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Board gender diversity and capital structure: Evidence from the Portuguese listed firms

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Abstract

This investigation analyzes the impact of board gender diversity on the financial policies of non-financial Portuguese listed firms between 2010-2019. The study applies the two-step Generalized Method of Moments (GMM) for econometric analysis. The results show that board gender diversity affects firms' capital structure. While female directors have no determinant role in defining firm indebtedness levels, they significantly contribute to its structure. Our results demonstrate that female directors, particularly those with executive roles, consistently contribute to reducing firms' long-term debt and prefer to issue short-term debt. Moreover, female directors tend to manage trade over financial debt, especially in older firms. Independent female directors play a significant role in smaller firms by decreasing long-term and financial debt. The study supports the notion that gender diversity on the board contributes differently to the firms' financial policies. Additionally, the findings are in line with the assumptions of agency, resource dependence, and pecking order theories. This study shows that gender diversity promotes short-term debt as a substitute for bank loans to avoid increasing firms' risk, which ultimately impacts the definition of financial debt levels.

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1. Introduction

The board of directors (BOD) plays a crucial role in the firm's capital structure, which is essential for daily operations and investment activities. Firm characteristics such as asset tangibility, size, growth, and profitability help directors to raise the necessary funds (Hang, Geyer-Klingeberga, Rathgebera, & Stöckl, 2018). Additionally, firms' governance structures, including leadership structure (Detthamronga, Chancharata, & Vithessonthic, 2017) and their directors' characteristics such as experience (Chua, Razak, Nassir, & Yahya, 2022) and gender (Poletti-Hughes & Martinez Garcia, 2022), may also improve the firms' access to the necessary resources.

Literature has been providing different theoretical models to help directors to find the optimal capital structure of their corporations, such as trade-off theory (Kraus & Litzenberger, 1973; Miller, 1977; Modigliani & Miller, 1963), agency theory (Jensen & Meckling, 1976), pecking order theory (Myers, 1984; Myers & Majluf, 1984), and market timing theory (Baker and Wurgler, 2002). Additionally, other theoretical tools are valuable for shareholders to deal with potential conflicts of interest between managers and shareholders (agency theory

- (Fama & Jensen, 1983; Jensen & Meckling, 1976), and to optimize their human capital resources (resource dependence theory - (Pfeffer & Salancik, 1978)) to increase firm value and reduce bankruptcy risk.

Grounded on these theoretical frameworks, this investigation analyzes the effects of directors' gender diversity on executive and independent roles on the financial policies of non-financial listed firms. The results reveal that female executive directors contribute to the reduction of firms' long-term and banking debt and increase short-term debt, especially in older and smaller firms. These findings align with the resource-based view that female directors, with their distinctive psychological characteristics, are valuable resources for reducing financial and bankruptcy risks while enabling access to alternative resources, such as trade debt to finance the firms' activities. Additionally, the results show that female directors also play a role in influencing firms' capital structure under certain circumstances, as they consistently reduce long-term and financial debt in smaller firms. Consequently, female independent directors may reduce agency conflicts and costs by minimizing financial and bankruptcy risks for firms.

Board gender diversity effects on firms' capital structure are a relatively understudied phenomenon (Benkraiem, Hamrouni, Miloudi, & Uyar, 2018; Hernandez-Nicolas, Martín-Ugedo, & Mínguez-Vera, 2015; López-Delgado & Diéguez-Soto, 2018), and thus, there are some research gaps to be filled. In this sense, our research presents the following contributions to the current state-of-the-art. First, while literature so far has an exclusive focus on accounting and market-based measures of leverage and debt maturities (e.g., (Briozzo, Cardone-Riportella, & García-Olalla, 2019; Chua et al., 2022; Granado-Peiró & López-Gracia, 2017; Hernandez-Nicolas et al., 2015)) and the cost of debt (e.g., García and Herrero (2021)), this study intends to provide a deeper understanding of the impact of gender diversity on firms' capital structure by considering, as far as we know, a new variable – financial debt – in this segment of research. Related measures were used by Amore, Minichilli, and Corbetta (2011), who studied the impact of Chief Executive Officer (CEO) succession on firms' capital structure, and García-Meca, López-Iturriaga, and Tejerina-Gaite (2017), who focused on the study of the relationship between the banking industry representation in the BOD directors and firms' financial policies. Moreover, Adusei and Obeng (2019) studied the effect of board gender diversity on the amount of borrowings detained by microfinance institutions. This research considers bank loans as a relative measure of firms' capital. This variable is particularly relevant in the South European Union context, where non-financial firms are heavily dependent on the banking industry to raise the necessary funds to implement their operational and investment strategies since capital markets from this European region are relatively small and illiquid.

Second, and to the best of our knowledge, this study provides new evidence by documenting that female independent directors promote the decrease of firm long-term and financial debt but only for smaller firms. Third, this study also sheds new light by demonstrating that female executive directors have a relevant effect on the definition of financial debt levels, especially in older firms. These findings indicate that boardrooms, where gender diversity is represented in executive and independent roles, can influence debt maturities' structure and substitute banking dependence with trade debt. The literature presents mixed evidence on replacing financial debt with trade credit (Luu & Nguyen, 2021). This study shows that gender diversity promotes short-term debt as a substitute for bank loans to avoid increasing firms' risk. Fourth, while extant literature provides detached information on the CEO role (Martín-Ugedo, Mínguez-Vera, & Plama-Martos, 2018) executive directors' role (La Rocca, Neha, & La Rocca, 2019), and independent directors' role (Benkraiem et al., 2018). This investigation provides a more holistic view by jointly analyzing the effects of all these directors' roles on firms' capital structure. Fifth, studying the Portuguese context provides new knowledge from the South European Union's point of view. Despite some similarities between France, Italy, Spain, and Portugal, namely the prevalence of the civil law system, high levels of ownership concentration, low shareholder protection, and less effective external control systems, Portugal also presents its specificities. Within this group of countries, Portugal is, according to Hofstede's cultural scores[1], the country with the highest level of uncertainty avoidance and with the lowest level of masculinity. Research documents that directors' gender differences in the definition of corporate financial policies become smaller as uncertainty avoidance increases (Wang, Holmes Jr, Devine, & Bishoff, 2018), and suggests that executive women directors tend to prefer higher levels of short-term debt in more "masculine" countries (La Rocca et al., 2019). Based on these assumptions, Portugal presents a unique cultural environment from other South European Union countries that needs to be investigated.

The remaining paper is organized as follows: after this introduction, section 2 presents a literature review on the impact of gender diversity on capital structure and establishes the study's hypotheses. Section 3 describes the sample, the variables selected, and the methodology followed in the research. Results are discussed in section 4, and robustness tests are addressed in section 5. Section 6 concludes.

2. Literature Review and Hypotheses

Firms' risk-taking strategies are under the board of directors' responsibility. Among them, the definition of the firms' capital structure is a primary concern. The literature offers several theories to help managers find the optimal capital structure to maximize shareholders' value. The trade-off theory (Kraus & Litzenberger, 1973; Miller, 1977; Modigliani & Miller, 1963) states that the equilibrium between interest tax shield and bankruptcy

[1] https://www.hofstede-insights.com/country-comparison/. See Hofstede (1980) for cultural dimensions' descriptions.

costs leads to an optimal capital structure. The agency theory suggests that debt can mitigate conflicts between the principal (shareholder) and the agent (manager) due to the separation of ownership and control (Jensen & Meckling, 1976). The pecking order theory (Myers, 1984; Myers & Majluf, 1984) argues that managers should prefer internal to external sources of finance. When internal funding is scarce, it is preferable to raise debt over equity due to information asymmetry costs. More recently, Baker and Wurgler's (2002) market timing theory suggests that firms should finance their activities with debt or equity at a specific moment, according to what financial markets value more.

One stream of research on firms' capital structure focuses on its determinants. According to Hang et al. (2018) meta-analysis, the most studied capital structure determinants are asset tangibility, earnings volatility, firm size and growth, profitability, non-debt tax shield, and growth opportunities. The authors also document that research considers the institutional environment and country-specific determinants, such as macroeconomic indicators, legal systems, taxation, and corporate governance.

The other stream of research studies the relationship between corporate governance and corporations' financial policies. Some pioneering theoretical and empirical articles were published during the nineties (Berger, Ofek, & Yermack, 1997; Booth & Deli, 1999; Maug, 1997; Mehran, 1992). According to our literature review, there are two major segments on this stream: (1) to understand if corporate governance mechanisms are determinants of firms' capital structure, and (2) to analyze the impact of individual directors' characteristics on firms' indebtedness.

In the first group, researchers analyze the impact of the board size and its independence (Berger et al., 1997; Kieschnick & Moussawi, 2018; Li, Jiang, & Mai, 2019), leadership structure (Detthamronga et al., 2017), ownership (Benkraiem et al., 2018; González, Guzmán, Pombo, & Trujillo, 2013), executive compensation (Liao, Mukherjee, & Wang, 2015; Mehran, 1992), firms' political connections (Chkir, Gallali, & Toukabri, 2020), and other managerial and institutional aspects (Briozzo et al., 2019; Martins, Schiehll, & Terra, 2017; Morellec, Nikolov, & ShüRhoff, 2015) on firms' capital structure.

In the second group, literature studies the effects of directors' characteristics, such as tenure and overconfidence (Amore et al., 2011; Ataullah, Vivian, & Xu, 2018), education and experience (Chua et al., 2022), nationality (Lo, Ting, Kweh, & Yang, 2016), the color of the skin (Elmagrhi, Ntim, Malagila, Fosu, & Tunyi, 2018), family belongingness (Molly, Uhlaner, De Massis, & Laveren, 2019), financial institutions belongingness (Byrd & Mizruchi, 2005), and gender (La Rocca et al., 2019; Martín-Ugedo et al., 2018; Nguyen, Bai, Hou, & Vu, 2021; Poletti-Hughes & Martinez Garcia, 2022).

The role of women directors in corporate strategies is a relevant research topic. According to Adams and Ferreira (2009) and Lara, Osma, Mora, and Scapin (2017), women directors can enhance board monitoring effectiveness. In addition, research indicates that women directors are typically less overconfident and more risk-averse than their male counterparts. This can result in lower levels of market and accounting returns volatility, as well as lower agency costs through better quality reporting and mitigation of information asymmetry, and lower levels of indebtedness (Ataullah et al., 2018; Barua, Davidson, Rama, & Thiruvadi, 2010; Faccio, Marchica, & Mura, 2016; Farag & Mallin, 2018; Gul, Srinidhi, & Ng, 2011; Hernandez-Nicolas et al., 2015; Peni & Vahamaa, 2010; Sghaier & Hamza, 2018).

Literature in this field presents its theoretical background mainly on the agency (e.g., Poletti-Hughes and Martinez Garcia (2022)) and resource dependence (e.g., Saad and Belkacem (2022)) theories. According to agency theory (Fama & Jensen, 1983; Jensen & Meckling, 1976), independent directors are a relevant corporate governance mechanism that, through their monitoring and control duties, reduce the costs of conflicts between managers and owners, protecting the shareholders' interests and maximizing firm value. Poletti-Hughes and Martinez Garcia (2022) support these assumptions by demonstrating that female independent directors' presence on the board of directors is an important mechanism to moderate the family firms' tendency toward indebtedness. As such, female independent directors contribute to a decrease in firms' financial risk.

