European Management Journal xxx (xxxx) xxx

Contents lists available at ScienceDirect

European Management Journal

journal homepage: www.elsevier.com/locate/emj

# The gender pay gap at the top floor: A multilevel analysis of Spanish listed companies

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ARTICLE INFO

*Keywords:*
Executive director compensation
Gender pay gap
Random slope
Three-level model

ABSTRACT

The gender pay gap, including at the top management level, is a socially relevant issue; however, it remains controversial. This study explores the distribution of pay by gender for executive directors of Spanish listed companies over the period 2012 to 2021. The analysis is based on multilevel regression. Three-level models with a fixed slope for gender show that female directors face an average 45% pay penalty relative to their male peers after controlling for time-varying individual and board/firm variables, time-invariant firm characteristics, and year of observation. A three-level model including all control variables and a random slope for gender shows that the gender pay penalty varies significantly across boards/firms (from 18% to 78%), with an average value of 46%. This finding suggests that unobservable heterogeneity among firms is a primary source of the observed gender pay gap.

## 1. Introduction

The gender measures and quotas imposed in recent years reflect the social interest in breaking through the glass ceiling. These actions have pressured or encouraged companies to achieve greater participation of women in company management, particularly on the board of directors. Some theories also suggest that besides ensuring equity and access to the talent of one-half of society, women's participation can be positive for company development and management. For example, resource dependency theory suggests that companies may want to diversify their governing bodies to broaden knowledge, skills, and contact networks (Hillman et al., 2000). This argument is supported by stakeholder theory, which conceives of a firm as a system of multiple stakeholders. Under stakeholder theory, diversity allows firms to make better decisions than if they had male-dominated boards, which may be out of touch with groups of stakeholders, such as women. Such a situation could incur costs owing to this stakeholder group's dissatisfaction with being overlooked (Ali et al., 2014; Carter et al., 2003). Another body of work, agency theory, suggests that women adopt more active roles than men in monitoring and controlling executives (Adams & Ferreira, 2009; Gallego et al., 2010).

Despite these arguments and the steady increase in the number of female directors, women remain generally underrepresented on the board of directors, particularly in executive positions. For example, in 2022, the average percentage of female directors in EU countries was 32.2%. Of these female directors, 21% were executives and 8.4% were CEOs. In Spain, the percentage of female directors was approximately 35%, with female executive directors and CEOs accounting for 18.18% and 2.9%, respectively.[1]

Women's participation on boards of directors has attracted the interest of researchers. Studies have examined the effect of women's inclusion on such areas as debt, financial health, performance, and corporate environmental behavior (Adams & Ferreira, 2009; Hussain et al., 2018; Pandey et al., 2019).

Another well-examined aspect of this debate is the gender pay gap. This concept refers to the systematic difference between the compensation received by women and men for similar work. This paper provides fresh evidence of the possible gender pay gap between male and female executives (Conyon, 2014; Graham et al., 2012; Gupta et al., 2018; Hutchinson et al., 2017; Kulich et al., 2011). Despite some discrepancies, most studies have reported a pay gap, even at the top management level. The gender pay gap, which in 2020 was on average 13% in the EU and

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[1] Data from the European Institute for Gender Equality, Gender Statistics Database website. https://eige.europa.eu/gender-statistics/dgs/indicator/wmidm_bus_bus_wmid_comp_compex/datatable.

https://doi.org/10.1016/j.emj.2024.06.004
Received 25 September 2023; Received in revised form 22 June 2024; Accepted 25 June 2024
Available online 27 June 2024

9.4% in Spain, also exists in leadership positions.[2] A recent study by Schneider et al. (2021) examined the salaries of executives in European companies and found that men are paid more than women. For the Spanish market, García and Herrero (2019) found that female executives' average salary is 2.8 times lower than that of men in the same position.

Several reasons have been suggested to explain these differences, including human capital attributes, as well as the characteristics of companies and their governing bodies. Theoretically, the most relevant approaches for explaining executive compensation are human capital theory and agency theory. According to human capital theory (Mincer, 1958), differences in compensation could be determined by differences in individual worker characteristics (i.e., skills, education, and experience). In contrast, agency theory (Jensen & Meckling, 1976) suggests that board compensation is a mechanism for aligning the objectives of managers and shareholders. Hence, company-specific aspects related to the supervisory and advisory role of board members (business complexity, company size, etc.) can lead to pay differentials. In line with these theories, any gender pay gap that is not the result of individual characteristics or firm characteristics may be the result of discrimination.

As indicated earlier, the empirical evidence at the director and senior executive levels in different markets appears to be inconsistent. For example, some studies have confirmed that women receive less compensation than their male counterparts at the executive director level (García & Herrero, 2019; Handschumacher-Knors, 2022). This inequality in fact seems to exist among all directors (Pucheta-Martinez & Bel-Oms, 2015) and senior management positions (Oehmichen et al., 2014; Schneider et al., 2021). However, other studies have shown no significant pay gap between male and female CEOs (Bugeja et al., 2012; Gupta et al., 2018). There is even evidence that women earn more in top management positions (Gayle et al., 2012). According to Leslie et al. (2017), the pressure to include women on the board of directors should lead companies to attract the best talent, and hiring such talent should in fact lead to a wage premium for women. The question of whether a gender pay gap exists at the executive level remains unanswered.

The present study tackled the questions surrounding the nature or existence of the gender pay gap using quantitative methods. Specifically, multilevel analysis was used because it groups individuals with others who display similar behavior. If such a grouping is possible, then traditional analyses may be violating the assumption of independence between individuals and thus may be providing erroneous results.

Recent methodological advances in the literature on executive compensation mean that the influence of time-level, director-level, and firm-level variables on executive board members' compensation can be analyzed (Acero & Alcalde, 2020; Handschumacher-Knors, 2022; Núñez et al., 2022). Multilevel analysis reveals whether the lower average compensation of women executive board members is due to individual- or firm-specific characteristics or whether it is the result of an arbitrary gender pay gap due to discrimination against women directors. To address the research aims, the gender pay gap among executives of Spanish listed companies from 2012 to 2021 was analyzed. This period was chosen because of data availability; since 2012, companies listed in Spanish markets have been required to provide a compensation report for their board of directors.

Despite these ongoing signs of pay inequality, women have been gaining ground on Spanish corporate boards in recent years. In 2006, the Unified Good Governance Code of Listed Companies was approved. A year later, the Organic Law March 2007 for the Effective Equality of Men and Women came into force. Through these regulations, Spain has sought to include women in corporate governance structures. The aforementioned law targeted a level of board representation of 40% by 2015. This percentage remains a target, and initiatives have since been taken to continue to promote gender diversity on boards of directors. Notable examples include Law 31/2014 of 3 December and Law November 2018 of 28 December. In 2013, the Unified Good Governance Code of Listed Companies was updated. In 2015, the new Code of Good Governance came into force. It was then updated in 2020 to set a target of a minimum of 40% female directors on boards of directors by 2022. Two aspects about these initiatives are worth noting. First, they offer recommendations. Failure to achieve these rates of inclusion does not lead to sanctions, if justified. Second, they refer to the participation of women on the board. These women do not need to be executives, however.

