Board gender diversity and employee productivity. The moderating role of female leaders

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ABSTRACT

Drawing on the Motivational Role Modeling Theory and Critical Mass Theory, the main objectives of this paper are to analyze the impact of Board Gender Diversity (BGD) on Employee Productivity (EP) and to investigate the moderating role of a Female CEO or a Female Board Chair on this relationship in Social Economy companies. The methodology used is a fixed-effects regression with panel data for 1,914 Spanish Social economy companies in the agri-food sector from 2017 to 2021. Our findings uncover a non-linear relationship between BGD and EP displaying a descendent curvilinear pattern, though not strictly U-shaped. Moreover, we confirm the moderating influence of a Female Chair, noting that its presence shifts the relationship between BGD and EP from an inverted curvilinear pattern to a U-shaped one. In this context, the board requires a minimum presence of women, set at a critical mass of 13 %. However, the moderating impact of a Female CEO remains inconclusive. This research underscores the significance of investigating board diversity, specifically emphasizing female leadership in understanding the link between BGD and EP. Moreover, to the best of our knowledge, this study is the first to explore the impact of BGD on EP by developing an integrated model based on Motivational Role Modeling Theory and Critical Mass Theory, and calculating the critical mass when a Female Chair is present on the board.

1. Introduction

Legal requirements and social pressures have encouraged firms to promote and prioritize gender diversity on company's boards and top management teams (Fernando & Tripathy, 2020; Thams et al., 2018). Consequently, more than one hundred countries have implemented quotas for women on the boards (Hrbková & Fellegi, 2022). However, progress toward board gender diversity (BGD) has been slow, and women are still underrepresented in corporate governance. In this regard, the European Parliament has formally adopted its new directive (EU)2022/2381 on gender balance in corporate boards. By 2026, companies must employ 40 % of the underrepresented sex as non-executive directors or 33 % among all directors (Papíková & Papík, 2023).

BGD plays a central role in corporate governance because the board can influence corporate outcomes (Johnson et al., 2013). The impact of BGD on a firm's performance has been a subject of interest and has received extensive attention under different theoretical frameworks such as Resource Dependency Theory (Ali et al., 2014), Agency Theory (Bernstein *et al.*, 2016; Francoeur *et al.*, 2008), Stewardship Theory (Bernstein *et al.*, 2016), Critical Mass Theory (Joecks *et al.*, 2013;

Torchia et al., 2011), the Knowledge-based view with Role Congruity Theory (Ali et al., 2023), Upper Echelons Theory (Luanglath et al., 2019; Terjesen et al., 2016), Stakeholder Theory (Francoeur et al., 2008), and Human Capital Theory (Carter *et al.*, 2010). The basic assumption is that gender diversity affects firm performance by bringing different skills, ideas, knowledge, experience, beliefs, values, and leadership styles to the table (Mumu et al., 2022). However, the empirical evidence regarding the consequences of BGD on performance remains inconclusive due to mixed results. Scholars argue that board diversity is a double-edged sword, yielding positive and negative effects (Tasheva & Hillman, 2019). Therefore, a deeper understanding and further exploration of the critical factors' moderating or mediating role are required (Zattoni et al., 2023).

This study aims to enhance the understanding of this research area by examining the impact of BGD on firms' performance in the Social Economy (SE) companies, particularly in the agri-food industry, a predominantly male-dominated sector with limited prior empirical studies and inconclusive results.

Drawing on the Motivational Role Modeling Theory (MRMT) (Morgenroth *et al.*, 2015) and Critical Mass Theory (CMT) (Kanter,

1977), we introduce a theoretical model to explore the relationship between BGD and firm performance, assessed through employees' productivity (EP). Furthermore, we explore the moderating role of a Female CEO (FCEO) or a Female Chair (FChair) in this relationship.

The SE companies comprise various organizations such as co-operatives, insurance/assurance companies, associations, foundations, ethical banks, and social organizations. They all share common values and features, such as the primacy of the individual and the social objective over capital, democratic governance, defense, and application of the principles of solidarity and responsibility, among others. These principles make them particularly likely to have gender-balanced management and decision-making structures (García et al., 2020; Bastida et al., 2023; Fernández-Guadaño & Martín-López., 2023; Castro et al., 2024).

The SE is a major socio-economic player in the European social market economy. There are 2.8 million SE organizations across all sectors, accounting in the European Union for 8 % of the EU's GDP. Furthermore, the agri-food sector is a good subject for study as it is a traditionally male-dominated sector, with a majority of Governing Boards (GBs) having no women, which makes it particularly interesting when it comes to analyzing the impact of the incorporation of women in decision-making bodies (Meliá-Martí et al., 2020). Despite the importance of SE companies (García-Pérez et al., 2024), most of the studies have focused on conventional capitalist companies listed on the markets, which highlights the interest of this study.

Our results show a descendent curvilinear relationship between BGD and EP. However, when there is an FChair, the BGD-EP relationship shifts to a U-shaped pattern, and it is possible to establish a critical mass equivalent to a Blau index diversity of 0.22–0.23. These results support both the MRMT and CMT. Although EP initially decreases as women join the board, once critical mass is achieved the EP levels increase and become somewhat higher than those obtained without an FChair. An FChair acts as a role model, motivating and inspiring the rest of the women on the board, empowering them to exploit their capacities and make a real impact on the board's decision-making and, thus, on EP. The contribution of our results is fivefold: First, we contribute to the critical mass literature by shedding light on the U-shaped link between BGD and EP. Second, we introduce the MRMT in the gender diversity field as the premise to analyze the modulator role of FCEO or FChair in this relationship. From this perspective, we contribute to better explaining the hypothesized relation's complexity. Third, we contribute by proposing an integrated model based on MRMT and CMT to calculate the critical mass when an FChair is on the board. The integration of both theories (CMT and MRMT) allows us to analyze the potential that an FChair has for changing the direction of the impact of GDB on EP, revealing a critical mass from which a higher BGD leads to increases in EP. Fourth, we expand our knowledge of BGD in unexplored SE companies. Finally, we contribute to identifying causal links with BGD and EP using longitudinal data.

