate that companies with women on their boards, i.e., *WOB*>0 are characterized by lower *ROA* and *ROE*, being the differences between means statistically significant. These findings anticipate a possible negative effect of *WOB* on firm performance.

By observing the graphs presented in Figure 2, it is possible to visualize the evolution of the mean and median values of *ROA* and *ROE* throughout the chosen period.

Figure 2 – Evolution of ROA and ROE within the period from 2015 to 2020



The graphs show an evident decline in 2020. This reflects the impact of the Covid-19 pandemic crisis on firm performance. The lockdown measures resulted in a decline in firms' performance once many economic activities were halted (Lassoued & Khanchel, 2021).

4.3.2. Descriptive statistics – women on the board

The descriptive statistics of *WOB* are displayed in Table 10.

Table 10 – Descriptive statistics of WOB

Variables	N	Mean	Median	Std. Deviation	Minimum	Maximum
WOB	1130	19.00	16.67	22.25	0	100
WOB>0	599	33.33	37.58	16.28	8.33	100

The mean percentage of women directors on boards is 19.00%, and the median is 16.67%. The maximum value shows that there is at least one firm whose board is entirely composed of female directors. Within the subsample composed only of firms with women in the boardroom, the boards have, on average, 33.33% of women directors.

Table 11 shows how many companies exist in the database, dividing *WOB*>0 into 5 classes.

Table 11 – Number of companies grouped by WOB interval

WOB	Number of Companies	Percentage
0	531	46.99
]0, 20%]	102	9.03
]20%, 40%]	316	27.96
]40%, 60%]	117	10.35
]60%, 80%]	55	4.87
]80%, 100%]	9	0.80
Total	**1130**	**100.00**

As it can be concluded, there is a reduced number of companies whose percentage of women is higher than 40%. When companies have women on the board, it is most common that their proportion is between 20% and 40%.

Table 12 highlights the descriptive statistics of *WOB* by industry.

Table 12 – Descriptive statistics of WOB by industry

Industries	N	Mean	Median	Std. Deviation	Minimum	Maximum
MANUF	497	20.20	20.00	23.36	0.00	100.00
RETAIL	248	20.22	20.00	24.12	0.00	100.00
CONSTRUCT	70	16.03	0.00	17.69	0.00	66.67
TRANSPORT	67	16.20	14.29	18.65	0.00	66.67
COMMUN	49	17.71	14.29	22.10	0.00	100.00
WATER	39	16.38	16.38	19.08	0.00	66.67
ADMIN	38	15.87	16.27	17.39	0.00	50.00

As displayed, in the *MANUF*, *RETAIL* and *COMMUN* industries, there are firms with no men on the board. Focusing on the mean values, the highest percentage of *WOB* belongs to the *RETAIL* industry, but by analysing the median, this percentage is similar to the one registered in the *MANUF* sector. The lowest median occurs in the *CONSTRUCT* sector, meaning that many companies only have men on their boards. Besides that, there are no significant differences in the mean of *WOB*.

The remaining measures of the presence of women directors on the BoD are dummy variables. Table 13 displays the frequency of the two genders occupying the CEO and Chairperson positions.

Table 13 – Descriptive statistics of CEOGEND and CHAIRPGEND

Variables	Number of Companies	Percentage
CEOGEND		
Male	962	85.13
Female	168	14.87
Total	1130	100.00
CHAIRPGEND		
Male	1029	91.06
Female	101	8.94
Total	1130	100.00

As it is shown, the discrepancies between men and women are notorious. Around 85.13% of companies have a man as CEO, and only 8.94% have a woman as Chairperson. These findings emphasize the low representativeness of women on the BoD and the prevalence of men in top management positions.

4.3.3. Descriptive statistics - control variables

Table 14 presents the descriptive statistics of the main continuous control variables.

Table 14 – Descriptive statistics of continuous control variables

Variables	N	Mean	Median	Std. Deviation	Minimum	Maximum
FSIZE	5588	17.44	17.26	1.03	15.23	22.92
SGROWTH	5588	9.60	15.27	18.78	-105.62	48.26
LEVDA	5588	57.48	60.03	19.80	12.35	98.02
LEVDE	5588	232.44	150.22	345.85	14.10	4946.66

The mean firm size (*FSIZE*) is 17.44. Regarding sales growth (*SGROWTH*), the distribution of this variable is negatively skewed once its mean is lower than its median. On average, firms register a sales growth of 9.60%. As stated above, leverage was defined in two different ways. Debt-to-Equity (*LEVDE*) is much more dispersed compared to the ratio between Debt and Total Assets (*LEVDA*).