The success or failure of these recommendations should not be determined solely by whether there is a given percentage of women on the board. This percentage is still far off the target, particularly at the executive director level. To assess whether women are truly valued as directors, there should be no significant differences in terms of salaries. The rule of equal pay for equal work should be upheld.

This paper adds to the literature on the gender pay gap of directors in several ways. First, studying the gender pay gap among executive directors in Spain is relevant, because Spain was one of the first countries to introduce gender diversity rules in 2007. Although not mandatory, these rules have continued to be updated, leading to a steady progression of inclusion of women on corporate boards. Therefore, Spain offers a suitable scenario for analyzing whether the inclusion of women is effective and equal in terms of compensation in positions of leadership. Second, the use of a three-level multilevel technique means that heterogeneity among observations, individual directors, and boards/firms can be assessed. Estimation of regression models at three levels—time, individual, and firm—enables assessment of the relative importance of each level of analysis and of specific variables at each level while holding all other levels and variables constant. Third, a three-level model with a random slope for gender in the level-2 equation predicts a firm-specific gender pay gap for firms with female executive directors.

The remainder of the paper is structured as follows. Section 2 presents the literature review and hypotheses. Section 3 describes the sample and research method, and Section 4 presents and discusses the results. Section 5 concludes.

## 2. Existing evidence and hypotheses

The inclusion of women in corporate governance structures has attracted scholarly interest. Researchers have sought to analyze the effects of this inclusion on companies in terms of not only equity and social justice, but also corporate growth and development. In general, the results in the literature support actions or policies that favor the inclusion and promotion of women in corporate governance structures. However, women's inclusion will never be complete if the compensation that they receive for their work is systematically lower than that of their male counterparts.

Numerous studies have shown the existence of a pay gap between men and women at the senior management level in different countries. Hutchinson et al. (2017) found that in Australian listed companies, female executives receive 22% less in base salary than men, and that this gap extends to bonuses and long-term incentives. Muñoz-Bullón (2010) confirmed the existence of a gender pay gap at the executive level in US listed companies. Schneider et al. (2021) analyzed a sample of European companies and found that women executives are paid 11% less than men, and that the pay gap is higher for externally hired women who are not promoted internally. Cook et al. (2019) confirmed the existence of a pay gap for both female executives and female board members in a study of US listed companies. Pucheta-Martinez and Bel-Oms (2015) studied Spanish listed companies and observed a pay gap between male and female directors. Handschumacher-Knors (2022) found that in German listed companies, the pay gap between executive women and men is due

[2] Data from the European Institute for Gender Equality, Gender Statistics Database website. https://eige.europa.eu/gender-statistics/dgs/indicator/bpfa_f_offic_f8_earn_gr_gpgr2.

to differences in individual- and company-level characteristics and is not the result of gender-based pay discrimination.

The empirical evidence is not unanimous, however. For example, in the North American market, Hill et al. (2015) found that female CEOs receive higher compensation than male CEOs. In two other studies, Bugeja et al. (2012) and Gupta et al. (2018) found no evidence of a pay gap between men and women at the CEO level.

The reasons cited to explain possible pay differences between men and women vary and include individual director characteristics, directors' functions, company characteristics, and discrimination. The theoretical foundations supporting many of the studies of individual director characteristics are built on human capital theory (Mincer, 1958). The theoretical foundations for the explanation of the impact of company characteristics and corporate governance on director compensation are built most notably on agency theory (Jensen & Meckling, 1976).

Consequently, the existence of a gender pay gap that cannot be explained by individual and/or company-specific factors could be the result of discriminatory behavior. Thus, the behavior of the majority group (men) based on prejudices or negative biases in the perceived capabilities of the minority group (women) may mean that even if women had the same human capital characteristics as men, they would be paid less (Carter et al., 2017).

### 2.1. Individual characteristics

According to human capital theory (Mincer, 1958), a worker's wages are a function of that individual's education and experience, among other personal characteristics. A gender pay gap justified by differences in skills, education, professional background, and other human capital variables would be legitimate and nondiscriminatory.

One of the factors explaining the gender pay gap in the labor market relates to the educational background and qualifications of workers. However, for executive directors, academic qualifications would seem irrelevant as a consideration. The ability to access corporate governance structures would imply that regardless of gender, any executive has extensive qualifications, skills, and training. For instance, Bell (2005) reported that the educational levels of men and women executives are not significantly different. Unsurprisingly, therefore, education does not explain pay differences (Acero & Alcalde, 2020; Handschumacher-Knors, 2022; Keller et al., 2023).

Regarding the characteristics of executive directors, age, and time at the company, among other aspects, may reflect their skills in the role and experience accumulated over time. These characteristics are expected to have a direct relationship with total compensation (Acero & Alcalde, 2020; Beck et al., 2020; Bertrand & Hallock, 2001; Graham et al., 2012; Handschumacher-Knors, 2022; Hutchinson et al., 2017; Vieito & Khan, 2012). However, studies also have shown that this relationship is nonlinear, and that the positive effect on total compensation decreases with time at the company (Muñoz-Bullón 2010). Núñez et al. (2022) found that executive compensation increases with age up to 58 years, after which the relationship becomes negative. In the first year following appointment, executive compensation may be lower because certain incentives or bonuses have not yet been activated and depend on long-term performance (Hutchinson et al., 2017).

Other studies (Conyon, 2014; Graham et al., 2012) have shown that the salary of executives is directly related to their functions in terms of the number of committees they belong to, whether they are the CEO, and whether they are the board chair. For example, 75% of the salary gap observed by Bertrand and Hallock (2001) can be explained by the person's function (CEO and/or chair of the board), as well as the size of the company. Núñez et al. (2022) showed that directors who are also chairs or chairs and CEOs earn more than twice as much as other directors. Hanschumacher-Knors (2022) observed that the individual-level variable with the greatest influence on compensation is CEO status, with CEOs paid 65% more than other executive directors.

### 2.2. Company characteristics

According to agency theory (Jensen & Meckling, 1976) compensation not only is a reflection of directors' work and a way of attracting and retaining talent, but also represents a corporate governance mechanism used to align the interests of managers with those of shareholders. Hence, differences in pay between men and women may be explained by differences between companies and corporate governance structures.

The basic functions of the board, such as monitoring managers and advising on decision making, determine basic board features, such as size, independence, and gender diversity. They also affect agency costs, director compensation, and thus the potential gender pay gap (Geiler & Renneboog, 2015).

Board independence is a mechanism for controlling boards and regulating director compensation, as well as aligning the interests of directors and shareholders (Conyon & He, 2012). Accordingly, highly independent boards are expected to have low agency costs and director compensation. However, board capture theory suggests that having independent directors does not always work in the interests of shareholders and may be conducive to high CEO salaries (Bugeja et al., 2012). Empirical studies also have confirmed a positive relationship between the percentage of independent directors on the board and director compensation (Hutchinson et al., 2017; Sur et al., 2015).

Although the influence of board independence on executive pay has been studies extensively, there is little evidence of its influence on the gender pay gap. Elkinawy and Stater (2011) found that companies with a higher proportion of independent directors pay women less than men, although this difference is significant only if age and tenure are excluded from the model. In addition, Geiler and Renneboog (2015) argued that the participation of more independent directors broadens the range of opinions on the board and contributes to more balanced decision making, overrides certain behavioral biases, and reduces the gender pay gap. Hutchinson et al. (2017) noted that independent boards tend to have executive compensation plans and strategies to avoid a pay gap among employees.