Resource dependence theory (Pfeffer & Salancik, 1978) argues that firms are open systems dependent on external contingencies. According to this theory, the BOD is an essential mechanism for reducing external dependency and environmental uncertainty (Hillman, Withers, & Collins, 2009) through the diversity of resources (directors) in terms of experiences, backgrounds, skills, expertise, and networks. According to Saad and Belkacem (2022), female directors are a relevant BOD resource since their specific characteristics contribute to access to additional financial leverage by incrementing firms' information transparency and reducing firm risk.

2.1. Board Gender Diversity and Indebtedness

Previous works found that board gender diversity, more specifically the number of female directors on the board, is relevant to decrease a firm's indebtedness (Granado-Peiró & López-Gracia, 2017; López-Delgado & Diéguez-Soto, 2018; Rossi, Hu, & Foley, 2017). This impact is more evident in family-managed firms, where family directors tend to increase their indebtedness (López-Delgado & Diéguez-Soto, 2018).

However, the impact of female directors on debt intensity can be influenced by its maturity. Briozzo et al. (2019), analyzing debt maturity structures of Spanish and Argentinian small and medium-sized enterprises (SMEs), conclude that the participation of women on boards has no impact on the short-term debt of Argentinian

firms but contributes to its decrease for Spanish firms. Hernandez-Nicolas et al. (2015) also confirm this finding in Spain, showing that female directors prefer long to short debt maturities. In opposition, Alves, Couto, and Francisco (2015) suggest that, in European listed firms, the fraction of women directors on the board of directors contribute to decrease total and long-term debt and to increase short-term debt. Even if these findings are not entirely robust, García and Herrero (2021) also confirm that female directors decrease firms' total and long-term debt in European Union firms.

Analyzing microfinance institutions' capital structure, Adusei and Obeng (2019) find inconclusive results, suggesting that the relationship between the variables in the analysis is sensitive to the econometric models.

In sum, while the literature seems to describe that women's presence on boards contributes to lower firm leverage, results are mixed about debt maturity and inconclusive and scarce in terms of the debt categories (trade versus financial). Based on the arguments mentioned above, the following hypotheses are formulated:

H1a – There will be a negative association between the fraction of women directors and total debt.

H1b – There will be a negative association between the fraction of women directors and long-term debt.

H1c – There will be a positive association between the fraction of women directors and short-term debt.

H1d – There will be a negative association between the fraction of women directors and financial debt.

2.1.1. Executive Female Directors and Indebtedness

Huang and Kisgen (2013) compare the financial decisions of male and female CEO and find that women exhibit less overconfidence than men and issue less debt. Martín-Ugedo et al. (2018) also report that Spanish-listed firms run by female CEOs present a lower debt level and lower financial leverage. Additionally, Hernandez-Nicolas et al. (2015) document that female executives prefer lower debt levels and can negotiate lower debt costs but choose higher debt maturities. In opposition, La Rocca et al. (2019) using a sample of non-listed European firms, document that female executives' presence increases short-term debt. De Araújo, Dos Santos, De Oliveira, and Dos Prazeres (2017) analyze executive women's impact on the financial policies of Brazilian listed companies and document the absence of an association between gender and capital structure. Based on the mixed evidence, the subsequent hypotheses naturally follow:

H2a – There will be a negative association between women CEOs and total debt.

H2b – There will be a negative association between women CEOs and long-term debt.

H2c – There will be a positive association between women CEOs and short-term debt.

H2d – There will be a negative association between women CEOs and financial debt.

H2e – There will be a negative association between the fraction of executive women and total debt.

H2f – There will be a negative association between the fraction of executive women and long-term debt.

H2g – There will be a positive association between the fraction of executive women and short-term debt.

H2h – There will be a negative association between the fraction of executive women and financial debt.

2.1.2. Independent Female Directors and Indebtedness

Independent directors are an internal mechanism to reduce agency costs between the principal and the agent, as managers are highly controlled by these members (Fama, 1980; Fama & Jensen, 1983; Hermalin & Weisbach, 1998, 2003). Based on this fact, Alves et al. (2015) conclude that the percentage of independent members on the board negatively impacts short-term debt but has the opposite impact on long-term debt. Similarly, Sheikh and Wang (2012) report that greater board independence is positively related to the total and long-term debt ratios. However, at the opposite pole, Richardson, Lanis, and Leung (2014) document a negative correlation between board independence and debt, proposing that stronger boards magnify the debt-substitution effect. Considering that women directors play an important monitoring role (Adams & Ferreira, 2009; Lara et al., 2017), contributing to the reduction of agency costs, and that they may be essential players in exerting a debt-substitution effect, Nekhili and Gatfaoui (2013) find out that firms with higher leverage are more likely to select women as independent directors to mitigate conflicts between firms and debtors. Benkraiem et al. (2018) are pioneers in analyzing the impact of the fraction of female independent directors. They document a non-significant tendency for a negative association between independent female directors and levels of total and long-term debt. More recently, Poletti-Hughes and Martinez Garcia (2022) using a Latin American sample, concluded that female independent directors act as moderators in the tendency of family-controlled firms to increase leverage. Based on the above arguments, we postulate that:

H3a – There will be a negative association between the fraction of independent women directors and total debt.

H3b – There will be a negative association between the fraction of independent women directors and long-term debt.

H3c – There will be a negative association between the fraction of independent women directors and financial debt.

3. Sample and Methodology

3.1. Sample

The sample contains 36 Portuguese non-financial listed firms from 2010 to 2019. Our sample represents 82% of non-financial and non-football Portuguese-listed firms. The remaining 18% are not considered due to the lack of public information.

We focus on the Portuguese market for several reasons. First, it is a small country, and most studies on capital structure focus on large-size countries, such as the U.K., the U.S., and Brazil (e.g., (Ataullah et al., 2018; De Araújo et al., 2017; Kieschnick & Moussawi, 2018)). Moreover, Portugal is a civil law country, with significant information asymmetries, poor minority protection, and more corruption among investors (La Porta, Lopez-De-Silanes, & Shleifer, 1999). In these countries, debt works as a mechanism to control managers' opportunistic behavior, which calls for the need to understand firms' capital structure. Our results can be extrapolated to countries with similar sizes and characteristics. Second, the majority of Portuguese firms have high levels of indebtedness. In the mean, the maximum level of debt was reached in 2012, and large firms are more indebted than micro, small, and medium-sized firms (Pordata, 2019). Third, in 2011 Portugal asked Troika's help (a group formed by the European Commission, the European Central Bank, and the International Monetary Fund) to solve high levels of public deficit and the negative impact of the international financial crisis of 2007/2008. Several austerity measures were applied in the country from 2011 until 2014, significantly impacting firms' capital structure. Fourth, Portugal presents cultural specificities from those Southern European countries covered by research (France, Italy, and Spain) in terms of masculinity and uncertainty avoidance levels that literature reveals to be environmental determinants of corporate financial policies.

This study focuses on listed firms. In Portugal listed firms need to publish annual corporate governance reports, while the others are only recommended to follow corporate governance recommendations.

The firms' accounting data were obtained in the Sistema de Análise de Balanços Ibéricos (SABI) database of Bureau van Dijk, and corporate governance information was collected in the annual corporate governance reports, published on the firms' websites. Due to specific accounting standards, firms from the financial industry and football clubs were excluded. Moreover, firms with no available corporate governance reports were also excluded.

The period analyzed spans the years 2010-2019. 2010 was the year of implementation of the current Portuguese accounting standards; the final year is 2019 to avoid the economic impact caused by the covid-19 pandemic situation. The final sample is an unbalanced sample of 36 firms, with a total of 349 observations.

3.2. Variables

To measure capital structure, four alternative proxies are used: total debt, long-term debt, short-term debt, and financial debt. Most studies use total debt and debt maturity (e.g., (Alves et al., 2015; Benkraiem et al., 2018; De Araújo et al., 2017; Elmagrhi et al., 2018; Kyriazopoulos, 2017; Lardon, Deloof, & Jorissen, 2017; Mehran, 1992; Molly et al., 2019)). Studies using the proxy of financial debt are scarce (e.g., García-Meca et al. (2017)), but it is an essential type of financing as it increases the firm's financial risk and uncertainty. These ratios can be calculated using both accounting and market data. As Granado-Peiró and López-Gracia (2017) and Nguyen et al. (2021), we use market data since listed firms are analyzed and this data contains investors' expectations.

Board gender diversity variables are used as independent variables. We use the fraction of women on the board of directors (WOB) as a general measure. Three variables are selected to capture specific roles that female directors may have on the BOD. For different executive duties, we consider a dummy variable for the CEO gender (CEOG) and a measure of the relative weight of female executives to the total number of executives (EW); for monitoring and controlling duties, we use the fraction of female independent directors to the total number of independent directors (IW).

The other corporate governance characteristics and firm-specific characteristics are also included as control variables. To control for other impacts of corporate governance characteristics that might influence the firm's capital structure, we included CEO duality (CEOD), board size (BS), and the percentage of independent members (IND). When the CEO is not the chairman, agency costs can be reduced as the manager is more controlled and will have more difficulty engaging in opportunistic behaviors (Jensen & Meckling, 1976). Board size can also influence the level of financing. However, the impact can be mixed. Larger boards increase information transparency but can also be less efficient in monitoring managers, leading to difficulties in communication and decision-making (Ahmed, 2019). Finally, independent members can control managers and reduce agency costs, which is essential to increase the quality of information and decision-making processes (Alves et al., 2015).

Firm-specific characteristics are also included as they are known as variables that impact capital structure, namely return-on-assets (ROA), market-to-book value (MTBV), asset structure (AS), firm size (SIZE), and age (AGE). Profitability (ROA) can present an ambiguous effect on capital structure. On one side, a negative relationship between leverage and profitability is suggested as more profitable firms have more internal funds, and retained earnings are the first option of financing following the pecking order theory (Myers, 1984). On another side, more profitable firms have greater stability and cash flows and thus a lower cost of debt (Zaid et al., 2020). Based on the trade-off theory, more profitable firms are more indebted.

The market timing theory of Baker and Wurgler (2002) suggests that when the market-to-book value increases, firms' leverage decreases as firms have more financing funds through the financial market. Asset structure is included since tangible assets can be used as collateral in case of a firm's failure. Therefore, based on the trade-off and the pecking order theories, firms with a high fixed asset level can easily access debt. Firm size can also have an ambiguous effect on capital structure. Large firms can increase their liabilities since they have more experience and can benefit from economies of scale (Alves et al., 2015). However, these firms usually have more internal funds and may prefer to use equity rather than the debt due to the hierarchy of financing sources

proposed by Myers and Majluf (1984). This ambiguous relation is also found regarding the firm age, as older firms are more established, have more credit history, and can more easily access debt while having more internal funds.

Table 1 presents a summary of the variables used in this investigation.

Table 1. Variables description.