The rest of the paper is structured as follows: Section 2 reviews the literature and sets out the different hypotheses; Section 3 covers the methodology, including the data source, the description of the main variables of the method, and the model approach; Section 4 shows the results, and Section 5 discusses these results. Finally, Section 6 presents conclusions with the contributions, practical implications, limitations, and future research lines.

2. Literature review and hypotheses

2.1. Board gender diversity and firm performance

Empirical research on the relationship between BGD and firm performance has yielded mixed results. Some studies find a positive relation (Campbell & Mínguez-Vera, 2008; Kramaric & Miletic, 2017; Lafuente & Vaillant, 2019; Terjesen et al., 2016); others provide a negative link (Adams & Ferreira, 2009), and others do not find a link at all (Carter et al., 2010; Chapple & Humphrey, 2014).

Several studies have tried to find different explanations for the contradictory results (Abbey & Adu-Danso, 2023; Bae & Skaggs, 2019), arguing that neither positive nor negative monotonic linear models are suitable for representing the shape of the gender diversity–performance link, proposing U-shaped relationships (Campos-García & Zúñiga-Vicente, 2023; Joecks et al., 2013; Wiley & Monllor-Tormos, 2018).

These findings are supported by the Critical Mass Theory (CMT), which postulates that there may be a crucial threshold in the extent of gender diversity beyond which the benefits of additional gains in firm performance are not accrued (Kanter, 1977). Following this line, some scholars have proved a U-shaped relationship between BGD and business performance (Bae & Skaggs, 2019; Joecks et al., 2013; Wiley & Monllor-Tormos, 2018). On the contrary, other scholars evidenced an inverted U-shaped relationship (Campos-García & Zúñiga-Vicente, 2023). Furthermore, recent research has obtained a different shape depending on the gender majority of the industry: a U-shaped relationship in male-majority industries and an inverted U-shaped relationship in female-majority industries (Ali et al., 2023).

Some research has established the critical mass of women as at least 30–40 % representation (Joecks et al., 2013; Kramaric & Miletic, 2017), while others establish a minimum of 3 women on the board for the effect to be significant (Liu et al., 2014; Shahab et al., 2020; Torchia et al., 2011, Castro, Tascón & Corral, 2023).

In the specific context of SE companies, previous studies have no consensus. Some studies have found a positive relationship between the presence of female board members and performance (Hernández-Nicolás et al., 2019; Hernández Ortiz et al., 2020), while others have proved it to be negative (Burress & Cook, 2010 and Masuku et al. 2016), and others found it non-significant (Esteban-Salvador et al.,2019; Huang et al., 2015; Meliá-Martí et al., 2019). However, none of them have analyzed the curvilinear relationship between BGD and performance. The inconsistency in results implies that linear models may not accurately represent the BGD-EP relationship; therefore, it seems appropriate to validate U-shaped relationships, according to the CMT.

Based on these considerations, our hypothesis is:

H1. There is a U-shaped relationship between BGD and EP

2.2. Moderator effect of FCEO and FChair

Inconclusive results in the studies of the relationship between BGD and performance have led to examining more complex relations. Previous research suggests that the link between BGD and performance is notably influenced by additional moderators (Khatib *et al.*, 2023) that should be considered in this association.

According to MRMT, women in leadership positions can act as role models to other women and have a positive impact, which could lead to improved decision-making and performance. Role models influence role aspirants' motivation, goals, and achievements, especially for members of stigmatized groups, by serving three functions: acting as behavioral models, representing "the possible," and being inspirational (Morgenroth et al., 2015). As a behavioral model, women possess skills and techniques that the role aspirants lack. Role aspirants can learn from them through observation and comparison with their performance (Kemper, 1968). Moreover, they have to represent the possible, which means that they need to be perceived by the role aspirant as attainable and embody an already existing or new goal to increase motivation. Finally, role models can function as inspirations, contributing to role aspirants' adoption of new pursuits.

The integration of both theories (CMT and MRMT) assumes that the presence of an FChair or an FCEO has the potential to change the extent or even the direction of the impact of GDB on EP, bringing to the surface a critical mass from which a higher BGD leads to increases in EP.

The board of directors in a cooperative is a group of members who collectively set strategy, oversee management, and protect members' interests by ensuring that the organization's management acts on their

behalf. It is the highest decision-making body in the organizational hierarchy. The board chair, whether a man or a woman, is a key figure and the visible face of the company. Often, the chair is the one who brings the board together and directs and leads the organization. A minority of women on many boards means they are not usually heeded by the rest of the group (De Creu *et al.*, 2008) and can be labeled as tokens, as stated by CMT. This raises barriers to exerting influence on decisions and often creates discomfort, isolation, and self-doubt in the group. According to MRMT, women who have succeeded in holding CEO or Board chair positions can act as role models to women on boards and serve as a source of inspiration and motivation, giving them the security they need to increase their participation and expression without constraints, avoiding the unwanted effects of being perceived as a token (Elstad & Ladegard, 2012). This can lead to improved decision-making and performance.