The nature of the impact of board size on compensation is unclear. Some authors link high board compensation to a lack of monitoring by large boards (Bugeja et al., 2012; Conyon, 2014). Meanwhile, other authors argue that coordination problems on large boards encourage powerful CEOs to restrict director compensation to discourage monitoring (Ryan & Wiggins, 2004). Moreover, like independence, board size can help explain the gender pay gap. It is generally accepted that larger boards have more communication problems and take longer to reach decisions, resulting in higher agency costs, as well as more complex and less effective oversight (Boone et al., 2007). Accordingly, larger boards can encounter coordination and supervision problems that can lead to larger pay differences between male and female directors. Research also has shown that board size positively influences the presence of women on the board (Geiger & Marlin, 2012; Hutchinson et al., 2017). From this perspective, board size may have a direct relationship with board gender diversity, which increases independence and oversight (Adams & Ferreira, 2009; Carter et al., 2003), thereby contributing to more balanced decision making and eliminating certain behavioral biases. Bell (2005) and Elkinawy and Stater (2011) found that the pay penalty for women relative to men decreases as the proportion of female directors increases. To date, few studies have examined the impact of board size on the gender pay gap, however.

Building on this idea, women managers may be more likely to support gender equality, either because they are more sensitive to it or because they themselves have experienced gender discrimination. Thus, with respect to board gender diversity, theories of gender discrimination (Altonji & Blank, 1999) suggest that gender-diverse boards are less likely to discriminate against women based on prejudices or assumptions about lower productivity. Hence, the gender pay gap is expected to be smaller in gender-diverse boards. Moreover, the literature highlights the link between the participation of women on corporate boards and better

governance (Adams & Ferreira, 2009; Carter et al., 2017). Carter et al. (2017) found that firms with a higher proportion of female directors have smaller salary gaps, and Geiler and Renneboog (2015) showed that the gender pay gap is lower for executives in firms with independent female directors. Perryman et al. (2016) observed that compensation differences between genders decrease as gender diversity in the top management team increases.

One corporate governance measure aimed at avoiding profit extraction is to link executive pay to firm performance. Therefore, corporate earnings (return on assets [ROA]) is another important variable when examining executive pay regardless of gender (Jensen & Murphy, 2010). In theory, women executives' pay and ROA should have a direct relationship, given the evidence suggesting that the presence of women on the board positively affects a firm's performance (García & Herrero, 2018; Martín-Ugedo & Minguez-Vera, 2014). However, Kulich et al. (2011) concluded that women executives are paid less than male executives for the same performance.

One consistent finding in the literature is the relationship between firm size and executive pay. For example, Bertrand and Hallock (2001) observed that part of the pay gap is due to women's greater representation in smaller firms. Potentially, size is a proxy for business complexity, so more skilled and experienced directors are needed, and higher salaries are required to attract and retain them (Graham et al., 2012). In relation to this idea, Brick et al. (2006) and López-Iturriaga et al. (2015) argued that management complexity is found in the most highly leveraged companies. Núñez et al. (2022) found that more highly leveraged firms pay their directors more, and that access to credit markets may be a sign of company progress.

After controlling for variables such as those already discussed in this section, studies have generally shown that part of the pay gap cannot be explained by company- or individual-level factors. The conclusion is that this part of the pay gap is determined by gender and can be explained by discriminatory factors or negative female stereotypes that attribute leadership characteristics to men to the detriment of women. Women are seen as caring and nurturing, qualities not associated with leadership (Koenig et al., 2011).

There is also evidence that a company's sector explains director compensation. For example, Handschumacher-Knors (2022) showed that firms in the basic resources sector pay their executive directors less compared to automobile, construction, and industrial companies. In Spain, Núñez et al. (2022) also observed that sector influences director compensation. Companies in the real estate, oil refining, and food sectors were found to pay the most, whereas transport, metallurgy, hotel, and retail companies paid below the average. Thus, as suggested by Smith et al. (2011), the tendency for women to work more for smaller firms and in low-wage sectors may be one factor in the pay gap.

One final consideration is time. Over time, women have made substantial progress such as access to the labor market, educational achievement, access to corporate governance bodies, and a reduction in the gender pay gap.

Based on these theoretical arguments and the existing empirical evidence, this study explores whether there indeed is a gender-driven executive pay gap or whether the pay gap is determined by individual- or firm-specific characteristics. Four hypotheses are formulated and tested.

**H1**. Features of firm complexity, performance, and executive monitoring affect executive director compensation.

**H2**. Compensation depends on individual executive director characteristics, such as position, affiliation with the company, and experience.

**H3**. There is a pay gap in favor of men, and this pay gap is not determined by individual or company characteristics.

**H4**. Unobservable firm-specific factors influence the pay penalty faced by female executive directors.

## 3. Data and research method

### 3.1. Data

The analysis examined the gender pay gap among executive directors of Spanish listed companies that submitted annual corporate governance reports and compensation reports for the years 2012–2021 to the Spanish Securities and Exchange Commission (CNMV). Specifically, the data set covered 459 executive directors from 152 companies for which the relevant information on director compensation was available. Annual accounting data on the firms were obtained from the Eikon Refinitiv database, which provided the debt ratio (total debt/total assets), total assets, and ROA variables for the firms and years with data on compensation.

The annual corporate governance reports and compensation reports of the sampled companies provided some of the data on their boards. In particular, the following information was hand-collected from those reports: individual members of the board, when they joined the board, and their role as director (executive, independent, proprietary, or external). Data on whether each director was CEO, board chair, or both also were collected, as were data on the committees to which they belonged and their compensation. Finally, data on each director's gender and age were gathered by consulting annual reports, the company homepage, or other online sources.

For the period 2012 to 2021, a total of 2241 observations of board members' annual compensation were collected. Of these observations, 2133 related to men and 109 related to women who were or had been on the boards of 152 companies, 21 of which had current or previous female representation on its board. The number of observations per year ranged from 196 in 2021 to 249 in 2015. The number of observations per director ranged from 1 to 10, and the number of observations per company ranged from 1 to 55.

The dependent variable was real total annual compensation of executive directors. The raw compensation valued at the current price in each year was expressed at constant 2012 prices to eliminate distortions due to changes in price levels. For modeling purposes, the observations in constant prices were transformed to a logarithmic scale.

The dependent variable was hierarchical, consisting of dated observations corresponding to individual directors on the boards of different firms. Given this hierarchical structure, variation in compensation was explored at the three observation levels of time, individual director, and board/firm. In other words, the analysis explored whether and how compensation varied between observations for each board member, for different board members at the same company, and for different boards/firms.

The key predictor in the analysis was gender. The gender of each board member was captured using a binary variable (Gender). Male directors (executives) were assigned a value of 0, and female directors (executives) were assigned a value of 1. In this study, Gender was considered a time-invariant attribute of individual board members.

The other factors determining compensation served as control variables. Following the literature presented in Section 2, the variables listed in Table 1 were selected. They were observed at one of the three levels of the data hierarchy: year, individual director, or board/firm. The control variables generally varied over time, except for the firm's sector, which was time-invariant.