Variables	Formulae	References
Dependent variables		
Total debt (TDebt)	Total liabilities/(Total liabilities + market equity)	Mehran (1992); Granado-Peiró and López-Gracia (2017)
Long-term debt (LTDebt)	Non-current liabilities/(Total liabilities + market equity)	Alves et al. (2015); Nguyen et al. (2021)
Short-term Debt (STDebt)	Current liabilities/(Total liabilities + market equity)	Alves et al. (2015); Nguyen et al. (2021)
Financial debt (FDebt)	Bank loans and similar/(Total liabilities + market equity)	Adapted from García-Meca et al. (2017)
Independent variables		
Women on the BOD (WOB)	Number of women/Total number of members of the BOD	Rossi et al. (2017); López-Delgado and Diéguez-Soto (2018)
CEO gender (CEOG)	Dummy variable that takes 1 if the CEO is a woman and 0 otherwise	Hernandez-Nicolas et al. (2015); Martín-Ugedo et al. (2018)
Executive women directors (EW)	Number of executive women/Total number of executive members	Alves et al. (2015); La Rocca et al. (2019)
Independent women directors (IW)	Number of independent women/Total number of independent members	Benkraiem et al. (2018); Teodósio, Madaleno, and Vieira (2022)
Controls		
Corporate governance		
CEO duality (CEOD)	Dummy variable that takes 1 if the CEO and the Chairperson are the same	Ahmed (2019); Thakolwiroj and Sithipolvanichgul (2021)
Board independence (IND)	Number of independent members/Total number of members of the BOD	García and Herrero (2021); Saad and Belkacem (2022)
Board size (BS)	ln (Number of members of the BOD)	Zaid et al. (2020); García and Herrero (2021)
Firm characteristics		
Return on assets (ROA)	Earnings Before Interest and Taxes (EBIT)/Total assets	García and Herrero (2021); Nguyen et al. (2021)
Market-to-book value (MTBV)	ln (Market value/Book value)	Baker and Wurgler (2002); Saad and Belkacem (2022)
Asset structure (AS)	Fixed assets/Total assets	Li et al. (2019); Sardo, Vieira, and Serrasqueiro (2022)
Firm size (SIZE)	ln (Total assets)	Boateng, Cai, Borgia, Bi, and Ngwu (2017); Zaid et al. (2020)
Firm age (AGE)	ln (Number of years the firm was born)	Kieschnick and Moussawi (2018); Sardo et al. (2022)

3.3. Models

We use dynamic panel data models to analyze the impact of gender diversity on firms' capital structure since debt ratios are highly persistent, their current values are correlated with past ones, and the independent variables usually are not strictly exogenous (Roodman, 2009a; Szomko, 2017).

The following regression models are analyzed:

$$Debt_{i,t} = \alpha Debt_{i,t-1} + \beta_n \times \sum Gender\ variables_{i,t} + \alpha_p \times \sum Governance\ variables_{i,t} + \gamma_l \times \sum Firm\ variables_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$\varepsilon_{i,t} = \mu_i + \upsilon_{i,t} \quad (2)$$

$$E(\mu_i) = E(\upsilon_{i,t}) = E(\mu_i \upsilon_{i,t}) = 0 \quad (3)$$

Where n represents the number of gender variables (n = 1, …, 4); p is the number of corporate control variables (p = 1, …, 3); l is the number of financial control variables (l = 1, …, 5); i is the firm analyzed; t is the year studied and $\varepsilon_{i,t}$ is the disturbance term, that has two orthogonal components (the fixed effects, μ_i, and idiosyncratic shocks, $\upsilon_{i,t}$).

The two-step system Generalized Method of Moments (GMM) estimator of Arellano and Bover (1995) and Blundell and Bond (1998) with orthogonal conditions and collapsed instruments is used to exploit all linear moment restrictions while controlling for too many instruments (Roodman, 2009b). The Sargan test of overidentifying restrictions, the Hansen test of the instruments' joint validity, the Wald test, and the autocorrelation of first and second-order errors (AR (1) and AR (2)) are analyzed to validate the adopted specifications.

4. Results

The summary statistics of the variables presented above are in Table 2. Panel A shows the descriptive statistics, namely: mean, maximum, minimum, standard deviation (SD), skewness, and kurtosis, while Panel B shows the correlation matrix.

On average, total debt represents 99% of total debt plus equity market value. Short-term and long-term debt have a similar weight on the firm's capital structure, accounting for 54% and 45%, respectively. These findings are consistent with the results obtained by Vieira (2017) for Portuguese firms. Moreover, financial debt accounts for 61% of the firm's total debt plus equity market value, on average.

In what concerns to gender diversity on the board of directors, it is relatively low. Female members represent 13% (on average) of the total members of the board of directors, and several firms do not have any women on the board, while the maximum presence of women is 67% of the entire board of directors. Female CEOs are present in less than 11% of the firms in the sample, and executive women represent 10.1% (on average) of total executives. Finally, independent women are 5.4% of the board's total independent members.

On average, the CEO also holds the position of chairperson in approximately half of the firms. Independent members represent an average of 20% of the total members of the board, which is less than the recommendation set by the Portuguese corporate governance guidelines of having at least one-third of independent members (recommendation number III. 4, IPCG (2018)). The board of directors, on average, comprises nine members.

Non-financial Portuguese listed firms have, on average, positive returns (ROA). Fixed assets represent, on average, 3.4% of total assets. Finally, while some firms are new in the market, with two years of activity, others have been in the market for more than 195 years.

The correlation between short and long-term debt is high but is not relevant as these are alternative proxies for measuring firms' capital structure. The other variables are not significantly correlated. Additionally, gender diversity variables are negatively correlated with total, long-term, and financial debt, and positively correlated with short-term debt, suggesting that women's presence on the board of directors, as CEO, or executive members reduces the level of firms' long-term indebtedness. Finally, the correlation between control variables and the capital structure proxies depends on the proxy used, suggesting that numerous factors influence the decision to choose short and long-term debt.

Table 3 shows the results obtained after estimating the proposed model. The Sargan test and Hansen test present p-values greater than 5% showing that the instruments are valid; the Wald test has a p-value of less than 5%, meaning that the joint significance and the coefficients are significantly distributed; AR(1) shows that the model is consistent and correctly specified by the variables used, and the AR(2) reveals that there is no second-order correlation problem in the model.

Over time, companies maintain the same capital structure (long-term, short-term, and financial debt). Usually, the probability of high leverage levels in the previous year implies more leverage in the current year since it is difficult to change the firm's capital structure in the short term.

Moreover, gender diversity affects firms' capital structure. The fraction of women directors (WOB) negatively impacts long-term and financial debt but has the opposite relationship with short-term debt. Portuguese women directors tend to reduce the firms' long-term and financial debt to lower the firm's exposure to financial risk and meet the firm's financial needs using short-term debt. This conclusion is in line with the behavioral gender differences, as women and men have different attitudes toward risk-taking. Women are more risk-averse, which impacts firms' financial decisions. Additionally, based on the agency theory, female members on board act as a monitoring effect of managers' opportunistic behaviors. Similar findings were found by Alves et al. (2015) and García and Herrero (2021) for European firms.

Table 2. Summary statistics.

Variables	TDebt	LTDebt	STDebt	FDebt	WOB	CEOG	EW	IW	CEOD	IND	BS	ROA	MTBV	AS	SIZE	AGE
Panel A: Descriptive statistics																
Mean	0.989	0.450	0.540	0.610	0.130	0.109	0.101	0.054	0.467	0.201	2.095	0.022	-0.201	0.034	19.871	3.432
Median	0.999	0.449	0.541	0.712	0.125	0.000	0.000	0.000	0.000	0.188	2.079	0.030	-0.183	0.000	19.720	3.434
SD	0.040	0.285	0.283	0.335	0.124	0.312	0.192	0.149	0.500	0.207	0.516	0.225	1.119	0.112	1.621	0.777
Min	0.631	0.000	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.693	-2.912	-5.809	0.000	14.657	0.693
Max	1.000	0.982	0.999	1.343	0.667	1.000	1.000	1.000	1.000	0.875	3.135	0.571	4.079	0.800	23.907	5.273
Skewness	-5.758	0.005	0.011	-0.580	0.820	2.511	2.588	3.809	0.132	0.592	-0.360	-9.311	-0.419	4.880	-0.120	-0.454
Kurtosis	38.808	1.914	1.937	2.053	3.498	7.306	10.928	20.944	1.017	2.332	3.018	113.599	4.859	28.449	3.629	3.835
Panel B: Correlation matrix																
TDebt	1.000															
LTDebt	0.133**	1.000														
STDebt	0.008	-0.990***	1.000													
FDebt	0.333***	0.383***	-0.338***	1.000												
WOB	-0.180***	-0.025	0.000	-0.066	1.000											
CEOG	-0.298***	-0.187***	0.147***	-0.137**	0.297***	1.000										
EW	-0.151***	-0.113**	0.093*	-0.143**	0.542***	0.622***	1.000									
IW	-0.049	0.083	-0.091*	0.005	0.196***	-0.016	0.059	1.000								
CEOD	-0.104*	-0.054	0.040	-0.132**	0.067	-0.235***	-0.143***	-0.035	1.000							
IND	0.034	0.128**	-0.124**	0.206***	-0.157***	-0.024	0.007	0.281***	-0.209***	1.000						
BS	0.188***	0.178***	-0.153***	0.277***	-0.092*	-0.066	-0.086*	0.192***	-0.509***	0.372***	1.000					
ROA	-0.034	0.139**	-0.145***	0.135**	0.078	0.025	0.015	-0.036	0.032	-0.101*	0.029	1.000				
MTBV	-0.132**	0.090	-0.111*	0.098*	0.179***	-0.133**	-0.025	0.192***	0.013	0.095*	0.260***	0.074	1.000			
AS	0.069	-0.121**	0.132**	-0.191***	-0.100*	0.083	-0.004	-0.039	-0.063	0.081	0.072	0.071	-0.079	1.000		
SIZE	-0.103*	0.286***	-0.303***	0.349***	-0.059	0.007	-0.080	0.176***	-0.289***	0.384***	0.668***	0.086	0.296***	-0.118**	1.000	
AGE	0.047	0.024	-0.017	-0.124**	-0.037	-0.095*	0.009	0.028	-0.002	0.007	-0.124**	-0.040	-0.083	-0.175***	-0.063	1.000

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. The variables description is presented in Table 1.

Table 3. Regression results.