Though research has extensively examined the impact of an FChair or FCEO on performance (Martín-Ugedo & Mínguez-Vera, 2023), there has been limited analysis of the moderating roles of FCEOs and FChairs in the relationship between BGD and performance (Birindelli et al., 2019; La Fuente & Vaillant, 2019), despite both CEO and Chair influence performance explaining a significant amount of its variance (Carnahan *et al.*, 2010). Similarly, Zattoni et al. (2022) emphasize in their recent review that exploring how CEOs or Chairs interact with board diversity in influencing firm performance could be particularly interesting.

Birindelli et al. (2019) found a positive moderating effect in this line. They demonstrated that a critical mass of women on the board in banks positively impacts environmental performance when female CEOs lead them. However, others have found no significant effect, whether in the case of FChairs or FCEOs (Lafuente & Vaillant, 2019). Finally, Glass and Cook (2018) suggest that female CEOs may have limitations in influencing firm outcomes. However, they also highlight that the positive effects of gender diversity among top leaders are contextual and conditioned by the gender composition of leaders at different levels.

Based on these considerations. Our hypothesis:

H2. The presence of an FCEO positively and significantly moderates the relationship between the BGD and EP.

H3. The presence of an FChair positively and significantly moderates the relationship between the BGD and EP.

The proposed model and hypotheses are shown in Fig. 1.

3. Methodology

3.1. Sample and data collection

The hypotheses were tested on a sample of 1914 Spanish agri-food SE companies, which included 1776 co-operatives (92.79 % of the whole), 122 agri-food producer associations (6.77 % of the total), and 16 other kinds of associations (representing 0.83 % of the total). The data were provided by Agri-food Co-operatives of Spain, a representative organization comprising most Spanish agri-food SE companies.[c] The period under study covers a panel of data from 2017 to 2021. The variable FCEO only has information in the panel from 2019 to 2021 and FChair from 2018 to 2021. In this study, only companies with a turnover of >500,000 euros have been considered.

3.2. Variables

3.2.1. Dependent variable

Employee Productivity (EP), calculated as turnover/number of employees. Previous gender research has measured organizational

performance as employee or labor productivity (Ali et al., 2014; Bae & Skaggs, 2019; Luanglath et al., 2019). EP has been selected as a performance metric over other accounting measures because in many SE companies net income may not accurately reflect the actual profit. SE companies prioritize satisfying their partners rather than maximizing profits, making traditional profit-based performance metrics less applicable (Kontogeorgos et al., 2018; Soboh et al., 2011). The EP resulting values were transformed using a natural logarithm (Ali *et al.*, 2014).

A significant part of agri-food SE companies' labor force is made up of discontinued workers. The number of employees has been established to calculate the EP ratio by considering the number of permanent employees plus the number of discontinuous or eventual employees (2 discontinuous, one fixed). This approximation was made after a discussion with managers of several SE companies.

3.2.2. Independent variables

To measure BGD, we used the Blau Index (Blau GB) (Ali *et al.*, 2014; Bae & Skaggs, 2019; Joecks *et al.*, 2013). Blau index values range from 0 to 0.5, where 0 indicates no diversity (100 % male or female), and 0.5 indicates maximum diversity (50 % male and 50 % female). The quadratic BlauGB form (BlauGB^2) has also been used to capture the potential curvilinear relationship between BGD and EP (see Bae and Skaggs (2019) and Joecks *et al.* (2013).

This indicator measures gender diversity, regardless of which gender is the majority, so an increase in BGD, measured through the Blau Index GB, can imply either the incorporation of men on boards with a greater presence of women or, on the contrary, the incorporation of women on boards with a greater presence of men. However, in a population such as the one analyzed, in which 99.2 % (in 2017) and 98.5 % (in 2021) of the companies are mostly composed of men, as will be detailed in the descriptive statistics (table 1), increases in BGD imply the incorporation of women on boards.

The Presence of an FCEO has been measured through a dichotomous variable (1=female CEO; 0= male CEO), the same as the Presence of an FChair (1=female Board Chair; 0: male Board Chair)

3.2.3. Control variables

Following previous work, we control for board size (Birindelli et al., 2019; Joecks et al., 2013; Tarkovska et al., 2023) and firm size (Ali et al., 2014; Moreno-Gómez et al., 2018). The number of members on the board constitutes board size. So while large boards are hindered by escalating disorganization and negatively impact board cohesion, at the same time they benefit from more resources, greater information and broader collective expertise (Birindelli et al., 2019). Regarding company size, measured by turnover in euros, large firms have more potential to perform better because of the economies of scale (Ali et al., 2014; Bae & Skaggs, 2019). Finally, we include a set of year dummy variables to rule out the effect of time and other environmental changes on EP.