The descriptive statistics of discrete control variables are exhibited in Table 15.

Table 15 – Descriptive statistics of discrete control variables

Variables	N	Mean	Median	Mode	Minimum	Maximum
FAGE	5588	37.39	31.00	26.00	3.00	264.00
BSIZE	5588	3.72	3	3	2	20

The board size goes from 2 to 20 in the companies presented in the sample, being the most frequent size 3. Concerning firm age, firms stand operating on the market for 37.38 years. The youngest firms were founded in 2012, and the oldest in 1756. The companies with women in the boardroom tend to be slightly older than companies belonging to the other half of the sample.

Analysing CEO Duality, Table 16 discloses how many companies have a different person occupying the roles of CEO and Chairperson.

Table 16 – Descriptive statistics of dummy control variables

Variable	Number of Companies	Percentage
CEODUAL		
Yes	202	17.88
No	928	82.12
Total	1130	100.00

As it can be concluded, CEO duality only occurs in 17.88% of the companies.

4.3.4. Descriptive statistics – additional control variables

Regarding the additional variables gathered from the survey, the descriptive statistics are presented in Table 17.

Table 17 – Descriptive statistics – additional control variables

Variables	N	Mean	Median	Std. Deviation	Minimum	Maximum
AMEETS	380	9.64	5.00	11.35	0.00	11.35
BAGE	380	51.02	51.00	8.13	29.00	78.00
BEDUC	380	63.87	75.00	38.26	0.00	100.00
BIND	380	16.48	0.00	22.89	0.00	80.00
BPEXP	380	27.45	16.67	32.19	0.00	100.00
BOWN	380	60.39	66.67	40.90	0.00	100.00

Regarding the number of meetings, the mean is 9.64 times a year, and the median is 5. As it can be concluded, on average, the age of the board members is 51. On average, 63.87% of the current members of the board have a higher degree, 27.45% had previous experience in similar functions, and 60.39% own shares of the company.

It is important to highlight that the representativeness of women as CEO and chairpersons is very low among the companies that answered the survey, as shown in Table 18.

Table 18 – Descriptive statistics – CEOGEND and CHAIRPGEND

Variables	Number of Companies	Percentage
CEOGEND		
Male	72	87.80
Female	10	12.20
Total	82	100.00
CHAIRPGEND		
Male	74	90.24
Female	8	9.76
Total	82	100.00

The final data sample of the adjusted model contains 82 different companies. Of these companies, only 10 have a woman as CEO and 8 a chairwoman. Given the reduced representativeness of women in these functions, it was not possible to include those two variables in that model, and consequently, test Hypotheses 2 and 3. Thus, only the impact of *WOB* was assessed in the robustness tests section.

At this stage, it is noteworthy that before running the regression presented in the next section, the Pearson correlation matrix[4] was analysed to address the multicollinearity issue. In general, the correlation coefficients between independent variables are low, not compromising the validity of the results.

[4] For simplification matters, the matrix was not tabulated.

5. Results and discussion

5.1. General results

The regression of Model (4) led to the results presented in Table 19.

Table 19 – Two-stages least square regression

	Dependent Variables	
Independent Variables	**(4.A) ROA**	**(4.B) ROE**
EST_WOB	-0.014**	-0.057***
	(0.006)	(0.016)
CEOGEND	0.282	2.001**
	(0.292)	(0.821)
CHAIRPGEND	-0.129	-0.495
	(0.371)	(1.046)
FSIZE	-0.601***	-1.793***
	(0.095)	(0.267)
FAGE	-0.011***	-0.031***
	(0.003)	(0.010)
CEODUAL	0.222	1.374**
	(0.239)	(0.672)
LEV	-0.005***	-0.098***
	(0.000)	(0.013)
SGROW	0.082***	0.247***
	(0.005)	(0.014)
BSIZE	-0.057	0.405**
	(0.057)	(0.161)
Observations	5588	5588
Adjusted R-Squared	0.16	0.10
F-Statistic	38.06	22.71
Prob (F-Statistic)	0.00	0.00

This table contains the results of the model regressed with the 2SLS technique. The variables are described in Chapter 3. The first numeric numbers are the variables' coefficients, and the standard errors are in parenthesis.
(***), (**) and (*) indicate significance at less than 1%, 5% and 10% levels, respectively.