Variables	Total debt							Long-term debt						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Debt (t-1)	0.638	0.672	0.693	0.735	0.600	0.691	0.695	0.457***	0.490***	0.478***	0.472***	0.444***	0.476***	0.445***
Constant	0.376	0.332	0.312	0.268	0.414	0.312	0.308	-0.054	-0.043	-0.014	-0.050	-0.086	-0.022	-0.007
WOB	-0.016	-	-	-	-0.008	-	-	-0.228*	-	-	-	-0.152	-	-
CEOG	-	-0.007	-	-	-	-	-	-	-0.075*	-	-	-	-	-
EW	-	-	-0.009	-	-	-0.005	-	-	-	-0.168***	-	-	-0.220**	-
IW	-	-	-	-0.001	-	-	0.001	-	-	-	-0.073	-	-	-0.045
CEOG*WOB	-	-	-	-	-0.054	-	-	-	-	-	-	-0.284	-	-
CEOG*EW	-	-	-	-	-	-0.011	-	-	-	-	-	-	0.075	-
CEOG*IW	-	-	-	-	-	-	-0.070**	-	-	-	-	-	-	-0.563
CEOD	0.002	0.001	0.001	0.002	-0.001	0.001	0.001	0.014	-0.003	-0.005	0.016	-0.001	-0.002	0.009
IND	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.011	-0.004	0.019	0.002	0.011	0.017	0.025
BS	0.007	0.005	0.004	0.004	0.005	0.004	0.004	0.065	0.046	0.048	0.080	0.037	0.054	0.074
ROA	0.007***	0.006**	0.006***	0.006***	0.006**	0.006***	0.006***	0.103***	0.103***	0.104***	0.103***	0.104***	0.105***	0.105***
MTBV	0.000	-0.001	-0.000	-0.000	-0.001	-0.000	-0.000	0.013	0.008	0.008	0.009	0.012	0.008	0.011
AS	-0.005	0.001	-0.001	-0.001	-0.000	0.000	-0.001	-0.216	-0.189	-0.210	-0.215	-0.191	-0.212	-0.229
SIZE	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0.009	0.009	0.007	0.005	0.014	0.007	0.004
AGE	0.001	0.000	0.000	0.001	-0.000	0.000	0.000	0.005	0.007	0.008	0.009	0.000	0.010	0.009
AR(1)	-0.848 [0.396]	-0.881 [0.378]	-0.860 [0.390]	-0.893 [0.372]	-0.802 [0.423]	-0.882 [0.378]	-0.869 [0.385]	-3.157 [0.002]	-3.204 [0.001]	-3.213 [0.001]	-3.157 [0.002]	-3.240 [0.001]	-3.203 [0.001]	-3.335 [0.001]
AR(2)	-1.286 [0.199]	-1.262 [0.207]	-1.285 [0.199]	-1.279 [0.201]	-1.266 [0.205]	-1.291 [0.197]	-1.273 [0.203]	0.251 [0.802]	0.287 [0.774]	0.195 [0.845]	0.240 [0.810]	0.239 [0.811]	0.160 [0.873]	0.194 [0.846]
Wald	807861 [0.000]	812128 [0.000]	964067 [0.000]	1.06e+06 [0.000]	929492 [0.000]	982550 [0.000]	1.21e+06 [0.000]	1474 [0.000]	1487 [0.000]	1550 [0.000]	1557 [0.000]	1300 [0.000]	1616 [0.000]	1476 [0.000]
Hansen	3.559 [0.313]	3.782 [0.286]	3.853 [0.278]	3.927 [0.269]	3.501 [0.321]	3.806 [0.283]	3.923 [0.270]	5.273 [0.153]	2.992 [0.393]	3.295 [0.348]	3.930 [0.269]	5.115 [0.164]	3.372 [0.338]	3.758 [0.289]
Sargan	1.128 [0.770]	2.064 [0.559]	2.640 [0.451]	1.847 [0.605]	0.963 [0.810]	2.576 [0.462]	1.627 [0.653]	2.232 [0.526]	1.322 [0.724]	1.480 [0.687]	1.546 [0.672]	2.240 [0.524]	1.499 [0.682]	1.603 [0.659]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Table 3. Regression results (continue).

	Short-term debt							Financial debt						
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Debt (t-1)	0.607***	0.604***	0.595***	0.588***	0.615***	0.598***	0.576***	0.398**	0.456**	0.416**	0.433**	0.402**	0.422**	0.433**
Constant	0.389	0.434	0.414	0.451	0.379	0.408	0.450	0.120	0.099	0.145	0.076	0.044	0.153	0.088
WOB	0.170**	-	-	-	0.168*	-	-	-0.279**	-	-	-	-0.140	-	-
CEOG	-	0.029	-	-	-	-	-	-	-0.135*	-	-	-	-	-
EW	-	-	0.137***	-	-	0.174**	-	-	-	-0.243**	-	-	-0.253**	-
IW	-	-	-	0.027	-	-	0.018	-	-	-	-0.121	-	-	-0.117
CEOG*WOB	-	-	-	-	0.012	-	-	-	-	-	-	-0.483*	-	-
CEOG*EW	-	-	-	-	-	-0.060	-	-	-	-	-	-	0.013	-
CEOG*IW	-	-	-	-	-	-	0.268	-	-	-	-	-	-	-0.091
CEOD	-0.015	-0.008	0.000	-0.013	-0.014	-0.004	-0.012	0.011	-0.008	-0.006	0.009	-0.009	-0.006	0.008
IND	-0.018	-0.017	-0.038	-0.022	-0.019	-0.034	-0.028	0.143	0.136	0.169	0.166	0.142	0.165	0.170
BS	-0.008	-0.009	0.001	-0.016	-0.007	-0.005	-0.017	0.078	0.060	0.068	0.089	0.036	0.070	0.090
ROA	-0.091	-0.089	-0.088	-0.091	-0.092	-0.091	-0.088	0.132***	0.120***	0.123***	0.119***	0.128***	0.124***	0.119***
MTBV	-0.022	-0.016	-0.017	-0.015	-0.022	-0.017	-0.016	0.002	-0.006	-0.002	-0.000	-0.003	-0.003	-0.000
AS	0.177	0.135	0.157	0.148	0.175	0.168*	0.153	-0.448	-0.378	-0.426	-0.375	-0.383	-0.457	-0.375
SIZE	-0.009	-0.010	-0.010	-0.009	-0.008	-0.009	-0.008	0.009	0.009	0.008	0.007	0.018	0.007	0.006
AGE	-0.007	-0.008	-0.008	-0.009	-0.007	-0.010	-0.008	-0.021	-0.024	-0.023	-0.021	-0.027	-0.023	-0.021
AR(1)	-2.916 [0.004]	-3.004 [0.003]	-2.938 [0.003]	-2.977 [0.003]	-2.922 [0.004]	-2.947 [0.003]	-2.971 [0.003]	-2.490 [0.013]	-2.622 [0.009]	-2.439 [0.015]	-2.596 [0.009]	-2.560 [0.011]	-2.457 [0.014]	-2.500 [0.012]
AR(2)	0.469 [0.639]	0.469 [0.639]	0.421 [0.673]	0.446 [0.656]	0.474 [0.635]	0.395 [0.693]	0.443 [0.658]	-0.637 [0.524]	-0.463 [0.643]	-0.829 [0.407]	-0.615 [0.538]	-0.468 [0.639]	-0.832 [0.405]	-0.653 [0.514]
Wald	2839 [0.000]	2976 [0.000]	2213 [0.000]	2180 [0.000]	2750 [0.000]	4542 [0.000]	2046 [0.000]	1151 [0.000]	1172 [0.000]	1186 [0.000]	1242 [0.000]	1092 [0.000]	1226 [0.000]	1396 [0.000]
Hansen	6.515 [0.089]	5.498 [0.139]	5.771 [0.123]	5.373 [0.146]	6.520 [0.089]	5.706 [0.127]	5.530 [0.137]	1.207 [0.751]	1.496 [0.683]	1.139 [0.768]	0.980 [0.806]	1.666 [0.645]	1.140 [0.767]	0.969 [0.809]
Sargan	4.437 [0.218]	3.803 [0.284]	3.732 [0.292]	3.674 [0.299]	4.576 [0.206]	3.579 [0.311]	4.061 [0.255]	0.474 [0.924]	0.657 [0.883]	0.470 [0.925]	0.388 [0.943]	0.752 [0.861]	0.453 [0.929]	0.388 [0.943]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

The validation of hypotheses H1b, H1c, and H1d are in line with the results provided by the extant literature (Adusei & Obeng, 2019; Alves et al., 2015; Briozzo et al., 2019; García & Herrero, 2021; López-Delgado & Diéguez-Soto, 2018; Rossi et al., 2017). This result shows the benefits of board gender diversity.

Results also show that having a female CEO (CEOG) tends to decrease long-term and financial debt, suggesting that women are less overconfident than men when issuing debt. Hypotheses H2b and H2d are validated, supporting the results of Hernandez-Nicolas et al. (2015) and Martín-Ugedo et al. (2018). Additionally, we also analyze the interaction between female CEO and the percentage of women on board, as well as with executive and independent members. The results show statistically significant reductions in the total debt when the female CEO interacts with female independent members, showing a reduction in total debt. When the female CEO interacts with women on board (WOB), that causes a decrease in financial debt.

In relation to the fraction of female executives over total executives (EW), the results show that a higher fraction of female executives decreases long-term and financial debt while increasing short-term debt. The finding supports our hypotheses H2f, H2g, and H2h. Female executives tend to avoid increasing financial credit and non-current liabilities to prevent additional risks, and instead, increasing short-term debt to cover the firm's financial needs. This conclusion aligns with the findings of Hernandez-Nicolas et al. (2015), who suggest that female executives prefer lower debt levels and can negotiate lower debt costs.

Finally, independent women do not seem to impact firms' leverage, contrary to our expectations (hypotheses H3a, H3b, and H3c).

In summary, the main results suggest that the different roles of women as board members, CEO, or executive directors contribute to a decrease in long-term and financial debt, but have a positive impact on short-term debt, confirming the existence of behavioral gender differences. Female members prefer to use internal financing, as suggested by the pecking order theory, and in case of financial needs, prefer to issue short-term debt, as it is less risky. Short-term debt acts as a substitute for financial and long-term debt. Moreover, women's presence works as a debt-substitution effect to reduce agency costs, without including independent women on the board. Based on the resource dependence theory, the results also suggest that female presence on the BOD is a significant resource to increase firms' information transparency and reduce firms' risk.

The variables used as controls for corporate governance are not statistically significant to explain firms' levels of indebtedness. Therefore, this conclusion suggests that gender diversity is a more significant factor in explaining firms' leverage than other characteristics, such as CEO duality, board size, and the number of independent members.

The other firm's characteristics show that only ROA seems to have an impact on the firm's capital structure. More profitable firms tend to increase their debt, including total, long-term, and financial debt. This finding supports the trade-off theory, which suggests that profitable firms can benefit from tax savings by increasing their debt levels.

5. Robustness Checks

To examine the robustness of our results, we have divided the sample into older and younger firms and large and small-size firms. The results are presented in Table 4 (age impact) and 5 (size impact).

Table 4. Robustness tests – Firm's age impact.