3.3. Analyses

Four Fixed and Random effects models have been proposed. After testing the Hausman specifications, the Fixed Effect (FE) estimator has proved to be more efficient than the random effects (RE) estimator. This test examines the equality of the coefficients of the fixed and random effect estimations. The null hypothesis is that the coefficients of both models are similar. If this hypothesis is rejected the coefficients will differ markedly, with only the intragroup estimation (fixed effects) being consistent. The following equation specifies the FE models:

$$LnEP_{it} = \beta_0 + \beta_1 BlauGB_{it} + \beta_2 FChair_{it} + \beta_3 FCEO_{it}$$
$$+ \beta_4 BlauGB^{2+}_{it} \beta_5 BlauGBxFCEO_{it} + \beta_6 BlauGB^2 xFCEO_{it}$$
$$+ \beta_7 BlauGBxFChair_{it} + \beta_8 BlauGB^2 xFChair_{it} + \beta_9 Boardsize_{it}$$
$$+ \beta_{10} Companysize_{it} + \sum Time_t + \varepsilon_{it}$$

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[c] Information obtained from the work of the Socioeconomic Observatory of Spanish Agro-Food Cooperatives (OSCAE), carried out by Agro-Food Co-operatives of Spain and financed by the Ministry of Agriculture, Fisheries and Food
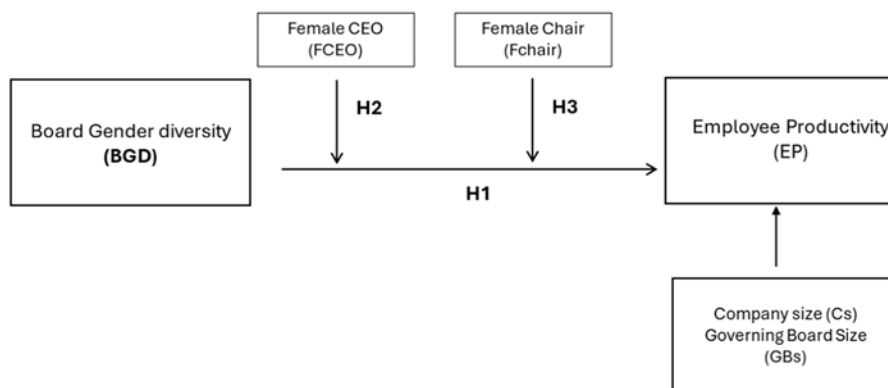
Fig. 1. Model proposed.

Table 1
Descriptive statistics.

	2017			2021		
	N	**Mean (SD)**	**Max-Min**	**N**	**Mean (SD)**	**Max-Min**
Board size	1867	8.36 (2.58)	20–1	1885	8.23 (2.57)	22–1
Turnover (€)	1914	8,868,676 (2.02e07)	4.4e08 – 500,000	1886	1,02e07 (2.46e07)	5.3e08–503,027
EP (employee productivity)	1838	786,775.1 (1373,223)	4,16e07–16,081	1820	759,049.5 (1,107,485)	1,6e07–16,713
LnEP	1838	13.07 (0.995)	17.54–9.68	1820	13.02 (1.008)	16.59–9.72
	N	**Number of women**	**%**	**N**	**Number of women**	**%**
Women on Board	1914	0	70.05	1886	0	59.07
		1	19.08		1	22.64
		2	6.85		2	9.97
		3	2.56		3	5.25
		>4	1.46		>4	3.07
	N	**BlauGB (%ud)**	**%**	**N**	**BlauGB (%ud)**	**%**
BlauGB	1867	0.00–0.10 (0–5.5 %)	69.68	1490	0.00–0.10 (0–5.5 %)	59.15
		0.11–0.20 (5.6–11.5 %)	9.19	210	0.11–0.20 (5.6–11.5 %)	9.92
		0.21–0.30 (11.6–18.7 %)	9.83	301	0.21–0.30 (11.6–18.7 %)	12.15
		0.31–0.40 (18.8–28.2 %)	6.16	195	0.31–0.40 (18.8–28.2 %)	7.43
		0.41–0.50 (28.3–50 %)	5.14	683	0.41–0.50 (28.3–50 %)	11.35
	N	**% enterprises with**	**% enterprises without**	**N**	**% enterprises with**	**% enterprises without**
Female CEO(FCEO)[1]	1894	6.82	93.08	1886	15.11	84.89
Female Chair (FChair)[2]	1876	2.83	97.17	1886	3.71	96.29
Equality policies	1914	14.63	85.37	1886	34.36	65.64

In 2017, 99.2 % of the companies had a higher % of men than women on the Board. In 2021, 98.5 %.
%ud: % of the under-represented group.
[1] The 2017 FCEO data correspond to 2019.
[2] The 2017 FChair data correspond to 2018.

Prior studies have documented endogeneity concerns in the relationship between board composition and performance (Schwartz-Ziv, 2017). To address the potential endogeneity problem, a one-year lagged EP measure has been used concerning the rest of the variables of the different panel regression models (see Birindelli et al., 2019; Joecks et al., 2013 and Lafuente & Vaillant, 2019). The robust option has been used to correct for potential heteroskedasticity and serial correlation.

Model 1, the baseline model, contains LnEP as the dependent variable and BlauGB, FChair, and FCEO as the independent and control variables. Model 2 also includes the quadratic BlauGB form. With models 1 and 2, we test the direct impact of BGD on EP and the existence of a curvilinear U-shaped relationship between them (H1)

Models 3 and 4 include four interaction terms: BlauGBxFCEO, BlauGB²xFCEO, BlauGBxFChair, and BlauGB²xFChair, to test whether the presence of a FCEO or FChair positively and significantly moderates the relationship between *BGD* and EP (H2 and H3).

3. Results

Tables 1 and 2 show the descriptive statistics and Pearson's correlation coefficients for the model variables.