Table 2 presents the mean, median value, and standard deviation of the dependent variable and of the explanatory variables. Based on the evidence discussed earlier, these variables should explain director compensation variability.

The mean annual compensation of the board members of the companies in the data set was €1.42 million at constant 2012 prices (SD, €2.25 million). These values have a coefficient of variation of 1.58. However, there were notable differences in the mean compensation of each of the 459 executive directors during the study period. There also were considerable differences in the mean compensation as a function of

**Table 1**
Variables and definitions.

| Variable | Definition |
|---|---|
| **Individual characteristics**[a] | |
| Salary | Individual real total annual compensation of executive directors expressed at constant 2012 prices |
| Ln_Salary | Logarithm of the individual real total annual compensation of executive directors expressed at constant 2012 prices |
| Gender | Dummy variable that takes the value 1 if the board member is a woman and 0 otherwise |
| CEO | Dummy variable that takes the value 1 if the board member is the CEO and 0 otherwise |
| First year | Dummy variable that takes the value 1 if the board member is appointed in the current observation year and 0 otherwise |
| Tenure | Number of years the board member has been a member of the board up to the current observation year |
| **Company characteristics**[a] | |
| Board independence | Proportion of independent directors on the board of directors of the company in the current observation year |
| Assets | Total assets of the company in the current observation year |
| Ln_Assets | Logarithm of total assets of the company in the current observation year |
| Debt ratio | Total debt to total assets in the current observation year |
| ROA | Return on assets (ROA), calculated as income after taxes divided by average total assets in the current observation year |

[a] Note: Along with the indicated variables, other variables were initially tested as potential explanatory variables for director compensation regarding year-level, individual-level, and firm-level heterogeneity. At the individual level, these variables were whether the executive held the role of president, the executive's age, the executive's educational level, the number of committees the executive belonged to, and, in the case of women, the fertility penalty. At the firm level, these variables were size of the board and board gender diversity. All variables were discarded according to statistical criteria in the preliminary analysis. The indicators ultimately selected to fit the models were those that showed the strongest and most consistent correlation with the dependent variable in the statistical analysis.

**Table 2**
Descriptive statistics of variables.

| Variable | Obs. | Mean | Median | SD |
|---|---|---|---|---|
| Salary (millions of €) | 2241 | 1.422 | 0.669 | 2.251 |
| Salary (millions of €) male | 2133 | 1.429 | 0.696 | 2.236 |
| Salary (millions of €) female | 108 | 1.285 | 0.268 | 2.540 |
| Gender | 2312 | 0.047 | 0 | 0.212 |
| CEO | 2312 | 0.452 | 0 | 0.497 |
| First year | 2312 | 0.073 | 0 | 0.261 |
| Tenure | 2312 | 11.117 | 8 | 9.647 |
| Board independence (lagged) | 2001 | 0.404 | 0.400 | 0.163 |
| Assets (millions of €) (lagged) | 2309 | 51.918 | 1.980 | 194.896 |
| Debt ratio (lagged) | 2306 | 0.314 | 0.272 | 0.263 |
| ROA (lagged) | 2294 | 0.036 | 0.019 | 0.575 |

gender. Mean male compensation (€1.43 million; SD = €2.24 million; coefficient of variation = 1.57) was similar to the overall mean, whereas mean female compensation was €1.29 (SD = €2.54 million; coefficient of variation 1.97). The average annual pay of female board members was approximately 10% lower than that of male board members,[3] and it had greater dispersion in both absolute and relative terms. Nonetheless, the median value of compensation of women was 61% lower than that of male directors, reflecting skewness and kurtosis differences in the distributions of pay depending on gender.

There also were large differences in the distribution of compensation depending on gender and board/firm. Table 3 describes the dependent variable for two companies (coded as 125 and 126) to illustrate those differences. Both firms had female board members and paid well above

[3] This salary gap was calculated as the difference between women's and men's salaries with respect to men's salaries.

**Table 3**
Compensation by gender and board/firm (selected firms).

| Firm | Board | Obs. | Mean (millions of €) | SD (millions of €) |
|---|---|---|---|---|
| #125 | Male | 32 | 2.667 | 3.832 |
| | Female | 4 | 1.878 | 2.689 |
| | Total | 36 | 2.579 | 3.700 |
| #126 | Male | 32 | 4.937 | 2.295 |
| | Female | 10 | 8.436 | 2.019 |
| | Total | 42 | 5.770 | 2.674 |

the average for all observations. The average compensation of male board members at company 125 was higher and had greater relative dispersion compared to that of female board members. In contrast, the average compensation of female board members at company 126 far exceeded that of male board members and had lower relative dispersion.

### 3.2. Method and models

Given the hierarchical nature of the data set, a three-level mixed-effects model was proposed for the analysis of individual compensation. The observations of the dependent variable were clustered into three hierarchical levels with a nested structure. The figures for compensation in different years (t) were the level-1 observation units, individual board members (i) with repeated measures of compensation over time were the level-2 observation units, and board/firms (j) were the level-3 observation units.

Multilevel modelling is a generalization of regression methods designed to deal with hierarchical data sets. Moerbeek et al. (2003) and Maas and Hox (2004), along with other methodological studies, have confirmed that multilevel regression is the most suitable method for analyzing data nested in two or more aggregation levels. As explained by Gelman (2006), multilevel models outperform classical regression in predictive accuracy when applied to hierarchical data because they are capable of estimating the predictive effects of explanatory variables observed at different levels of aggregation.

In this study, the null model was first specified to verify the informative relevance of a three-level hierarchy for the distribution of compensation in the data set. The three-level null model consisted of three equations, one per aggregation level. At the year level, the model indicated that the compensation of a director over time would deviate from that director's mean compensation, $\beta_{0ij}$, by a random year-related error, $\varepsilon_{tij}$. At the individual level, the model indicated that the personal mean compensation, $\beta_{0ij}$, would differ from the mean compensation, $\gamma_{00j}$, of the members of the same board by a random individual-related error, $u_{0ij}$. At the board/firm level, the model indicated that the firm-specific mean compensation, $\gamma_{00j}$, would differ from a general mean compensation, $\alpha_{000}$ (often referred to as the "grand mean" in the literature), by a random board/firm-related error, $v_{00j}$. Replacing terms, the single-equation form of the null model can be expressed by the following equation:

$$\log\left(y_{tij}\right) = \alpha_{000} + \varepsilon_{tij} + u_{0ij} + v_{00j} = \alpha_{000} + w0_{tij} \quad [1]$$

The value of the dependent variable in Equation (1) is a fixed parameter, $\alpha_{000}$ (grand mean), plus a composite multilevel random error, $w0_{tij}$, that captures three different sources of compensation variability: variability between the observations for individuals over time ($\varepsilon_{tij}$), variability between directors on the same board ($u_{0ij}$), and variability between boards/firms ($v_{00j}$). Assuming that the random errors $\varepsilon_{tij}$, $u_{0ij}$, and $v_{00j}$ followed identical uncorrelated normal distributions with zero mean and constant variances $\sigma^2$ (ε), $\sigma^2$ (u), and $\sigma^2$ (v), the variability of log-compensation can be expressed as the sum of three variance components, one per aggregation level:

$$\sigma^2\left[\log\left(y_{tij}\right)\right] = \sigma^2\left(\alpha_{000} + w0_{tij}\right) = \sigma^2\left(\alpha_{000} + \varepsilon_{tij} + u_{0ij} + v_{00j}\right)$$
$$= \sigma^2(\varepsilon) + \sigma^2(u) + \sigma^2(v) \quad [2]$$

The variance components indicated how much variability corresponded to unexplored year-related factors, $\sigma^2$ ($\varepsilon$), individual director factors, $\sigma^2$ (u), and board/firm factors, $\sigma^2$ (v). The null model was developed to provide predictive models by including observable characteristics as explanatory variables to account for year, director, and board/firm heterogeneity to explain compensation variability.