	Total debt – older firms							Total debt – younger firms						
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Debt (t-1)	-0.264***	-0.324***	-0.311***	-0.329***	-0.246***	-0.295***	-0.390***	1.402***	1.514***	1.387***	1.348***	1.435***	1.332***	1.299***
Constant	1.229***	1.277***	1.268***	1.274***	1.208***	1.268***	1.516***	-0.395**	-0.523*	-0.375***	-0.329***	-0.417	-0.291**	-0.265**
WOB	0.004	-	-	-	0.006	-	-	0.003	-	-	-	-0.009	-	-
CEOG	-	-0.007	-	-	-	-	-	-	0.030	-	-	-	-	-
EW	-	-	-0.006	-	-	0.006	-	-	-	0.006	-	-	-0.025	-
IW	-	-	-	-0.022	-	-	0.038	-	-	-	-0.003	-	-	-0.002
CEOG*WOB	-	-	-	-	-0.049	-	-	-	-	-	-	0.085	-	-
CEOG*EW	-	-	-	-	-	-0.036	-	-	-	-	-	-	0.043	-
CEOG*IW	-	-	-	-	-	-	-0.934	-	-	-	-	-	-	-0.062
CEOD	-0.000	-0.002	-0.001	-0.003	-0.001	-0.003	-0.013	-0.001	0.009	-0.000	-0.001	0.006	0.001	-0.003
IND	0.000	-0.005	-0.003	-0.007	-0.002	-0.004	-0.002	0.010	0.011	0.015	0.011	0.012	0.014	0.014
BS	-0.002	-0.003	-0.002	-0.003	-0.002	-0.003	-0.009	-0.007	-0.004	-0.006	-0.004	-0.001	0.000	-0.001
ROA	-0.072	-0.085	-0.076	-0.083	-0.072	-0.085	-0.141	0.005**	0.006***	0.006***	0.006***	0.006***	0.007***	0.006***
MTBV	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	0.001	0.002	0.003	0.003	0.002	0.003	0.002	0.003
AS	0.030	0.043	0.037	0.061	0.039	0.036	-0.014	0.001	-0.003	0.002	-0.000	-0.005	-0.011	0.002
SIZE	0.001	0.001	0.001	0.002	0.001	0.001	-0.002	0.000	-0.000	-0.000	-0.001	-0.002	-0.002	-0.001
AGE	0.004	0.006	0.006	0.005	0.005	0.003	-0.013	0.001	0.007	0.002	0.001	0.005	0.003	-0.001
AR(1)	-1.028 [0.304]	-1.020 [0.308]	-1.011 [0.312]	-0.995 [0.320]	-1.037 [0.300]	-1.021 [0.307]	-1.021 [0.307]	-0.391 [0.695]	-0.614 [0.539]	-0.585 [0.559]	-0.686 [0.492]	-0.465 [0.642]	-0.772 [0.440]	-0.567 [0.571]
AR(2)	-0.951 [0.342]	-0.985 [0.324]	-0.968 [0.333]	-1.068 [0.285]	-0.938 [0.348]	-0.961 [0.337]	-0.967 [0.333]	-0.979 [0.328]	-0.981 [0.327]	-0.987 [0.324]	-0.981 [0.327]	-1.024 [0.306]	-1.007 [0.314]	-0.975 [0.329]
Wald	429097 [0.000]	350370 [0.000]	435762 [0.000]	506279 [0.000]	413385 [0.000]	744425 [0.000]	257.3 [0.000]	3.10e+06 [0.000]	453474 [0.000]	7.26e+06 [0.000]	1.24e+07 [0.000]	1.87e+06 [0.000]	1.90e+06 [0.000]	8.61e+06 [0.000]
Hansen	3.313 [0.346]	3.151 [0.369]	2.986 [0.394]	3.390 [0.335]	3.451 [0.327]	3.274 [0.351]	2.695 [0.441]	1.685 [0.640]	2.236 [0.525]	1.711 [0.634]	1.733 [0.630]	2.108 [0.550]	2.109 [0.550]	1.773 [0.621]
Sargan	9.376 [0.025]	7.853 [0.049]	7.932 [0.047]	4.575 [0.206]	10.29 [0.016]	8.988 [0.030]	4.534 [0.209]	2.607 [0.456]	3.078 [0.380]	2.874 [0.411]	3.823 [0.281]	3.513 [0.319]	4.732 [0.192]	5.532 [0.137]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Table 4. Robustness tests – Firm's age impact (continue)

Variables	Long-term debt – older firms							Long-term debt – younger firms						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Debt (t-1)	0.465***	0.506***	0.447***	0.508***	0.442***	0.438***	0.101	0.675***	0.673***	0.692***	0.670***	0.679***	0.693***	0.639***
Constant	-0.499	-0.287	-0.430	-0.294	-0.427	-0.333	0.676	0.011	-0.042	-0.001	-0.064	-0.003	0.073	-0.078
WOB	-0.327*		-	-	-0.249*	-	-	-0.109	-	-	-	-0.096	-	-
CEOG	-	-0.112**	-	-	-	-	-	-	0.013	-	-	-	-	-
EW	-	-	-0.268***	-	-	-0.209**	-	-	-	-0.048	-	-	-0.169	-
IW	-	-	-	-0.127	-	-	0.311	-	-	-	-0.043	-	-	-0.030
CEOG*WOB	-	-	-	-	-0.495*	-	-	-	-	-	-	-0.043	-	-
CEOG*EW	-	-	-	-	-	-0.100	-	-	-	-	-	-	0.154	-
CEOG*IW	-	-	-	-	-	-	-5.390	-	-	-	-	-	-	-0.455
CEOD	0.008	-0.019	-0.014	-0.005	-0.013	-0.020	-0.082	0.036	0.048	0.034	0.047	0.036	0.033	0.046
IND	-0.026	-0.038	-0.013	-0.026	-0.038	-0.013	0.113	0.088	0.075	0.090	0.090	0.095	0.076	0.123
BS	-0.015	-0.019	-0.026	-0.018	-0.028	-0.035	-0.159	0.064	0.084	0.066	0.083	0.061	0.074	0.084
ROA	-0.480***	-0.430***	-0.458***	-0.454***	-0.444***	-0.460***	-0.467***	0.155***	0.150***	0.151***	0.154***	0.156***	0.152***	0.156***
MTBV	0.037**	0.031*	0.034*	0.033*	0.035**	0.034**	0.042***	0.017	0.012	0.012	0.013	0.015	0.010	0.017
AS	-0.211	-0.243	-0.155	-0.321	-0.160	-0.209	-0.962	-0.082	-0.038	-0.062	-0.032	-0.078	-0.113	-0.016
SIZE	0.033	0.025	0.031	0.028	0.033	0.030	0.022	-0.003	-0.004	-0.004	-0.003	-0.003	-0.008	-0.002
AGE	0.046	0.024	0.044	0.011	0.036	0.031	-0.072	0.024	0.027	0.026	0.027	0.025	0.026	0.028
AR(1)	-2.385 [0.017]	-2.614 [0.009]	-2.528 [0.012]	-2.466 [0.014]	-2.499 [0.013]	-2.535 [0.011]	-0.930 [0.352]	-2.341 [0.019]	-2.300 [0.021]	-2.285 [0.022]	-2.263 [0.024]	-2.294 [0.022]	-2.287 [0.022]	-2.399 [0.017]
AR(2)	0.612 [0.541]	0.806 [0.420]	0.552 [0.581]	0.753 [0.452]	0.606 [0.545]	0.563 [0.573]	-0.452 [0.651]	-0.974 [0.330]	-0.978 [0.328]	-0.985 [0.325]	-0.985 [0.325]	-0.969 [0.332]	-1.061 [0.289]	-0.991 [0.322]
Wald	2726 [0.000]	4058 [0.000]	4216 [0.000]	3144 [0.000]	5610 [0.000]	5928 [0.000]	57.38 [0.000]	13644 [0.000]	50732 [0.000]	44694 [0.000]	16979 [0.000]	16919 [0.000]	117158 [0.000]	20107 [0.000]
Hansen	3.090 [0.378]	1.991 [0.574]	2.163 [0.539]	2.469 [0.481]	2.530 [0.470]	1.989 [0.575]	0.248 [0.969]	5.776 [0.123]	5.444 [0.142]	5.542 [0.136]	5.763 [0.124]	5.717 [0.126]	5.553 [0.136]	5.824 [0.121]
Sargan	2.448 [0.485]	1.698 [0.637]	2.088 [0.554]	2.277 [0.517]	1.833 [0.608]	1.860 [0.602]	1.666 [0.645]	3.596 [0.309]	3.606 [0.307]	3.725 [0.293]	3.925 [0.270]	3.616 [0.306]	3.725 [0.293]	4.016 [0.260]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Table 4. Robustness tests – Firm's age impact (continue).

Variables	Short-term debt – older firms							Short-term debt – younger firms						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Debt (t-1)	0.511*	0.475*	0.480*	0.496*	0.483	0.467*	0.512*	0.618***	0.632***	0.648***	0.638***	0.629***	0.658***	0.632***
Constant	0.847*	0.635	0.748	0.627	0.796	0.725	0.800	0.518	0.479	0.404	0.464	0.501	0.321	0.451
WOB	0.373***	-	-	-	0.279	-	-	-0.018	-	-	-	-0.032	-	-
CEOG	-	0.124	-	-	-	-	-	-	-0.010	-	-	-	-	-
EW	-	-	0.237***	-	-	0.177*	-	-	-	0.083	-	-	0.181	-
IW	-	-	-	0.084	-	-	0.192	-	-	-	0.003	-	-	-0.003
CEOG*WOB	-	-	-	-	0.399	-	-	-	-	-	-	0.041	-	-
CEOG*EW	-	-	-	-	-	0.115	-	-	-	-	-	-	-0.116	-
CEOG*IW	-	-	-	-	-	-	-1.657	-	-	-	-	-	-	0.128
CEOD	-0.033	0.005	0.002	-0.015	-0.009	0.007	-0.030	-0.036	-0.038	-0.017	-0.032	-0.034	-0.018	-0.031
IND	0.052	0.045	0.018	0.039	0.053	0.019	0.040	-0.139	-0.124	-0.151	-0.129	-0.141	-0.138	-0.145
BS	0.035	0.037	0.044	0.042	0.041	0.043	0.042	-0.032	-0.036	-0.007	-0.029	-0.027	-0.013	-0.031
ROA	0.370	0.330	0.392	0.326	0.380	0.404	0.189	-0.145**	-0.147*	-0.145*	-0.147*	-0.146*	-0.148**	-0.145*
MTBV	-0.036**	-0.025*	-0.031**	-0.026	-0.035**	-0.033**	-0.018	-0.014	-0.013	-0.011	-0.014	-0.014	-0.010	-0.016
AS	0.309	0.397	0.296	0.424	0.281	0.342	0.286	0.041	0.055	0.100	0.055	0.037	0.147	0.047
SIZE	-0.029	-0.025	-0.026	-0.026	-0.030	-0.026	-0.029	-0.005	-0.003	-0.004	-0.003	-0.005	0.000	-0.003
AGE	-0.038	0.003	-0.025	0.006	-0.023	-0.017	-0.019	-0.046	-0.045	-0.043	-0.043	-0.044	-0.043	-0.040
AR(1)	-1.979 [0.048]	-1.979 [0.048]	-1.924 [0.054]	-2.012 [0.044]	-1.892 [0.059]	-1.898 [0.058]	-1.946 [0.052]	-2.287 [0.022]	-2.436 [0.015]	-2.350 [0.019]	-2.418 [0.016]	-2.315 [0.021]	-2.501 [0.012]	-2.257 [0.024]
AR(2)	0.756 [0.450]	0.795 [0.427]	0.694 [0.488]	0.819 [0.413]	0.716 [0.474]	0.686 [0.493]	0.814 [0.416]	-1.035 [0.301]	-1.049 [0.294]	-1.059 [0.289]	-1.045 [0.296]	-1.030 [0.303]	-1.116 [0.264]	-1.034 [0.301]
Wald	4221 [0.000]	4628 [0.000]	4549 [0.000]	5880 [0.000]	5516 [0.000]	9797 [0.000]	7711 [0.000]	14565 [0.000]	52937 [0.000]	16815 [0.000]	15449 [0.000]	18198 [0.000]	33454 [0.000]	32811 [0.000]
Hansen	5.528 [0.137]	4.411 [0.220]	5.039 [0.169]	3.798 [0.284]	5.932 [0.115]	5.355 [0.148]	3.019 [0.389]	2.865 [0.413]	2.827 [0.419]	2.954 [0.399]	3.019 [0.389]	2.933 [0.402]	2.755 [0.431]	3.163 [0.367]
Sargan	3.722 [0.293]	3.001 [0.391]	4.088 [0.252]	3.053 [0.384]	3.807 [0.283]	4.121 [0.249]	3.740 [0.291]	3.059 [0.383]	3.332 [0.343]	3.178 [0.365]	3.040 [0.385]	3.058 [0.383]	2.946 [0.400]	2.633 [0.452]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Table 4. Robustness tests – Firm's age impact (continue).