The average size of the companies' GB is around eight members, with a maximum value of 22 in 2021. 59.07 % of the companies analyzed in 2021 had no women on the GB, 22.64 % had one, and 9.97 % had two, a slight improvement compared to 2017. The presence of FCEOs has increased from 6.82 % of the SE companies in 2019 to 15.11 % in 2021. The same applies to FChairs, which went from 2.83 % in 2018 to 3.71 % in 2021. Most firms had entirely male GBs in 2017 (70.05 % 2017), although the trend over the five years shows an increase in the number of women on boards, reducing the percentage of SE companies with totally masculinized boards to 59.07 %. Finally, there is an increase in the equity policies of companies over the period analyzed. In 2017, only 14.63 % of companies had such policies, compared to 34.36 % in 2021.

In SE companies, the significant imbalance in gender representation

Table 2
Correlation matrix.

	LnEP	BlauGB	BlauGB^2	FCEO	FChair	Board size	Firm size
LnEP	1						
BlauGB	−0.0851***	1					
BlauGB^2	−0.0126	−0.6015***	1				
FCEO	−0.0221	0.0874***	0.0168	1			
FChair	−0.0284**	0.1972***	0.0082	0.1239***	1		
Board size	0.0627***	−0.0181*	−0.0283***	0.0205	−0.0613***	1	
Firm size	0.1379***	−0.0160	−0.01055	0.0366**	−0.0238**	0.2411***	1

.1*, 0.05**, 0.01***.

on boards is evident, with 99.2 % of boards having more men than women in 2017. Although there was a slight decrease to 98.5 % in 2021, this still indicates a predominantly male presence on Boards. Consequently, there are low BlauGB levels, signifying the underrepresentation of women. Thus, promoting diversity and raising BlauGB levels suggests increasing the weight of the underrepresented group, which in this case pertains to women.

The correlation matrix (Table 2) highlights a negative linear relationship between LnEP and BGD (BlauGB) (r=−0.08***) and between LnEP and FChair (r=−0.028**), not being significant in the case of FCEO (r=−0.022), which indicates that SE companies with a more diverse GB seem to have lower EP and the same for FChair. Regarding BGD (BlauGB) and FCEO and FChair, both relationships appear to be positive and significant ($r = 0.08$***and $r = 0.19$***, respectively). SE companies with a more diverse BGD are likelier to have a female CEO or FChair. Almost all correlation coefficients are below 0.5 except for the correlation between BlauGB and BlauGB^2, but still at a safe level of 0.6, which points to no multicollinearity concerns in our models.

Table 3 shows the four models proposed, which reflect highly significant F statistics. Model 1 shows that BlauGB is not statistically significant, indicating the possibility of a non-linear relationship between BGD and EP. Model 2 introduces the quadratic term of BlauGB for a

Table 3
Results of FE regressions. Dependent variable: LnEP.

Variables	MODEL 1 (Robust SE)	MODEL 2 (Robust SE)	MODEL 3 (Robust SE)	MODEL 4 (Robust SE)
BlauGB	−0.0231 (0.0630)	−0.1134 (0.0826)	−0.1061 (0.0841)	−0.1250 (0.0840)
BlauGB^2		−0.0388** (0.0180)	−0.0372** (0.0183)	−0.0416** (0.0182)
BlauGBxFCEO			0.0040 (0.2944)	0.0640 (0.2939)
BlauGB^{2}xFCEO			−0.1006 (0.6123)	−0.2445 (0.6171)
FChair	−0.0126 (0.0621)	−0.0063 (0.0617)	−0.0065 (0.0621)	0.0422 (0.0434)
FCEO	0.0305* (0.0177)	0.0303* (0.0177)	0.0366 (0.0268)	0.0346 (0.0268)
BlauGBxFChair				−2.0112** (0.820)
BlauGB^{2}xFChair				4.8600*** (1.8203)
Board size	0.0082 (0.0104)	0.00857 (0.0104)	0.0085 (0.0104)	0.0081 (0.0104)
Firm size (€)	2.90e-08*** (6.07 e-9)	2.90e-08*** (6.08 e-9)	2.90e-08*** (6.08 e-9)	2.90e-08*** (6.08 e-9)
Intercept	12.6840***	12.6924**	12.69114***	12.6963***
Year dummy	yes	yes	yes	yes
Num obs	5409	5409	5409	5409
Groups	1924	1924	1924	1924
R^2(within)	0.1021	0.1029	0.1030	0.1050
F-test	18.97***	103.98***	90.07***	62.16***
Hausman Test	630,13***	537,35***	507,63***	775,97***

Note: FBC: All the variables have a year lag with respect to LnEP. Hausman tests are significant, confirming the fixed effect (within) regression. Robust standard errors are reported in parentheses. 1*, 0.05**,.01 ***.

curvilinear relationship. In both models, the existence of a female CEO significantly impacts EP, while the presence of an FChair is not significant. We find that BlauGB^2 is negatively significant (−0.0388**), which confirms that the relationship between BGD and EP is curvilinear and descendent (see blue curve in Fig. 2). These results imply that more BGD leads to less EP, which rejects H1.