This table presents the results of the 2SLS for two models. These models vary in terms of their dependent variable. Model (4.A) measures firm performance using *ROA*, whereas Model (4.B) uses *ROE*. The independent variables are the same in both models, except for leverage (*LEV*) which, as explained before, was defined differently to avoid

multicollinearity. For simplification matters, the industry dummies, and year dummies are not tabulated, but they were considered in the regression.

In order to conclude about the hypotheses developed, it is crucial to understand the impact of the variables that measure the presence of women on the board, i.e., *EST_WOB*, *CEOGEND* and *CHAIRPGEND*.

EST_WOB exerts a negative and significant influence on *ROA* and *ROE*, at the 5% and 1% significance levels, respectively. These results led to a rejection of Hypothesis 1 (H1). In practical terms, it is estimated a decrease of 1.4 percentual points (pp) on *ROA* and 5.7 pp on *ROE* due to an increase of 1% in the proportion of women on the board, *ceteris paribus*. This result is a novelty considering the literature review carried out in Chapter 2. This negative impact appeared essentially in developing geographical contexts or in industries male-dominated. However, given the variety of industries present in the data sample and taking into consideration that Portugal is a developed country, previous literature findings cannot be applied to the current study. These results may indicate that the relationship between the proportion of women in the boardroom and firm performance measures is not linear and it may be conditioned by certain moderators. In order to go deeper in the analysis, in the robustness tests sections, a few interactive terms were added to the model.

Concerning Hypothesis 2 (H2), the coefficients of *CEOGEND* are positive in the two models. However, only when firm performance is measured through *ROE* it is possible to find a significant association between those two variables. When the CEO is a woman, i.e., *CEOGEND* takes the value 1, there is an estimated increase of 200.1 pp on *ROE*, cc. Thus, Hypothesis 2 (H2) is accepted when firm performance is measured using *ROE*, but in the case of *ROA* the hypothesis is rejected, given the lack of statistical significance. The positive association between the *CEOGEND* and performance is supported by the upper echelon theory. According to this theory, the upper management features have a huge impact on firm performance. Given that the leadership styles of women and men as CEO are different as pointed out by Moreno-Gómez et al. (2018), the results suggest that female CEOs are a valuable source of improved profitability, particularly when measured by *ROE*.

Lastly, regarding Hypothesis 3 (H3) no significant effect was detected in the case of the *CHAIRPGEND*. The lack of significance leads to a rejection of this Hypothesis 3 (H3).

Concerning the control variables, it is important to highlight that their impact on performance is in line with the expected results explored in Section 3.2.3. In Model (4.B), all control variables play a significant effect on performance. *FSIZE* and *FAGE* are both statistically significant at the 1% level of significance. The negative impact produced by these two variables indicates that smaller and younger firms tend to perform better. It seems that medium and large Portuguese companies benefit more when the CEO is the Chairperson and by having larger boards, but these effects are only significant in the model of *ROE*. Another measure that positively and significantly affects firm performance is *SGROW*, meaning that companies whose sales increase more, tend to be more profitable. At last, leverage has a significant negative impact on performance.

5.2. Robustness tests

As a way of evaluating the robustness of the results previously presented, different approaches were considered. For the sake of parsimony, only results that contradict those previously discussed are tabulated.

5.2.1. Results for the period from 2015 to 2019

First, it was tested how the inclusion of the year 2020 had or did not have an impact on the results generated. Given the pandemic situation experienced globally, companies experienced an anomalous situation that impacted their performance. As shown in Chapter 4, there was a decrease in 2020 in the mean and median values of *ROA* and *ROE*. Based on this information, the model was regressed excluding the year 2020, that is, considering only the period from 2015 to 2019. The results remained qualitatively unchanged.

5.2.2. Adjusted model

As mentioned before, a questionnaire was sent to the companies of the final data sample in order to gather data regarding some important control variables to be considered in the model. This procedure sought to overcome the limitations of the SABI database concerning the board's specific information.

This test aimed to verify if the previous results remained unchanged, or if they vary with the inclusion of new variables. It is noteworthy that, given the reduced representativeness of women in the CEO and Chairperson functions, it was not possible to test Hypotheses 2 and 3. Thus, only the impact of *EST_WOB* on performance was assessed.

The results highlight that *EST_WOB* doesn't affect significantly firm performance as the previous results suggested, but the coefficients remained negative. However, the lack of significance may be the result of the reduced sample, considering that this dataset contains only 82 companies.