In the predictive three-level models, all the explanatory variables in the level-1 equation were time-varying characteristics, irrespective of the aggregation level of observation, because these variables should explain compensation variability over the observation period. The level-2 equation expressed the random intercept of a board member's compensation as a linear function of gender. Finally, the level-3 equations expressed the variability across boards/firms of the random coefficients in the level-2 equation as linear functions of observable time-invariant board/firm characteristics.

To clarify the role of gender in the distribution of compensation, several versions of the model were estimated. The log of compensation served as a response variable, gender was a key time-invariant level-2 predictor, and different sets of other explanatory variables acted as controls.

Model 1 specifies that after controlling for a set of year-specific dummies, $D_k$, with fixed effects, $\beta_k$ (level-1 equation), the mean log-compensation per year, $\beta_{0ij}$, received by board member i at firm j would depend on the gender of that board member, $G_{ij}$, through a fixed parameter, $\gamma_{01}$ (level-2 equation). Assuming the same level-3 equation of the null model, the single-equation form of Model 1 can be expressed as follows:

$$\log\left(y_{tij}\right) = \alpha_{000} + \gamma_{01}G_{ij} + \Sigma\beta_k D_{kij} + u_{0ij} + v_{00j} + \varepsilon_{tij} \quad [3]$$

Because the dependent variable is given on a logarithmic scale, the coefficient $\gamma_{01}$ directly determines the mean pay penalty for female board members with respect to their male counterparts after controlling for year of observation.[4] The composite random error takes the same form as in the null model, capturing the three potential sources of residual variability (i.e., compensation variability unexplained by gender and observation year).

Model 2 includes other time-varying characteristics, $X_h$, of individual board members and their positions within the board as explanatory variables, with fixed effects $\eta_h$, along with the observation year in the level-1 equation. It uses the same level-2 and level-3 equations as in Model 1. The compact form of Model 2 can be expressed as follows:

$$\log\left(y_{tij}\right) = \alpha_{000} + \gamma_{01}G_{ij} + \Sigma\beta_k D_{kij} + \Sigma\eta_h\left(X_h\right)_{tij} + u_{0ij} + v_{00j} + \varepsilon_{tij} \quad [4]$$

The characteristics observed at the individual level, $X_h$, include a dummy for CEO responsibility, a dummy for first year as board member, member's tenure on the board (in years), and the square of this tenure. The coefficient $\gamma_{01}$ thus predicts the average pay penalty for female directors with respect to male directors with similar individual conditions, $X_h$, on the board in the same year.

Model 3 estimates the gender pay penalty for female directors with respect to male directors who are members of similar boards/firms in the same year. Some of the board/firm characteristics are time-varying variables, $W_q$, with fixed effects, $\varphi_q$, that appeared in the level-1 equation. These characteristics include degree of board independence (proportion of independent board members), firm size (log of assets), debt ratio (total debt/total assets), and ROA. Other time-invariant firm characteristics could be represented by a set of industry-specific dummies, $Z_p$, with fixed effects $\alpha_p$ in the level-3 equations. The level-2 equation is the same as that included in Models 1 and 2. Replacing terms, the single-equation form of Model 3 can be expressed as follows:

$$y_{tij} = \alpha_{000} + \gamma_{01}G_{ij} + \Sigma\beta_k D_{kij} + \Sigma\varphi_q\left(W_q\right)_{tij} + \Sigma\alpha_p Z_{pj} + u_{0ij} + v_{00j} + \varepsilon_{tij} \quad [5]$$

Coefficient $\gamma_{01}$ predicts the mean pay penalty for female directors with respect to male directors who, regardless of personal conditions, are members of similar boards of similar firms in the same year.

Model 4 estimates the gender pay penalty controlling for all explanatory variables included in the previous models (Equation (6)):

$$y_{tij} = \alpha_{000} + \gamma_{01}G_{ij} + \Sigma\beta_k D_{kij} + \Sigma\eta_h\left(X_h\right)_{tij} + \Sigma\varphi_q\left(W_q\right)_{tij} + \Sigma\alpha_p Z_{pj} + u_{0ij} + v_{00j} + \varepsilon_{tij} \quad [6]$$

The gender coefficient in Model 4 estimates the pay penalty for female directors with respect to male directors in the same year, $D_k$, who have similar personal conditions, $X_h$, on the board and who were members of boards with similar characteristics, $W_q$, within the same industry, $Z_p$.

Models 1 to 4 estimate the pay penalty of female board members through a fixed parameter using different sets of controls. Consequently, each model provides only one prediction of the gender pay penalty for all firms. However, firm-specific estimates of the gender pay penalty could be observed by allowing the slope of gender in the level-2 equation, as well as the intercept, to vary randomly across boards/firms in an additional level-3 equation.

Accordingly, Model 5 replaces the fixed effect of gender with a random coefficient, $\gamma_{01j} = \alpha_{010} + v_{01j}$. Here $\alpha_{010}$ represents the mean gender pay penalty for all boards/firms, and $v_{01j}$ is a level-3 random error capturing the variability of the slope of gender and thus the variability of the gender pay penalty across boards/firms due to unobserved board/firm heterogeneity. The compact single-equation form of Model 5 can be expressed as follows:

$$\log\left(y_{tij}\right) = \alpha_{000} + \alpha_{010}G_{ij} + \Sigma\beta_k D_{kij} + \Sigma\eta_h\left(X_h\right)_{tij} + \Sigma\varphi_q\left(W_q\right)_{tij} + \Sigma\alpha_p Z_{pj} + u_{0ij} + v_{00j} + v_{01j}\,G_{ij} + \varepsilon_{tij} \quad [7]$$

Model 5 includes the same set of explanatory variables as Model 4; however, it differs in the composite random error, which in this case is $w1_{tij} = \varepsilon_{tij} + u_{0ij} + v_{00j} + v_{01j}{}^{*}G_{ij}$. Unlike $w0_{tij}$, the error $w1_{tij}$ is autocorrelated and heteroscedastic, specifying that the slope of gender in the level-2 equation may vary randomly at level 3. The composite random error in Equation (7) depends linearly on the value of the key predictor (i.e., gender). Compared to previous specifications, Model 5 further explores the gender pay gap distribution by including an additional random effect, $v_{01j}$, corresponding to the variability of the gender pay penalty across boards/firms. Therefore, Model 5 enables prediction of firm-specific gender pay penalties, as well as a mean gender pay penalty for all firms, while controlling for all other observed individual attributes, board/firm characteristics, and year of observation.