	Financial debt – older firms							Financial debt – younger firms						
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Debt (t-1)	0.441	0.440	0.421	0.400	0.451	0.414	0.387	0.456***	0.500***	0.462***	0.447***	0.504***	0.471***	0.429***
Constant	-0.633	-0.441	-0.607	-0.435	-0.531	-0.614	-0.885	0.148	0.049	0.010	0.073	0.156	-0.007	0.150
WOB	-0.150	-	-	-	-0.089	-	-	-0.097	-	-	-	-0.015	-	-
CEOG	-	-0.164**	-	-	-	-	-	-	-0.025	-	-	-	-	-
EW	-	-	-0.187*	-	-	-0.188	-	-	-	-0.027	-	-	-0.063	-
IW	-	-	-	-0.199	-	-	-0.389	-	-	-	-0.067	-	-	-0.060
CEOG*WOB	-	-	-	-	-0.484	-	-	-	-	-	-	-0.206	-	-
CEOG*EW	-	-	-	-	-	-0.002	-	-	-	-	-	-	0.050	-
CEOG*IW	-	-	-	-	-	-	2.220	-	-	-	-	-	-	-0.127
CEOD	-0.086*	-0.101*	-0.093**	-0.105*	-0.097*	-0.094**	-0.094	0.124***	0.122***	0.120***	0.132***	0.123***	0.120***	0.136***
IND	0.190	0.170	0.184	0.198	0.184	0.185	0.192	0.245	0.213	0.198	0.264	0.307	0.171	0.300
BS	-0.115	-0.105	-0.110	-0.095	-0.115	-0.111	-0.073	0.199**	0.188**	0.203**	0.225**	0.165	0.199**	0.242***
ROA	0.390	0.390	0.400	0.397	0.398	0.396	0.529	0.141***	0.129**	0.129***	0.140***	0.138**	0.127***	0.146***
MTBV	0.005	-0.001	0.004	0.002	0.003	0.004	-0.011	0.006	-0.001	-0.001	0.006	0.004	-0.003	0.007
AS	-0.815	-0.920	-0.860	-1.017	-0.795	-0.875	-0.833	0.045	0.063	0.089	0.111	0.045	0.066	0.116
SIZE	0.040	0.036	0.039	0.035	0.038	0.040	0.043	-0.010	-0.007	-0.004	-0.010	-0.011	-0.003	-0.014
AGE	0.104	0.073	0.104	0.079	0.089	0.104	0.134	-0.032	-0.023	-0.035	-0.034	-0.021	-0.032	-0.041
AR(1)	-1.633 [0.102]	-1.681 [0.093]	-1.642 [0.101]	-1.729 [0.084]	-1.662 [0.097]	-1.664 [0.096]	-1.777 [0.076]	-2.198 [0.028]	-2.171 [0.030]	-2.213 [0.027]	-2.222 [0.026]	-2.188 [0.029]	-2.174 [0.030]	-2.255 [0.024]
AR(2)	-0.441 [0.659]	-0.388 [0.698]	-0.533 [0.594]	-0.356 [0.722]	-0.425 [0.671]	-0.523 [0.601]	-0.267 [0.789]	-0.124 [0.901]	-0.109 [0.913]	-0.225 [0.822]	-0.143 [0.886]	0.109 [0.913]	-0.352 [0.725]	-0.124 [0.901]
Wald	1146 [0.000]	796.0 [0.000]	968.5 [0.000]	933.7 [0.000]	1352 [0.000]	1004 [0.000]	964.0 [0.000]	45667 [0.000]	22689 [0.000]	30722 [0.000]	19439 [0.000]	16110 [0.000]	35510 [0.000]	21605 [0.000]
Hansen	0.807 [0.848]	1.139 [0.768]	0.758 [0.859]	0.679 [0.878]	0.924 [0.820]	0.761 [0.859]	0.559 [0.906]	1.166 [0.761]	1.076 [0.783]	0.948 [0.814]	1.181 [0.758]	1.960 [0.581]	0.866 [0.834]	1.329 [0.722]
Sargan	1.132 [0.769]	1.269 [0.736]	0.702 [0.873]	0.441 [0.932]	1.397 [0.706]	0.705 [0.872]	0.440 [0.932]	0.769 [0.857]	1.037 [0.792]	0.807 [0.848]	1.059 [0.787]	1.287 [0.732]	0.844 [0.839]	0.995 [0.802]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

The results in Table 4 show that firms' age impacts the conclusions, as women's influence on firms' capital structure is only evident for older firms. Moreover, in addition to previous findings for older firms, market-to-book value has a positive impact on long-term debt and a negative impact on short-term debt. Contrary to the proposal of market timing theory, an increase in market-to-book value contributes to the rise in long-term debt, as the debtholders have more confidence that firms can quickly meet debt covenants. CEO duality contributes to decreasing financial debt in older firms, suggesting that when the CEO is also the chairman, their aversion to risk, especially financial risk, increases. The impact of CEO duality on financial debt is the opposite for younger firms, which is explained by these firms' need for more financial sources. Additionally, board size is also relevant for younger firms in positively explaining financial debt, as a larger board contributes to increasing information transparency.

Table 5 shows that firms' size also impacts capital structure. Female presence on BOD is more relevant to explain capital structure for small-size firms. The presence of a female CEO and female executive members reduce total debt for small-size firms and have no impact on large-size firms. This finding is new since the effect of female presence on total debt was insignificant in the previous analysis, suggesting that female members contribute to reducing firms' risk, especially in small-size firms. Although gender diversity contributes to decreasing leverage for both large and small-size firms, the results are more consistent with small firms, especially the impact of WOB.

Moreover, the variable IW gains relevance to explain long-term debt for small-size firms, suggesting that for these firms, independent women act as a monitoring effect of BOD, reducing agency costs, mitigating conflicts, and decreasing leverage levels. This result supports our hypothesis H3b. A similar result was found by Benkraiem et al. (2018). Concerning short-term debt, the impact of gender diversity also exists in large and small-size firms, but it is more relevant to small firms, especially regarding women's presence on board. Finally, independent women on BOD are relevant to reduce financial debt for small-size firms, which corroborates our hypothesis H3c. Independent female directors act as moderators to reduce firms' leverage and risk.

When analyzing the impact of size, we find that other explanatory variables become more relevant. For instance, for large firms, CEO duality reduces short-term debt, while independent members increase long-term and financial debt by improving decision-making quality. Board size also contributes to the rise in long-term debt and decreases short-term debt. Surprisingly, asset structure has a negative impact on long-term and financial debt, contrary to our expectations. However, it positively affects short-term debt as fixed assets can be used as collateral. For small-size firms, market-to-book value contributes to an increase in long-term and financial debt while a decrease in short-term debt.

In addition, we also analyze the impact of critical mass women on board, as examined by Saad and Belkacem (2022). In Portugal, listed firms are required to have at least 33.3% of their board seats occupied by women as of 1 January 2020. To assess the effect of this policy, we create a dummy variable for women's critical mass (DWMass) and include it in our analysis. The results of our analysis are shown in Table 6.

Table 5. Robustness tests – Firm's size impact.

	Total debt – large-size firms							Total debt – small-size firms						
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Debt (t-1)	0.709	0.831	0.786**	0.809***	0.633	0.748*	0.798**	0.712***	0.691***	0.702***	0.734***	0.643***	0.804***	0.672**
Constant	0.358	0.210	0.250	0.226	0.450	0.281	0.235	0.292	0.304	0.308	0.267	0.361	0.190	0.325
WOB	-0.017	-	-	-	-0.016	-	-	-0.009	-	-	-	-0.009	-	-
CEOG	-	0.004	-	-	-	-	-	-	-0.003*	-	-	-	-	-
EW	-	-	0.001	-	-	-0.011	-	-	-	-0.012**	-	-	-0.002	-
IW	-	-	-	0.001	-	-	0.001	-	-	-	-0.012	-	-	-0.023
CEOG*WOB	-	-	-	-	-0.031	-	-	-	-	-	-	-0.060*	-	-
CEOG*EW	-	-	-	-	-	0.017	-	-	-	-	-	-	-0.019***	-
CEOG*IW	-	-	-	-	-	-	-0.009	-	-	-	-	-	-	-0.021
CEOD	0.007	0.010	0.008	0.009	0.003	0.008	0.009	0.000	-0.000	0.000	0.001	0.000	-0.000	0.002
IND	0.012	0.009	0.005	0.004	0.012	0.004	0.004	0.002	0.005	0.001	0.005	0.001	0.004	0.003
BS	0.020	0.017	0.017	0.016	0.021	0.018	0.017	0.001	0.000	0.001	0.001	0.001	0.000	0.002
ROA	-0.018	-0.012	-0.017	-0.015	-0.027	-0.018	-0.016	0.005***	0.005***	0.006***	0.005***	0.006***	0.006***	0.005***
MTBV	-0.002	-0.000	-0.001	-0.001	-0.003	-0.002	-0.001	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
AS	0.006	-0.012	0.004	0.000	0.023	0.013	0.000	-0.005	0.002	-0.006	0.002	-0.006	0.000	-0.002
SIZE	-0.005	-0.004	-0.004	-0.004	-0.006	-0.004	-0.004	-0.000	0.000	-0.001	-0.000	-0.000	0.000	-0.000
AGE	-0.002	-0.000	-0.000	0.000	-0.003	0.001	0.000	0.001	0.000	0.001**	0.000	0.001	0.000	0.000
AR(1)	-0.904 [0.366]	-0.975 [0.329]	-0.935 [0.350]	-0.958 [0.338]	-0.837 [0.402]	-0.933 [0.351]	-0.956 [0.339]	-2.129 [0.033]	-2.214 [0.027]	-2.037 [0.042]	-1.937 [0.053]	-1.832 [0.067]	-2.172 [0.030]	-1.733 [0.083]
AR(2)	-1.292 [0.196]	-1.287 [0.198]	-1.288 [0.198]	-1.286 [0.198]	-1.259 [0.208]	-1.298 [0.194]	-1.286 [0.198]	0.268 [0.789]	1.114 [0.265]	-0.479 [0.632]	0.606 [0.545]	-0.508 [0.612]	0.289 [0.772]	0.345 [0.730]
Wald	433690 [0.000]	201016 [0.000]	227805 [0.000]	253070 [0.000]	434416 [0.000]	186345 [0.000]	584977 [0.000]	2.11e+07 [0.000]	8.17e+06 [0.000]	1.37e+07 [0.000]	7.51e+06 [0.000]	1.60e+07 [0.000]	2.19e+07 [0.000]	9230 [0.000]
Hansen	2.338 [0.505]	2.194 [0.533]	2.104 [0.551]	2.124 [0.547]	2.022 [0.568]	2.627 [0.453]	2.169 [0.538]	1.308 [0.727]	2.605 [0.457]	1.087 [0.780]	3.774 [0.287]	1.408 [0.704]	1.935 [0.586]	3.144 [0.370]
Sargan	1.401 [0.705]	1.150 [0.765]	2.276 [0.517]	1.783 [0.619]	0.917 [0.821]	2.069 [0.558]	1.764 [0.623]	2.708 [0.439]	5.431 [0.143]	3.688 [0.297]	3.876 [0.275]	2.518 [0.472]	4.486 [0.214]	4.206 [0.240]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Table 5. Robustness tests – Firm's size impact (continue).