5.2.3. Results with moderating effects

As illustrated in the literature review, some authors detected moderating effects that made the relationship between female presence on the board and performance measures not linear. Even if two independent variables are not correlated, their interaction might produce effects on the dependent variable. In order to address this issue, some interaction terms were added to the model, and it was concluded whether the effect produced by the interaction was significant or not. This procedure was done for various combinations of the variables that test the hypotheses.

First, the variables related to the presence of women were combined *EST_WOB* *CEOGEND*, *EST_WOB*CHAIRPGEND*, and *CEOGEND*CHAIRPGEND*, but no significance was found in these interactive terms. This means that when the CEO is a woman or the company has a Chairwoman, it doesn't influence the relationship between *EST_WOB* and performance measures. Similarly, the gender of the CEO does not influence the effect of the Chairperson, and vice versa.

Additionally, it was tested the interaction of *EST_WOB*, *CHAIRPGEND* and *CEOGEND* with the model's control variables. In the case of continuous and discrete control variables, such as *FSIZE* and *LEV*, dummy variables were created, turning 1 when the observations are higher than the median, and 0 otherwise. Again, qualitatively differences were not detected.

Lastly, two additional dummy variables were introduced, defined based on the median of the performance accounting-based measures, i.e., *dummyROA* and *dummyROE,* as illustrated in Table 20.

Table 20 – Dummy variables related to firm performance

Dummy Variables	Definition
DummyROA	Equal to 1, if ROA is greater than the median; 0, otherwise.
DummyROE	Equal to 1, if ROE is greater than the median; 0, otherwise.

When these dummy variables were combined with *EST_WOB* and *CEOGEND,* the interactive terms were statistically significant, and their coefficients were negative. Table 21 displays a summary of the results from these regressions. It is important to state that the only variation from the original model was the introduction of these dummy variables and the respective interactive terms. The remaining variables were considered as previously done in Model (4).

Table 21 – Summary of the results from the introduction of interactive terms

	ROA		***ROE***	
	***DummyROA*=1**	***DummyROA*=0**	***DummyROE*=1**	***DummyROE*=0**
EST_WOB	Negative***	Positive	Negative***	Positive*
CEOGEND	Negative	Positive*	Negative	Positive***
(***), (**) and (*) indicate significance at less than 1%, 5% and 10% levels, respectively.				

In practical terms, these results suggest that in the case of companies that tend to have slightly worse financial performance, i.e., *DummyROA* or *DummyROE* equal to 0, the impact of having women on the board is positive. On the other hand, the effect of women directors on the board tends to be negative in firms that experience greater profitability, i.e., *DummyROA* or *DummyROE* equal to 1.

Although merely speculative, these results may suggest that women in companies with lower profitability may occupy positions in more operational areas and, therefore, have more opportunities to positively impact performance. On the other hand, in more profitable companies, women's roles may not directly influence results. In these situations, their presence on the board can be perceived as being negative to the company's performance.

A similar result was obtained with the interaction between *CEOGEND* and the dummy variables of performance. However, only in low-profitable firms, the impact of *CEOGEND* is statistically significant. These results seem to be supported by the findings of Glass and Cook (2016). When women face risky situations, they may notice an opportunity to prove their leadership skills and to stand out. Furthermore, when companies face periods of worse performance, a turnaround has more potential to be perceived. In this sense, women are more prompt to take risks, as they will get a chance to break stereotypes and become visible as capable of leading the company to achieve better results. In the case of high-performing firms, the coefficient is not statistically significant, and Hypothesis 2 cannot be accepted.

6. Conclusion

This dissertation aimed to analyse the relationship between the presence of women on corporate boards and firm performance. Three variables were used to test the same number of hypotheses: the percentage of females on the board (*EST_WOB*), CEO Gender (*CEOGEND*) and Chairperson Gender (*CHAIRPGEND*). Firm performance was assessed using two accounting-based indicators, *ROA* and *ROE*.

Hypotheses 1, 2 and 3, were developed in the affirmative sense, taking into consideration that the association between the presence of women on corporate boards and firm performance was expected to be positive.

First, the general results led to a rejection of Hypothesis 1 because it was found a negative and significant effect of *EST_WOB* on *ROA* and *ROE*. Previous empirical studies that detected a negative link, such as Saidat et al. (2019) and Jadiyappa et al. (2019) were based on data from companies that operate in developing countries where discrimination against women is still very high. In the case of Portuguese companies, it is not feasible to sustain the results based on this argument. According to the World Economic Forum (2022), Portugal is much closer to achieving gender parity when compared to those developing countries. While Portugal occupies the 29th position, Jordan, India, and Pakistan are at the bottom of the ranking, specifically in places 122, 135 and 145, respectively. Given the reduced availability of information about the board composition, the survey sent to the companies allowed to surpass this barrier. When the adjusted controlled model was regressed, the impact of *EST_WOB* on performance remained qualitatively similar.