## 4. Results and discussion

Table 4 presents the results of the maximum likelihood estimation (MLE) of the null model and the five predictive models described in the previous subsection. The estimation procedure was restricted maximum likelihood (REML), which maximizes the deviance function, D = -2ln(L), where L represents the likelihood corresponding to the residuals of the OLS estimation of the single-equation compact form for each model with the observed data. REML estimation ensures consistent and asymptotically efficient parameter estimates and reduces the bias of full MLE in small samples by controlling for the number of fixed-effects parameters in each specification.

[4] In the estimated models, the dependent variable was the logarithm of pay. Therefore, the gender pay penalty was calculated as $\exp(\gamma_{01}) - 1$ (i.e. the difference between women's and men's pay with respect to men's pay).

**Table 4**
Results of estimation.

| | Null model | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|---|
| Fixed effects parameters | | | | | | |
| *Time* | | | | | | |
| Year dummies | No | Yes | Yes | Yes | Yes | Yes |
| Intercept | 13.0403[a] (0.0961) | 12.7840[a] (0.1031) | 12.6686[a] (0.1160) | 6.4357[a] (0.5568) | 5.9884[a] (0.5370) | 5.9518[a] (0.5362) |
| *Individual director* | | | | | | |
| Gender | | −0.7612[a] (0.2166) | −0.6159[a] (0.2057) | −0.7668[a] (0.1952) | −0.6010[a] (0.1821) | −0.6159[a] (0.2153) |
| CEO | | | 0.2481[a] (0.0492) | | 0.2422[a] (0.0501) | 0.2435[a] (0.0501) |
| First year | | | −0.6276[a] (0.0552) | | −0.6176[a] (0.0615) | −0.6174[a] (0.0615) |
| Tenure | | | 0.0225[b] (0.0091) | | 0.0249[a] (0.0089) | 0.0251[a] (0.0089) |
| Tenure2 | | | −0.0004[b] (0.0002) | | −0.0004[c] (0.0002) | −0.0004[c] (0.0002) |
| *Board/firm* | | | | | | |
| Industry dummies | No | No | No | Yes | Yes | Yes |
| Board independence (lag) | | | | 0.3808[b] (0.1561) | 0.4130[a] (0.1510) | 0.4063[a] (0.1509) |
| Log-assets (lag) | | | | 0.3085[a] (0.0269) | 0.3218[a] (0.0258) | 0.3233[a] (0.0258) |
| Debt ratio (lag) | | | | 0.0742[a] (0.0247) | 0.0609[b] (0.0238) | 0.0598[b] (0.0241) |
| ROA (lag) | | | | 0.1187[a] (0.0281) | 0.0951[a] (0.0272) | 0.0935[a] (0.0276) |
| Random effects parameters | | | | | | |
| *Board/firm* | | | | | | |
| $Sd(v_{01j})$ | | | | | | 0.5433 (0.18 1.67) |
| $Sd(v_{00j})$ | 1.0222 (0.88 1.19) | 1.0239 (0.88 1.19) | 1.0316 (0.89 1.19) | 0.57564 (0.46 0.72) | 0.5656 (0.46 0.70) | 0.5645 (0.46 0.70) |
| *Individual director* | | | | | | |
| $Sd(u_{0ij})$ | 0.8509 (0.78 0.93) | 0.8566 (0.78 0.94) | 0.8002 (0.74 0.88) | 0.7842 (0.71 0.86) | 0.7158 (0.65 0.79) | 0.7065 (0.64 0.73) |
| *Time* | | | | | | |
| $Sd(\varepsilon_{tij})$ | 0.5432 (0.54 0.58) | 0.5389 (0.52 0.56) | 0.5183 (0.50 0.54) | 0.5148 (0.50 0.53) | 0.4994 (0.48 0.52) | 0.4994 (0.48 0.52) |
| Log restricted likelihood | −2537.937 | −2481.079 | −2404.293 | −2033.914 | −1972.352 | −1971.786 |
| Observations | 2241 | 2241 | 2241 | 1934 | 1934 | 1934 |
| Level 2 units | | 470 | 470 | 470 | 470 | 470 |
| Level 3 units | | 150 | 150 | 150 | 150 | 150 |

Notes: Standard error in parentheses for fixed effects parameters. 95% confidence interval in parentheses for random effects parameters.
[a] 1% significance level.
[b] 5% significance level.
[c] 10% significance level.

The null model estimate for the grand mean was 13.0403, implying a multilevel annual mean compensation of exp(13.0403) = €460,607 per year at constant 2012 prices. The observed values of compensation differed from the grand mean because of unexplored year, board member, and board/firm heterogeneity. The estimates of the random effects in the null model were $Sd(\varepsilon_{tij}) = 0.5616$ at the year level, $Sd(u_{0ij}) = 0.8509$ at the individual level, and $Sd(v_{00j}) = 1.0222$ at the board/firm level. The variance component estimates were the corresponding squares. Total residual variance was 2.0982. Therefore, the proportion of total variability of compensation was 15% observed at the year level, 35.2% observed at the individual level, and 49.8% observed at the board/firm level. Hence, one-half of the total compensation variability was observed at the board/firm aggregation level, and more than one-third was observed at the individual director aggregation level.

Thus, estimates from the null model confirmed that most of the observed variability of compensation around the grand mean depended on as-yet unexplored factors at the individual and board/firm aggregation levels. The overall results confirmed that a three-level model seemed suitable to understand the predictive strength of gender for director compensation, because both board/firm characteristics and individual board member variables likely explained most of the observed variability of compensation over time. Hence, year-related variables observed at level 1, individual board member attributes observed at level 2, and board/firm characteristics observed at level 3 should be explored as determinants of the distribution of compensation by gender over time among individual directors across boards/firms.

Overall, the estimation of predictive models including year, individual, and board/firm control variables confirmed H3. There is evidence of a large and significant pay penalty for women among directors of Spanish companies. The estimates of the penalty indicated that female director compensation was 53% lower than that of male directors when controlling only for year of observation (Model 1), 46% lower when also controlling for time-varying individual director characteristics (Model 2), 54% lower when controlling for firm/board characteristics and observation year but not for personal characteristics (Model 3), and between 45% (Model 4) and 46% (Model 5) lower when controlling for year, director, and board/firm variables. The interpretation is simple: there is evidence of a gender pay gap among directors of Spanish listed firms. The results suggest that the mean compensation of female directors tends to be substantially lower in the same year than that of their male counterparts with similar levels of responsibility and experience in boards/firms that are similar in terms of executive monitoring, assets, debt ratio, ROA, and industry.

Additionally, coefficient estimates for control variables revealed significant fixed effects, with the expected signs according to the theory-based predictions, thereby confirming H1 and H2. Holding the position of CEO and having experience increased compensation, thus confirming H1. However, board members' tenure had a nonlinear relationship with pay, echoing evidence from prior studies. The proportion of independent board members and firm size, debt ratio, and ROA all had positive effects on director compensation, confirming H2, as reported in the literature.

The random effects in the multilevel models were used to estimate the residual variance of each model; that is, the proportion of pay variability not explained by the independent variables included as fixed effects. Models 1 to 4 shared the same specification of the multilevel composite random error, $w0_{tij}$. Model 1 included only gender and observation year as independent variables, and thus it naturally had the highest total residual variance and the highest residual variance at each level. Model 4 included all explanatory variables of pay considered in this study and thus had the lowest total residual variance and the lowest residual variance at each level.