Model 3 introduces the interaction terms BlauGBxFCEO and BlauGB^{2}xFCEO to test if the presence of FCEO positively moderates the relationship between BGD and EP (H2) (see Table 3, model 3). Our results do not support this hypothesis (H2 is rejected), while both terms appear insignificant. The moderating effect of FCEO can also be observed in Fig. 2 (model 3). The green curve shows the impact of BGD on LnEP in the presence of FCEO. The results show that an FCEO increases EP a little, up to a Blau index of 0.25, compared to the absence of an FCEO (blue curve, model 2). Blau Index= 0.25 (which equates to a presence of the minority group of 14.5 %) sets the point from which EP decreases as the diversity increases more with the presence of an FCEO than without one.
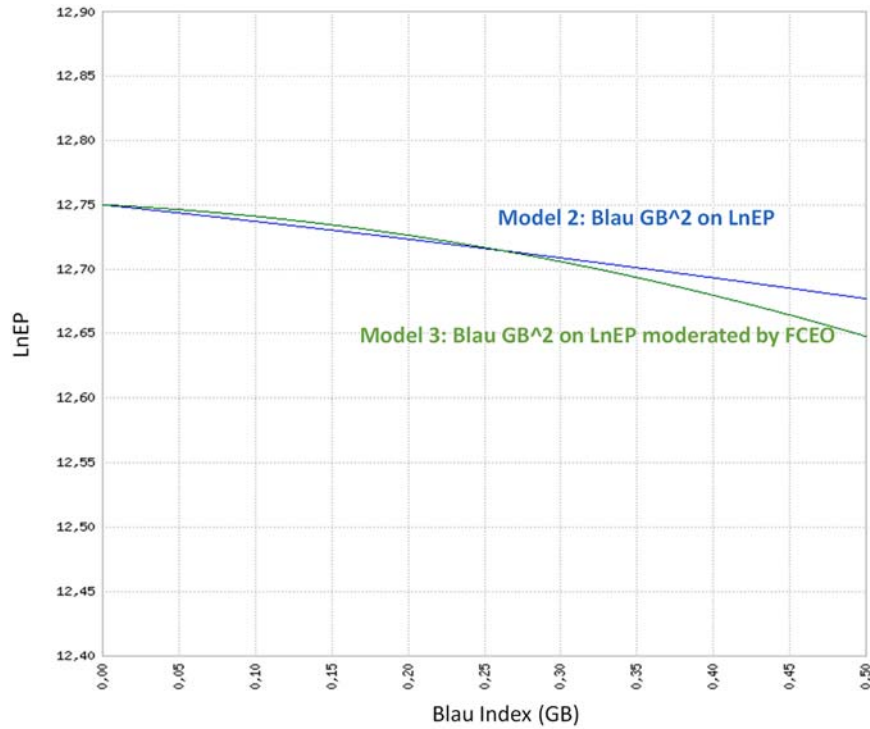
Model 4 introduces the moderation effect of FChair to test H3 (table 3). The interaction between FChair and BlauGB is significant and negative (−2.0112*). Furthermore, the interaction between FChair and BlauGB^2 is significant and positive (4.8600***). These results indicate that while the relationship between BGD and EP is curvilinear and of a descendent shape (model 2), an FChair moderates the relationship, and the shape changes from convex to concave (U-shaped). These findings support H3, that is, FChairs have a moderating role in the relationship between BGD and EP. The moderating effect of FChair can also be observed in Fig. 3 (red curve). An FChair in the GB changes the relation between BGD and EP from a curvilinear and descendent shape to a concave U shape. Although at low levels of BGD, increases in BGD lead to reductions in EP, after overcoming a certain degree of diversity (Blau Index=0.22, which, taking a masculinized board as a starting point, equates to 13 % of women on the board), higher levels of diversity lead to improvements in EP. This growth in EP with increasing diversity occurs from Blau Index=0.22 to 0.50, the maximum diversity level in which males equal females on the GB. These results confirm the Critical Mass Theory.

4. Discussion

In our study, we explored the U-shaped relationship between BGD and EP using a dataset based on CMT. We did not find evidence supporting this U-shaped link contrary to CMT expectations. Instead, our results suggest a curvilinear and descendent-shaped relationship.

Our findings differ from those of Ali et al. (2014), and Luanglath et al. (2018), who found a linear relationship: Ali et al. (2014) found a linear relationship between BGD and EP, and Luanglath et al. between top management team diversity and EP.

Our results also contrast with those of Bin Bae and Skaggs (2019), Joecks et al. (2013), and Willey and Monllor (2018), who identified a U-shaped relationship. Bin Bae and Skaggs (2019) found this relationship between gender diversity in management and EP, and Joecks et al. (2013) and Willey and Monllor (2018) between BGD and other firm performance measures.

LnEP: Natural Logarithm of Employee Productivity; FCEO: Female CEO

Fig. 2. EP- BGD relationship with and without the moderation effect of FCEO.
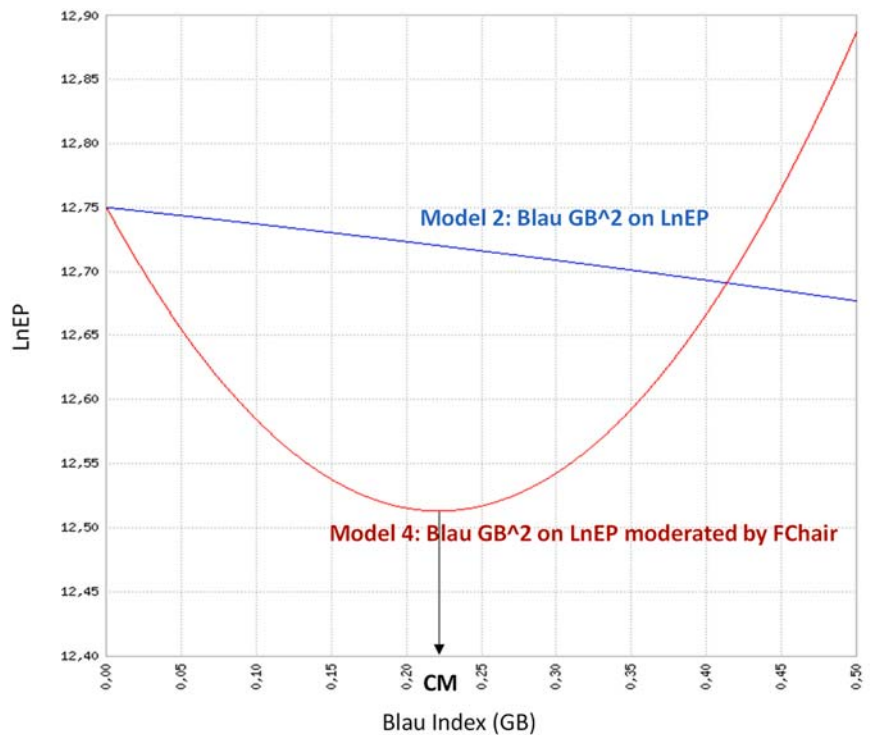
LnEP: Natural Logarithm of Employee Productivity; FChair: Female Chair; CM: Critical Mass (0,22)