	Long-term debt – large-size firms							Long-term debt – small-size firms						
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Debt (t-1)	0.035	0.039	-0.005	0.066	0.034	-0.005	0.061	0.767***	0.701***	0.714***	0.687***	0.699***	0.716***	0.531*
Constant	0.880	0.874	0.852	0.937	0.855	0.846	0.966	0.046	-0.274	-0.136	-0.541	-0.115	-0.157	-0.434
WOB	-0.119	-	-	-	-0.033	-	-	-0.573***	-	-	-	-0.464***	-	-
CEOG	-	-0.100**	-	-	-	-	-	-	-0.053	-	-	-	-	-
EW	-	-	-0.328***	-	-	-0.345***	-	-	-	-0.160***	-	-	-0.136	-
IW	-	-	-	0.059	-	-	0.061	-	-	-	-0.677***	-	-	0.015
CEOG*WOB	-	-	-	-	-0.296	-	-	-	-	-	-	-0.589***	-	-
CEOG*EW	-	-	-	-	-	0.029	-	-	-	-	-	-	-0.034	-
CEOG*IW	-	-	-	-	-	-	-0.039	-	-	-	-	-	-	-2.841
CEOD	0.042	0.026	0.026	0.039	0.028	0.028	0.040	0.007	-0.016	-0.016	-0.010	-0.007	-0.018	-0.065
IND	0.149*	0.133*	0.196**	0.136*	0.130	0.199**	0.139*	-0.116	-0.001	-0.017	0.181	-0.052	-0.008	0.189
BS	0.259***	0.229***	0.210***	0.277***	0.223***	0.212***	0.279***	0.003	-0.040	-0.027	-0.035	-0.021	-0.029	-0.119
ROA	-0.139	-0.159	-0.130	-0.269	-0.141	-0.127	-0.261	0.120**	0.118***	0.116***	0.100***	0.124**	0.117***	0.121***
MTBV	0.001	-0.004	-0.010	0.005	-0.003	-0.010	0.006	0.034***	0.027**	0.028**	0.027**	0.033***	0.028**	0.042*
AS	-0.894**	-0.788**	-0.593*	-1.127***	-0.788**	-0.588*	-1.142***	-0.265**	-0.051	-0.107	-0.020	-0.224*	-0.094	0.012
SIZE	-0.041	-0.037	-0.029	-0.050	-0.034	-0.030	-0.051	0.007	0.027	0.017	0.040	0.019	0.019	0.047
AGE	-0.031	-0.037	-0.058**	-0.014	-0.041*	-0.057**	-0.015	0.011	0.005	0.013	0.007	0.011	0.011	0.012
AR(1)	-2.504 [0.012]	-2.451 [0.014]	-2.315 [0.021]	-2.723 [0.007]	-2.467 [0.014]	-2.317 [0.021]	-2.659 [0.008]	-2.916 [0.004]	-2.885 [0.004]	-2.973 [0.003]	-2.897 [0.004]	-2.915 [0.004]	-3.017 [0.003]	-1.953 [0.051]
AR(2)	-0.181 [0.856]	-0.176 [0.860]	-0.410 [0.682]	-0.177 [0.860]	-0.167 [0.868]	-0.416 [0.677]	-0.208 [0.835]	-1.000 [0.317]	-0.874 [0.382]	-0.967 [0.333]	-0.554 [0.580]	-1.023 [0.306]	-0.933 [0.351]	-0.875 [0.382]
Wald	1869 [0.000]	2214 [0.000]	1882 [0.000]	1695 [0.000]	2056 [0.000]	1831 [0.000]	1906 [0.000]	2380 [0.000]	2554 [0.000]	3201 [0.000]	1420 [0.000]	2466 [0.000]	17743 [0.000]	803.3 [0.000]
Hansen	0.640 [0.887]	0.669 [0.880]	1.007 [0.800]	0.713 [0.870]	0.836 [0.841]	1.002 [0.801]	0.672 [0.880]	1.953 [0.582]	0.700 [0.873]	0.786 [0.853]	1.119 [0.772]	1.913 [0.591]	0.769 [0.857]	0.562 [0.905]
Sargan	0.496 [0.920]	0.588 [0.899]	0.772 [0.856]	0.458 [0.928]	0.618 [0.892]	0.737 [0.865]	0.480 [0.923]	1.329 [0.722]	0.364 [0.948]	0.459 [0.928]	0.895 [0.827]	1.311 [0.727]	0.420 [0.936]	0.712 [0.870]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Table 5. Robustness tests – Firm's size impact (continue)

	Short-term debt – large-size firms							Short-term debt – small-size firms						
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Debt (t-1)	0.085	0.087	0.047	0.090	0.089	0.047	0.092	0.849***	0.787***	0.803***	0.790***	0.845***	0.800***	0.792***
Constant	0.276	0.367	0.271	0.334	0.290	0.283	0.354	-0.111	0.267	0.116	0.524	-0.083	0.145	0.657
WOB	0.098	-	-	-	0.116	-	-	0.454***	-	-	-	0.435***	-	-
CEOG	-	0.018	-	-	-	-	-	-	0.035	-	-	-	-	-
EW	-	-	0.284***	-	-	0.396***	-	-	-	0.146***	-	-	0.120	-
IW	-	-	-	-0.056	-	-	-0.055	-	-	-	0.483	-	-	0.735
CEOG*WOB	-	-	-	-	-0.064	-	-	-	-	-	-	0.437**	-	-
CEOG*EW	-	-	-	-	-	-0.188***	-	-	-	-	-	-	0.046	-
CEOG*IW	-	-	-	-	-	-	-0.100	-	-	-	-	-	-	-0.654
CEOD	-0.072**	-0.065**	-0.055**	-0.066**	-0.074**	-0.063***	-0.066**	-0.004	0.013	0.016	0.007	0.001	0.017	-0.019
IND	-0.074	-0.071	-0.124	-0.069	-0.082	-0.138	-0.069	0.101	-0.017	-0.002	-0.153	0.077	-0.013	-0.169
BS	-0.184***	-0.180***	-0.138*	-0.185***	-0.187***	-0.152**	-0.183***	0.019	0.044	0.032	0.047	0.023	0.036	0.023
ROA	0.153	0.172	0.141	0.199	0.153	0.135	0.201	-0.159*	-0.138*	-0.140*	-0.134*	-0.157*	-0.140*	-0.127**
MTBV	-0.018	-0.014	-0.008	-0.015	-0.017	-0.009	-0.014	-0.052***	-0.036**	-0.039**	-0.034**	-0.050***	-0.038**	-0.032
AS	0.891*	0.893*	0.693*	0.967**	0.899*	0.662*	0.958*	0.236**	0.041	0.093	0.010	0.228**	0.083	0.009
SIZE	0.022	0.018	0.014	0.020	0.022	0.016	0.019	0.004	-0.015	-0.006	-0.029	0.001	-0.008	-0.033
AGE	0.026	0.025	0.051*	0.024	0.025	0.045	0.024	-0.011	0.000	-0.008	0.001	-0.009	-0.006	0.001
AR(1)	-2.420 [0.016]	-2.512 [0.012]	-2.335 [0.020]	-2.701 [0.007]	-2.427 [0.015]	-2.393 [0.017]	-2.678 [0.007]	-2.398 [0.017]	-2.500 [0.012]	-2.469 [0.014]	-2.571 [0.010]	-2.409 [0.016]	-2.502 [0.012]	-2.570 [0.010]
AR(2)	0.0506 [0.960]	0.021 [0.983]	-0.107 [0.915]	0.047 [0.963]	0.075 [0.940]	-0.158 [0.874]	0.058 [0.954]	-1.065 [0.287]	-0.907 [0.364]	-0.998 [0.318]	-0.788 [0.431]	-1.042 [0.298]	-0.968 [0.333]	-0.747 [0.455]
Wald	1817 [0.000]	1921 [0.000]	3224 [0.000]	2377 [0.000]	1912 [0.000]	5440 [0.000]	2593 [0.000]	7846 [0.000]	10186 [0.000]	6322 [0.000]	3460 [0.000]	10161 [0.000]	69724 [0.000]	143.5 [0.000]
Hansen	1.740 [0.628]	1.407 [0.704]	1.935 [0.586]	0.865 [0.834]	1.685 [0.640]	1.437 [0.697]	0.853 [0.837]	4.529 [0.210]	3.588 [0.310]	3.701 [0.296]	3.296 [0.348]	4.694 [0.196]	3.683 [0.298]	2.965 [0.397]
Sargan	2.362 [0.501]	2.282 [0.516]	2.870 [0.412]	1.345 [0.719]	2.403 [0.493]	2.700 [0.440]	1.297 [0.730]	4.859 [0.182]	4.874 [0.181]	4.574 [0.206]	2.404 [0.493]	4.776 [0.189]	4.603 [0.203]	2.525 [0.471]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Table 5. Robustness tests – Firm's size impact (continue).