Model 5 estimated an additional random effect for between-firm variability of the gender pay penalty, denoted as $Sd(v_{01j})$ in Table 4. As expected, the random effect, $Sd(v_{01j})$, specifically associated with the gender pay gap was large (0.5433) and significant at the 5% level, whereas the fixed effects and other random effects did not differ substantially from those predicted in Model 4, except for minor differences in parameter estimates. Accordingly, there is evidence that the gender

pay penalty varies significantly among firms after controlling for observable individual circumstances, board/firm characteristics, and observation year. The results thus confirm H4. The main practical implication for research is that Sd($v_{01j}$) enabled prediction of firm-specific gender pay penalties for firms with women on their boards, whereas the previous models provided only a fixed prediction of the penalty for all firms.

The multilevel sets of residuals from the Model 5 estimation were used to predict the random effect of gender for each board/firm. Unsurprisingly, predicted company-specific pay penalties differed appreciably among firms with women on their boards. They were much lower than the mean penalty in some cases, such as for firms 126 (−18%), 18 (−30%), and 100 (−32%). In contrast, for other firms, they were higher than the mean penalty—for example, in firms 147 (−78%), 89 (−69%), and 121 (−62%).

This finding can be interpreted in two ways. First, there was high variability between companies in terms of the gender pay penalty for directors, in the range of 18%–78% lower pay for female directors. These firm-specific pay penalties were not explained by observation year, individual board member characteristics, or board/firm features already included in the model as explanatory variables of pay. Hence, other unobserved factors, perhaps related to the corporate culture of each board/firm, would be required to explain disparities in the gender penalty between different firms. Second, the pay penalty for female directors compared to male peers in the present data set was so great and so ingrained that predictions showed not only a substantial average gender pay gap, but also high pay penalties for female directors in most boards/companies and moderate pay penalties even in boards/companies where women actually received higher average pay than their male peers. One example was board/company 126, where the data correlation between gender and pay was positive.

Models 4 and 5 use a linear function of gender at level 2 to predict the compensation of each board member of each company. This linear function consists of an intercept and a slope associated with the gender of the *i*th director at the *j*th firm. The intercept represents the average pay of a male director at each company, and the slope expresses the pay penalty for female board members with respect to their male peers. Models 4 and 5 specify the intercept as a random coefficient, $\gamma_{00j}$, that can take a specific value for each firm: however, they differ in the specification of the slope of gender. In Model 4, the slope is assumed to be a fixed parameter, $\gamma_{01}$, common to all firms, and it predicts a mean value for the gender pay penalty. In contrast, Model 5 specifies the gender slope as a random coefficient, $\gamma_{01j}$, that can take different values for different firms, and it predicts specific gender pay penalties for firms with female representation on the board, as well as a mean value of the pay penalty for all firms.

Fig. 1 shows the values predicted by both models for the random intercept, $\gamma_{00j}$, with the corresponding standard errors of estimation for each company. The mean value of the intercept is ordered from lowest to highest. Overall, the intercepts predicted by both models are close. There are no substantial differences between them in either coefficient values or standard errors.

The differences between the two models are evident with respect to the estimated gender slopes representing the pay penalty for female board members, as shown in Fig. 2. Model 4 predicts a single value for the slope of gender (−0.601) for all companies. Hence, the lines expressing average individual director compensation ($\beta_{0ij} = \gamma_{00j} + \gamma_{01} G_{ij}$) as a function of gender are parallel for all companies. Model 5 predicts a specific gender slope for each company ($\beta_{0ij} = \gamma_{00j} + \gamma_{01j} G_{ij}$); therefore, the lines $\beta_{0ij}$ are not necessarily parallel.

Consequently, the predictions of individual director mean pay, $\beta_{0ij}$, as a function of gender differ considerably from one model to the other. Model 4 and all previous models in the literature (to the best of the authors' knowledge) predict one value of gender pay penalty for all firms, with or without female board members. The current analysis reveals that the traditional approach is considerably less informative about the effects of gender on director pay than predicting a firm-specific value of the gender pay penalty (as in Model 5) for firms with female directors. The firm-specific values of the gender slope reflect unobserved heterogeneity among firms regarding the gender pay penalty faced by the members of their boards.

Fig. 3 illustrates the situation for four companies with female representation on the board. For some of these companies, Model 4 underestimates the gender pay penalty with respect to Model 5 (e.g., 147 and 113) but overestimates it for others (e.g., 126 and 132).

## 5. Conclusions

The gender pay gap refers to the systematic difference in pay between men and women in similar jobs. It remains a key issue in the public debate, with slow progress toward reducing this gap. Analyzing this phenomenon is complex and involves interactions between the dynamics of global economics, personal factors, and aspects of the corporate world. To examine the gender pay gap at the top management level, this article presents a multilevel analysis of executive board member compensation for 152 Spanish listed companies between 2012 and 2021. The results confirm the existence of substantial and significant pay penalties for women directors in major listed companies in Spain. The estimation of predictive models at three aggregation levels—year, individual, and firm—specifying a fixed slope for the gender variable provides interesting findings. Controlling for year of observation, female directors receive approximately 45% lower pay than male directors with similar responsibility and experience in firms that are similar in terms of executive monitoring, size, debt ratio, ROA, and industry. The other individual factors and all corporate factors considered in this study tend to influence board member compensation as expected based on theoretical predictions.