Fig. 3. The moderating effect of FChair on EP-BGD.

On the other hand, our results are in line with the ones obtained by Birindelli et al. (2019) and Campos-García and Zúñiga-Vicente (2022), who found a curvilinear inverted U-shaped relationship between BGD and performance.

Thus, our study confirms a curvilinear and descending relationship, though not strictly U-shaped. Our results indicate that the impact of BGD on EP varies depending on the levels of diversity. As BGD increases and boards become more diverse and plural, challenges such as

miscommunication and non-cooperation emerge and negatively impact EP. Following the social identity theory (Tajfel & Turner, 1979), individuals tend to maintain a positive self-identity, exhibit stereotypical behavior, and consequently, emphasize differences between the two groups (male and female). This hinders group functionality and hampers realizing the benefits associated with greater diversity (Ali et al., 2014).

When we consider the moderating effect of an FChair, the model reveals a U-shaped relationship between BGD and EP. At lower levels of BGD (indicating highly masculinized boards), increases in BGD lead to decreases in EP until the Blau Index$_{GB}$ reaches 0.22 (equivalent to a presence of women of 12–13 %). Beyond this point, EP begins to rise with increasing diversity, indicating a positive impact of BGD on EP.

Our findings differ from those of La Fuente and Vaillant (2019), who concluded that the BGD-performance relationship is not contingent on the presence of female leadership (Fchair or FCEO). In contrast, our results suggest that women's ability to advance their leadership goals successfully depends on other women leader's presence in the organization (Birindelli et al., 2019; Glass & Cook, 2018) and underscores the significance of having female leadership, particularly in the role of an FChair, as this empowers a critical mass of women on the board to influence EP positively. FChairs embody the goals of women directors, influencing expectancy and, consequently, motivation and goals through vicarious learning. A female leader on the board can contribute to a more secure environment for female directors to express their opinions. Simultaneously, male directors may exhibit increased respect and openness towards views raised by women, ultimately enhancing the effectiveness of board decisions (Wang & Kelan, 2013).

In this line, Dula et al. (2020) observed that having an FChair alone is not significantly associated with improved board dynamics. They highlighted the importance of achieving a critical mass of female board members.

Our results support the integration of CMT and MRMT, specifically when the conditions outlined by CMT are met since the favorable effect of an FChair's presence as a role model in EP only occurs when a critical mass of women on the Board has been reached. Similarly, but in the opposite direction, only the critical mass theory is fulfilled. in the presence of a role model (FChair).

As role models, FChairs have the potential to reshape the self-stereotypes, beliefs about abilities, and perceived external barriers of female directors. This transformation leads to a more active and collaborative role within the board, increased decision-making participation, and improved EP.

However, this effect is not observed in the presence of an FCEO. These results differ from studies such as Birindelli et al. (2019), which identified a U-shaped relationship in banks led by an FCEO.

These findings suggest that the moderating influence of female leadership on the relationship between BGD and EP depends on the leadership position (FChair or FCEO), a concept supported by the MRMT. According to this theory, a role model must fulfill three functions: serve as a behavioral model, represent possibilities, and inspire. The distinct profiles of the CEO and Chair result in varying degrees of fulfilling these functions as role models, leading to an irregular impact on women on the board.

A crucial aspect is that the role model must represent the possible, meaning that those aspiring to the role must envision themselves in that position. This becomes challenging if the profiles and characteristics of the role model and the aspirant differ significantly. Morgenroth et al. (2016) noted that "a role model serving as inspiration may make a goal desirable but could simultaneously negatively impact aspirants' expectations of success when attainability is low."

In the agri-food SE companies, which have served as the basis for the present study, board members are farmers who often lack a university education and the skills necessary for CEO positions. In such scenarios, female board members face difficulties considering an FCEO as a role model, as it falls short of meeting the criteria of representing the "possible." Conversely, for these female board members, an FChair is one of them, making this position appear attainable and desirable to them.

Our findings provide evidence countering the Queen Bee Phenomenon (QBP), which posits that successful women in male-dominated settings hinder the progress of their female subordinates (Derks et al., 2016). According to QBP, organizations with women in leadership roles may limit opportunities to benefit from women's diversity, leading to diminished outcomes (Ellemers et al., 2012). In contrast to what QBP suggests, our results regarding SE companies indicate that female leaders are more akin to "collaborative leaders" as opposed to the perception of them as "tyrannical leaders" (Drexler, 2013). These female leaders foster an environment of collaboration and trust, allowing other women to express themselves and learn, ultimately enhancing the company's functioning and performance.