Second, Hypothesis 2 was accepted in the case of *ROE*. Although the coefficient was positive when the performance is measured through *ROA*, the lack of significance led to a rejection of H2.

Third, no association was detected between the gender of the Chairperson and firm performance, which led to a rejection of H3.

Despite these results, when moderators were added to the model, expressed through interactive variables, distinct results were obtained. In low-performing firms, the effect of *EST_WOB* on performance tends to be positive, suggesting that women may get the chance to be involved in more operational areas under these circumstances. On the other hand, in high-performing firms, they may oversee duties whose impact on

performance is not direct, and thus, their presence on the board shows a negative impact. Similarly, in low-performing firms, the impact of having a female CEO is positive and significant. These results indicate that women may desire to be seen as "turnaround specialists" and give their best in risky situations to prove their leadership skills (Glass & Cook, 2016).

The findings of this dissertation contribute to the extant literature about the research topic in two main ways. Firstly, the results showed a negative association between the presence of women on boards, measured as a percentage of the total number of board members, and firm performance. These results represent a novelty in the literature, once this negative link generally occurs in developing countries or specific industries where men's presence is predominant. Moreover, by using a different sample and adjusting the model with more control variables, the results remained qualitatively similar. Secondly, the study provides evidence that the relationship between women on the board, measured as the percentage of the total board members and as the CEO's gender, and firm performance is not linear, being different for high-performing and low-performing firms.

It is important to note that this study is not exempt from limitations, that can be seen as opportunities for future research. Firstly, board features were considered constant across the chosen period (2015-2020) once it was not possible to gather information on the board composition for each year. So, this dissertation used the last updated data from the SABI database. Further research may investigate the appointment dates of the board members. By doing that, it will be possible to study in what circumstances board diversity is promoted and how the performance change after that appointment. Secondly, the low answer rate of the survey sent to companies compromised the robustness test that addressed more control variables. Although the results obtained were like those of the large sample, the small sample size reduces somehow the findings' reliability. Another limitation is the difficulty in finding evidence explanatory of the non-linear relationship between the presence of women on the boards and performance. This opens space for future research based on qualitative approaches, and different measurements for performance.

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Appendices

Appendix 1 - Survey[5]

Section 1 - Code

1.1. Code

Please enter the code sent by email. This code can be consulted in the subject of the email, as well as in the body text.

_____

Section 2 – General Information

2.1. How many elements belong to the Board of Directors?

_____

2.2. Indicate the average number of annual meetings of the Board of Directors.

_____

Section 3 – CEO Information

Please enter the following information about the CEO.

3.1. Gender

Select only one option

- Male
- Female
- Other: _____

3.2. Age

_____

[5] The questionnaire was sent to the companies in Portuguese. All questions were mandatory.

3.3. Education level
Select only one option

- □ High school
- □ Bachelor's degree
- □ Master's degree
- □ PhD
- □ Other: _____

3.4. For how many years (approximately) has this person been in his/her current role at the company?

_____

3.5. Has this person previously held similar roles in other companies?
Select only one option

- □ Yes
- □ No

3.6. Is this person a shareholder in the company?
Select only one option

- □ Yes
- □ No

3.7. Is the CEO of the company chairperson of the Board of Directors?
Select only one option

- □ Yes
- □ No

3.8. The CEO of the company is a sole member of the Board?
Select only one option

- □ Yes
- □ No

Section 4 – Board Members

Please enter the details of one of the members of the Board.

4.1. Gender
Select only one option

- ☐ Male
- ☐ Female
- ☐ Other: _____

4.2. Age

_____

4.3. Education level
Select only one option

- ☐ High school
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ PhD
- ☐ Other: _____

4.4. Is this person a shareholder in the company?
Select only one option

- ☐ Yes
- ☐ No

4.5. Does this person belong to the executive team?
Select only one option

- ☐ Yes
- ☐ No

4.6. For how many years (approximately) has this person been in his/her current role at the company?

_____

4.7. Has this person previously held similar roles in other companies?

Select only one option

- Yes
- No

4.8. Does the company's Board of Directors have more elements than those indicated? [6]

Select only one option

- Yes
- No

End of the survey.

[6] Section 4 was replicated proportionately to the number of members who belong to the board to ensure that information from all directors is collected.