To the authors' knowledge, this study is the first to explore between-

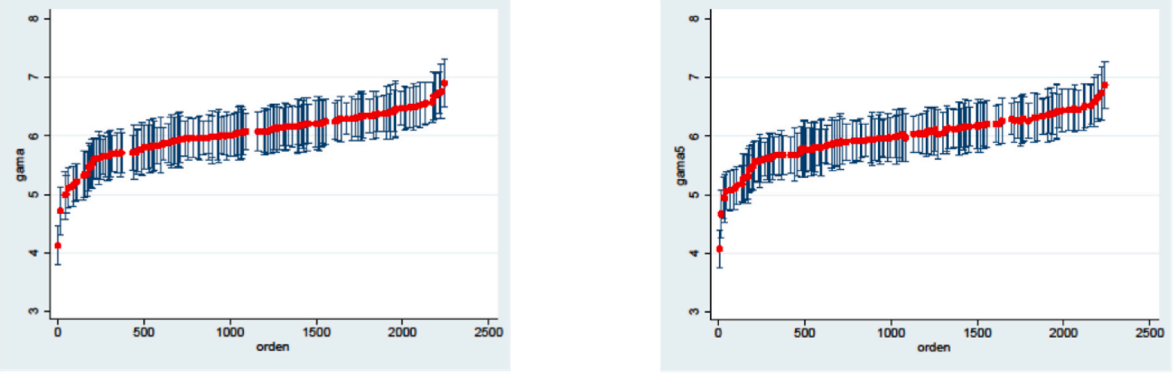


**Fig. 1.** Predicted $\gamma_{00j}$ intercepts ordered from lowest to highest average value with standard errors.

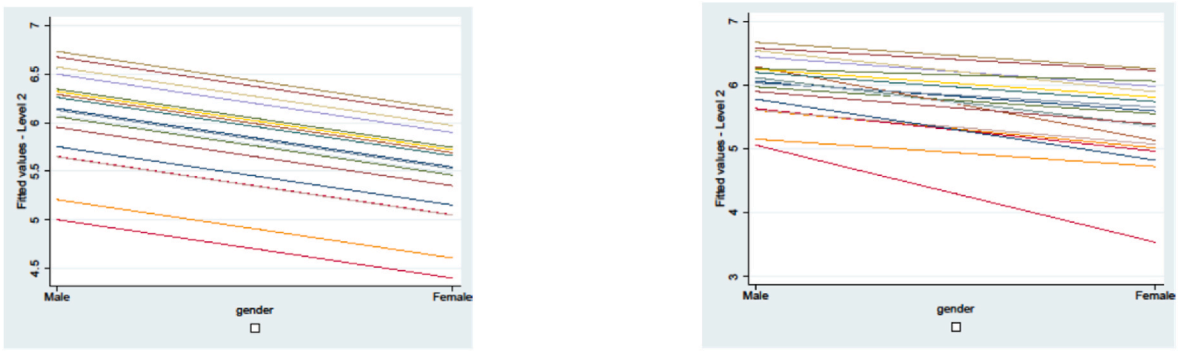


**Fig. 2.** Predicted individual compensation $\beta_{0ij}$ as a function of gender for all firms with female representation on the board.

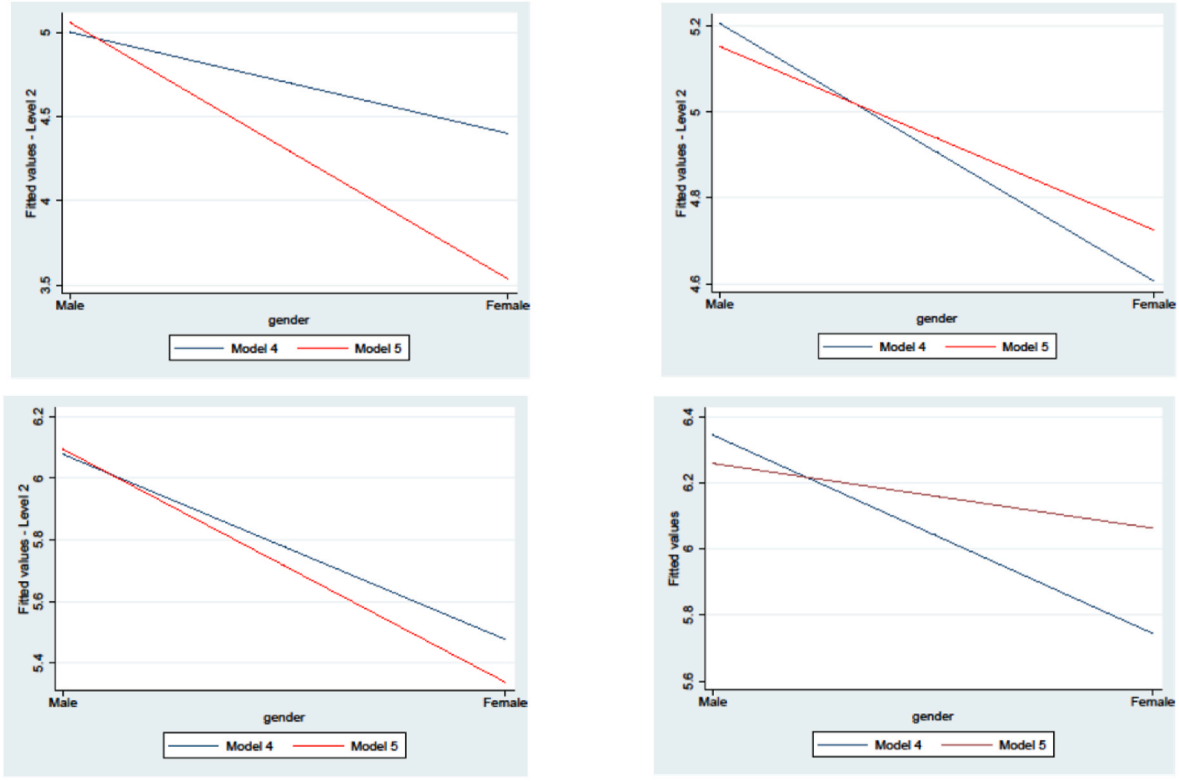


**Fig. 3.** Comparison of predicted individual compensation $\beta_{0ij}$ for a selection of firms with female representation on the board of directors.

firm unobserved heterogeneity in terms of the gender pay gap by specifying a random slope for the gender variable at the individual aggregation level. The estimation of a significant variance component associated with the slope of gender in the level-2 equation implies that unobserved firm-related factors determine specific gender pay gaps for boards of firms that are similar in terms of industry, assets, debt ratio, ROA, and board monitoring. This finding suggests that despite legal regulations, pay disparities due to gender discrimination remain deeply rooted in the corporate culture of many firms.

### 5.1. Theoretical implications

Some theoretical implications can be derived from this study. The three-level analysis shows the significance of a random slope for the gender variable; therefore, the results suggest that there are discriminatory penalties in the pay of female managers due to corporate culture. This gender pay gap among executive directors is illegitimate and should be addressed by adopting initiatives aimed at changing the legislation and obliging firms to comply with regulations or face sanctions. In addition, corporate culture should be considered when setting executive compensation to avoid discrimination. Recruitment, promotion, and pay differ greatly across firms for a variety of reasons. For instance, some firms may be committed to reducing gender bias in board composition and the gender pay gap among board members as a part of their strategic planning, while others may display no concern for gender issues.

### 5.2. Practical implications

The study shows the existence of a gender pay gap, even in leadership positions such as executive directorships. This finding indicates that equality has not yet been achieved and should provide an incentive for regulators and policymakers to improve employment legislation to prevent discrimination against women.

The study also has implications for companies and executive directors. Specifically, the lower pay that female directors receive in certain companies may prevent highly qualified women from accessing

these positions, resulting in loss of talent and productivity. Moreover, women's lesser access to managerial positions could affect the working conditions of women at lower levels of the organization. Therefore, the findings of the study may have implications not only for the labor market, but also for the economy in general. Finally, the study is of interest for society as a whole, given that executive pay is a controversial issue and the study sheds light on this topic.

### 5.3. Limitations and future research

The main limitations of this study include the low proportion of female executives on corporate boards and the lack of more detailed data on the individual characteristics of executive directors. Nevertheless, the data set used in the present study was as large as possible given the data available at the time of the study. Another limitation is that the research focused on listed companies only, because data on compensation were unavailable for unlisted firms. Therefore, the results are not applicable to unlisted companies or at least merit a cautious approach to extrapolating them to such firms.

Future research could investigate the components of overall compensation to analyze for differences in compensation structures between men and women. Future studies also could include variables related to working conditions, such as type of contract and employment relationship. Finally, as more data on the compensation of individual executive directors become available, future analyses could replicate the study using an international sample.

## Funding

The authors thank the Cátedra Finanzas Internacionales–Banco Santander of the University of Valencia for providing financial support.

## CRediT authorship contribution statement

**C. José García:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Begoña Herrero:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Luis E. Vila:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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