	Financial debt – large-size firms							Financial debt – small-size firms						
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Debt (t-1)	0.358	0.345	0.245	0.484	0.267	0.112	0.480	0.545**	0.594**	0.580**	0.538**	0.535*	0.564*	0.730***
Constant	1.397	1.418	1.739	1.175	1.570	1.906**	1.174	-0.523	-0.627	-0.486	-0.833	-0.655	-0.559	-1.885***
WOB	-0.110	-	-	-	-0.024	-	-	-0.214	-	-	-	-0.142	-	-
CEOG	-	-0.092	-	-	-	-	-	-	-0.081	-	-	-	-	-
EW	-	-	-0.336**	-	-	-0.186	-	-	-	-0.131	-	-	-0.086	-
IW	-	-	-	0.060	-	-	0.059	-	-	-	-0.524***	-	-	-2.138**
CEOG*WOB	-	-	-	-	-0.438	-	-	-	-	-	-	-0.496	-	-
CEOG*EW	-	-	-	-	-	-0.234	-	-	-	-	-	-	-0.067	-
CEOG*IW	-	-	-	-	-	-	-0.022	-	-	-	-	-	-	8.101
CEOD	0.062	0.045	0.044	0.081	0.028	0.007	0.080	-0.058	-0.073	-0.071	-0.062	-0.069	-0.072	0.088
IND	0.281**	0.253**	0.312**	0.242**	0.272**	0.339***	0.242**	-0.071	-0.031	-0.040	0.101	-0.038	-0.035	-0.028
BS	0.243	0.209	0.229	0.225	0.200	0.210	0.225	-0.124	-0.124	-0.120	-0.137	-0.141	-0.129	0.069
ROA	0.073	0.034	-0.034	0.055	0.017	-0.069	0.054	0.092	0.085	0.084	0.081	0.093	0.082	0.089
MTBV	-0.041	-0.052	-0.065	-0.036	-0.054	-0.074	-0.037	0.032*	0.024	0.028	0.027	0.030*	0.027	-0.031
AS	-2.226*	-2.049	-2.007*	-1.874	-2.330*	-2.550*	-1.876	0.047	0.126	0.082	0.161	0.090	0.084	0.128
SIZE	-0.064	-0.058	-0.066	-0.059	-0.059	-0.064	-0.059	0.061	0.066*	0.057	0.079*	0.071*	0.062*	0.100***
AGE	-0.049	-0.067	-0.105*	-0.038	-0.076	-0.119**	-0.039	-0.007	-0.018	-0.007	-0.016	-0.012	-0.008	0.001
AR(1)	-1.683 [0.092]	-1.558 [0.119]	-1.569 [0.117]	-1.648 [0.099]	-1.627 [0.104]	-1.370 [0.171]	-1.632 [0.103]	-1.586 [0.113]	-1.725 [0.085]	-1.593 [0.111]	-1.679 [0.093]	-1.543 [0.123]	-1.462 [0.144]	-2.239 [0.025]
AR(2)	-0.351 [0.726	-0.147 [0.883]	-0.331 [0.740]	-0.430 [0.667]	-0.010 [0.920]	-0.160 [0.873]	-0.423 [0.672]	0.177 [0.859]	0.399 [0.690]	0.168 [0.866]	0.288 [0.774]	0.216 [0.829]	0.174 [0.862]	-0.206 [0.837]
Wald	1434 [0.000]	1244 [0.000]	1686 [0.000]	1876 [0.000]	1323 [0.000]	1830 [0.000]	1903 [0.000]	1264 [0.000]	1786 [0.000]	2317 [0.000]	1145 [0.000]	1492 [0.000]	2740 [0.000]	1379 [0.000]
Hansen	5.780 [0.123]	5.234 [0.155]	5.827 [0.120]	4.888 [0.180]	5.486 [0.140]	5.160 [0.160]	4.897 [0.179]	5.199 [0.158]	4.737 [0.192]	5.168 [0.160]	5.145 [0.161]	5.399 [0.145]	5.460 [0.141]	1.680 [0.641]
Sargan	4.198 [0.241]	3.896 [0.273]	4.224 [0.238]	5.199 [0.158]	3.570 [0.312]	3.771 [0.287]	5.230 [0.156]	3.268 [0.352]	3.340 [0.342]	3.419 [0.331]	3.007 [0.390]	3.402 [0.334]	3.405 [0.333]	3.137 [0.371]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Table 6. Robustness tests – Women's critical mass.

	Total debt					Long-term debt				
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Debt (t-1)	0.720*	0.660	0.655	0.684	0.735	0.498***	0.439***	0.490***	0.477***	0.472***
Constant	0.290	0.355	0.351	0.321	0.268	-0.100	-0.080	-0.057	-0.029	-0.050
DWMass	-0.007	-	-	-	-	-0.065**	-	-	-	-
WOB	-	-0.012	-	-	-	-	-0.201	-	-	-
DWMass*WOB	-	-0.010	-	-	-	-	-0.035	-	-	-
CEOG	-	-	-0.002	-	-	-	-	-0.067*	-	-
DWMass*CEOG	-	-	-0.019	-	-	-	-	-0.032	-	-
EW	-	-	-	-	-	-	-	-	-0.130**	-
DWMass*EW	-	-	-	0.000	-	-	-	-	-0.103	-
IW	-	-	-	-	-0.001	-	-	-	-	-0.073
CEOD	0.003	0.002	0.001	0.001	0.002	0.010	0.016	-0.004	-0.008	0.016
IND	0.003	0.002	0.005	0.002	0.003	0.002	0.014	-0.007	0.014	0.002
BS	0.005	0.007	0.004	0.004	0.004	0.038	0.062	0.041	0.035	0.080
ROA	0.006***	0.006***	0.006	0.006***	0.006***	0.098***	0.105***	0.103***	0.103***	0.103***
MTBV	0.000	0.000	-0.001	-0.000	-0.000	0.011	0.013	0.008	0.009	0.009
AS	-0.007	-0.007	-0.001	-0.002	-0.001	-0.212	-0.248	-0.186	-0.224	-0.215
SIZE	-0.001	-0.002	-0.001	-0.001	-0.001	0.011	0.010	0.010	0.010	0.005
AGE	0.001	0.001	-0.001	0.001	0.001	0.013	0.008	0.006	0.007	0.009
AR(1)	-0.924 [0.355]	-0.875 [0.381]	-0.920 [0.358]	-0.857 [0.391]	-0.893 [0.372]	-3.103 [0.002]	-3.194 [0.001]	-3.205 [0.001]	-3.130 [0.002]	-3.157 [0.002]
AR(2)	-1.263 [0.207]	-1.273 [0.203]	-1.175 [0.240]	-1.259 [0.208]	-1.279 [0.201]	0.277 [0.782]	0.201 [0.841]	0.300 [0.764]	0.183 [0.855]	0.240 [0.810]
Wald	1.20e+06 [0.000]	866731 [0.000]	870792 [0.000]	1.03e+06 [0.000]	1.06e+06 [0.000]	1694 [0.000]	1558 [0.000]	1506 [0.000]	1757 [0.000]	1557 [0.000]
Hansen	3.392 [0.335]	3.420 [0.331]	3.996 [0.262]	3.968 [0.265]	3.927 [0.269]	3.481 [0.323]	5.312 [0.150]	3.023 [0.388]	3.492 [0.322]	3.930 [0.269]
Sargan	3.165 [0.367]	1.329 [0.722]	3.163 [0.367]	2.735 [0.434]	1.847 [0.605]	1.481 [0.687]	2.055 [0.561]	1.336 [0.721]	1.524 [0.677]	1.546 [0.672]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Table 6. Robustness tests – Women's critical mass (continue)

	Short-term debt					Financial debt				
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Debt (t-1)	0.579***	0.588***	0.606***	0.589***	0.588***	0.432**	0.402**	0.457**	0.402*	0.433**
Constant	0.504	0.459	0.422	0.437	0.451	-0.019	0.099	0.033	0.096	0.076
DWMass	0.076**	-	-	-	-	-0.060	-	-	-	-
WOB	-	0.068	-	-	-	-	-0.249*	-	-	-
DWMass*WOB	-	0.166	-	-	-	-	-0.047	-	-	-
CEOG	-	-	0.033	-	-	-	-	-0.106*	-	-
DWMass*CEOG	-	-	-0.017	-	-	-	-	-0.123	-	-
EW	-	-	-	0.104	-	-	-	-	-0.168	-
DWMass*EW	-	-	-	0.073	-	-	-	-	-0.206**	-
IW	-	-	-	-	0.027	-	-	-	-	-0.121
CEOD	-0.014	-0.015	-0.009	0.001	-0.013	0.011	0.010	-0.007	-0.008	0.009
IND	-0.020	-0.022	-0.018	-0.036	-0.022	0.134	0.136	0.142	0.178	0.166
BS	0.014	0.010	-0.012	0.010	-0.016	0.036	0.069	0.039	0.038	0.089
ROA	-0.089	-0.092	-0.089	-0.089	-0.091	0.107***	0.129***	0.119***	0.119***	0.119***
MTBV	-0.019	-0.021	-0.016	-0.017	-0.015	0.005	0.002	-0.005	-0.000	-0.000
AS	0.190	0.213*	0.135	0.171	0.148	-0.449	-0.463	-0.369	-0.480	-0.375
SIZE	-0.014	-0.012	-0.009	-0.012	-0.009	0.017	0.010	0.015	0.014	0.007
AGE	-0.014	-0.012	-0.008	-0.008	-0.009	-0.015	-0.019	-0.024	-0.024	-0.021
AR(1)	-2.964 [0.003]	-2.934 [0.003]	-3.002 [0.003]	-2.931 [0.003]	-2.977 [0.003]	-2.349 [0.019]	-2.447 [0.014]	-2.588 [0.010]	-2.322 [0.020]	-2.596 [0.009]
AR(2)	0.419 [0.675]	0.422 [0.673]	0.465 [0.642]	0.413 [0.680]	0.446 [0.656]	-0.543 [0.587]	-0.620 [0.535]	-0.288 [0.774]	-0.777 [0.437]	-0.615 [0.538]
Wald	3992 [0.000]	3777 [0.000]	3352 [0.000]	2224 [0.000]	2180 [0.000]	1061 [0.000]	1117 [0.000]	1112 [0.000]	1127 [0.000]	1242 [0.000]
Hansen	5.884 [0.117]	6.197 [0.102]	5.497 [0.139]	5.783 [0.123]	5.373 [0.146]	2.251 [0.522]	1.316 [0.725]	1.816 [0.611]	1.753 [0.625]	0.980 [0.806]
Sargan	3.963 [0.266]	4.390 [0.222]	3.784 [0.286]	3.810 [0.283]	3.674 [0.299]	1.074 [0.783]	0.557 [0.906]	0.849 [0.838]	0.852 [0.837]	0.388 [0.943]

Note: *, **, *** Significant at the 10%, 5% and 1% levels, respectively. p-values in brackets. The variables description is presented in Table 1.

Based on the analysis presented in Table 6, it can be concluded that having at least 33.3% of the board members (DWMass) is effective in reducing long-term debt and increasing short-term debt. However, the presence of a critical mass of women's presence on board is not statistically significant for financial debt. For female executives, a critical mass does not impact long-term debt but is relevant to financial debt. These findings suggest that the presence of a critical mass of women is not always a crucial factor, as its impact on results can vary.

6. Conclusion

This study analyzes the effects of board gender diversity on the financial policies of Portuguese non-financial listed firms between 2010 and 2019. The main results prove that female presence on boards, whether as members, CEO, or executives, leads to a decrease in the firms' level of long-term and financial indebtedness. When raising funds, female members tend to prefer issuing short-term debt. Women not only help monitor the board to prevent opportunistic behaviors and agency costs but also tend to be risk-averse, preferring to decrease the structural debts (long-term debt and financial debt). In this sense, our findings show that firms follow the hierarchy of funding proposed by the pecking order theory, whereby they issue debt only when self-funds are not enough to support the firm's activity. The results are particularly evident in older firms. The existence of at least 33.3% of women on board is not essential, as most of the results hold even without this critical mass. However, independent female directors are particularly effective in decreasing long-term and financial debt for small-size firms.

This study presents some interesting implications. First, our results support the view that different gender roles on board contribute differently to firms' financial policies. We suggest that future research on the effects of gender diversity on firms' capital structure should distinguish between different directors' roles on the board, rather than relying only on traditional measures that focus on the CEO or on measures of women's presence on the board that use the board size as a reference point rather than specific directorship type. Moreover, we also recommend using different capital structure measures, as the impact of gender depends on the type of the company's indebtedness. Second, our findings support the establishment of gender quotas in corporate governance recommendations, as the presence of female directors on the board reduces firm risk. Despite the European Commission's recommendation that women should hold 40% of non-executive positions in public firms by 2020, the representation of women on board remains low in most countries, highlighting the need to reinforce policies to promote gender equality. Finally, our results can help investors to better understand firms' behavior according to the roles attributed to female directors on the corporate boards, potentially creating value through this presence.

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