5. Conclusions

This research investigates the BGD-EP relationship and the moderating role of FChairs and FCEOs in this relationship. Our findings point to a curvilinear and descendent-shaped relationship between BGD and EP. It implies that issues like miscommunication and non-cooperation arise as boards become more diverse and plural, negatively affecting EP. However, the BGD-EP relationship shifts when an FChair is on the board, going from a descending and curvilinear shape to a U-shape, confirming the moderating role of the FChair. Our results support the integration of the CMT and the MRMT: CMT holds true but only in the presence of a role model, specifically an FChair. Therefore, above the critical mass of 13 % of females on the board, incorporating women significantly and positively affects EP. Conversely, MRMT, visible through the impact of an FChair as a role model for other women on the board, is only fulfilled once a critical mass has been attained or exceeded.

It has not been proven that an FCEO moderates the relationship between BGD and EP. This leads us to conclude that the moderating effect of female leadership on the relationship between BGD and EP depends on the specific leadership position the woman holds.

This paper highlights the importance of considering the presence of role models when designing gender policies in companies. It demonstrates that solely adding women to boards does not enhance performance. Only through the presence of an FChair that motivates and inspires other women on the board, empowering them to cultivate their capabilities, can the BGD become impactful. The absence of a similar effect with the presence of an FCEO underscores the crucial need to ensure that females tasked with serving as role models from positions of responsibility fulfill the three essential functions of a role model: acting as a behavioral model, representing the possible, and being inspirational.

This study contributes to the research on BGD and performance for several reasons, with implications for theory and research. First, it addresses a gap in the literature by analyzing the relationship between BGD and EP, focusing on EP as a performance variable. Only Ali et al. (2013) have explored this aspect. Secondly, considering that research has presented evidence against diversity-performance main effect models (Van Knippenberg et al., 2016), this study stands out as one of the few to emphasize the significance of the moderating effect of an FChair or an FCEO on performance, and it is the only one to examine both moderators simultaneously.

Thirdly, the combined analysis of both moderators allows us to conclude that the moderating impact of female leadership on the relationship between BGD and EP depends on the leadership position (FChair or FCEO). This reinforces the MRMT, emphasizing the pivotal role of the role model serving its three functions. If the FCEO fails to fulfill one of these functions, particularly the representation of "the possible," she stops functioning as a role model, and its moderating effect disappears.

Fourthly, we contribute to the current body of knowledge by introducing an integrated model grounded in MRMT and CMT. This approach

has enabled us to calculate the critical mass when there is an FChair on the board. Our findings endorse the integration of CMT and MRMT, particularly highlighting that BGD influences EP only when a role model (FChair) is present.

Fifth, our results oppose the Queen Bee Phenomenon (QBP), which argues that women who succeed in male-dominated settings play a negative role in advancing their female subordinates (Derks et al., 2016). Consequently, organizations with queen bees at the managerial level can diminish outcomes by limiting opportunities to benefit from women's diversity (Ellemers et al., 2012).

In contrast to what QBP suggests, our results are in line with Arvate et al. (2018), who found that in public organizations in which a woman was elected leader, there was an increase in the number of top and middle managers compared with the ones in which a male was elected leader, which led them to argue that "The QBP may be a myth." Our results show that in SEEs, female leaders are "collaborative leaders" or, as Arvate et al. (2018) denominated them, "Regal leaders" instead of "tyrannical leaders" (Drexler, 2013). They create the necessary environment and trust so that other women can express themselves and learn, improving the company's general functioning and performance.

Finally, our analysis is conducted in the context of SE companies, a type of industry where no prior studies have explored the U-shaped relationship between GBD and EP.

Furthermore, our results have several managerial and practical implications. Our findings indicate that gender policies at the board level in highly masculinized companies should not rely solely on quantitative criteria. In this regard, in SE companies without an FChair increasing the number of women on boards does not inherently improve performance. Initiatives aiming to enhance board diversity significantly impact performance when accompanied by the presence of an FChair. This suggests that initiatives aimed at diversifying boards may yield limited impact if no positive reinforcement exists for the underrepresented group. In the context analyzed, this positive reinforcement is realized through the presence of an FChair. It is essential to highlight that having an FCEO alone, without a corresponding FChair, does not impact the relationship between BGD and EP.

Moreover, a board with fewer women but high motivation and empowerment might be more effective than a board with more women whose participation is less impactful. These findings highlight the significance of gender policies prioritizing building confidence and empowerment among women on boards, underscoring the effectiveness of introducing female leadership role models, such as FChair, as a highly successful corporate strategy.

This study has limitations; the FCEO and FChair data were accessible for 2019–2021 and 2018–2021, respectively. They are based on Spanish SE companies in the agri-food industry, known for their high degree of masculinization. The company's typology and the specific country could introduce a potential bias. SE companies often have a democratic and collaborative spirit that may differ from other industries and organizational contexts.

Future research should explore the moderating impact of female leadership across different sectors, countries, and organizational types in order to provide a more comprehensive understanding of the relationship between BGD and firm performance, particularly those investigating the moderating impact of FCEOs and FChairs on this relationship.

CRediT authorship contribution statement

Elena Meliá-Martí: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Guillermina Tormo-Carbó:** Writing – original draft, Validation, Methodology, Data curation. **Josefina Fernández-Guadaño:** Writing – review & editing, Visualization, Supervision.

Declaration of competing interest

The authors of the manuscript declare that they have no conflict of interest.

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