Journal of
Risk and Financial Management

MDPI

Article

Does Board Gender Diversity Really Improve Firm Performance? Evidence from Greek Listed Firms

Stavros E. Arvanitis [1,*], Evangelos G. Varouchas [1] and George M. Agiomirgianakis [1,2,3]

[1] Department of Accounting and Finance, School of Management and Economics Sciences, Hellenic Mediterranean University, 71410 Heraklion, Greece; varouchasv@hmu.gr (E.G.V.); georgeagios@hmu.gr (G.M.A.)
[2] School of Social Sciences, Hellenic Open University, 26335 Patras, Greece
[3] Hellenic Scientific Institute, Economics of Education & Life Long Learning, of Research & Innovation, 10434 Athens, Greece
* Correspondence: starvan@hmu.gr; Tel.: +30-2810-379674

Abstract: In recent decades, the contribution of board gender diversity to corporate performance has drawn the interest of researchers, politicians and regulators. This paper examines whether board gender diversity affected the financial performance of 111 Greek listed firms from 2008 to 2020. We use the two-step system GMM estimator to address the endogeneity problem, which is the appropriate method used in governance literature. Our main empirical finding supports the existence of a positive relation between board gender diversity and firm performance. This finding remains robust to three different proxies of gender diversity and under two alternative performance measures, i.e., return on assets and Tobin's Q. We also find that there is an inverted U-shaped relation between the proportion of female directors and firm performance (measured by Tobin's Q). Moreover, we find that gender diversity could lead to maximization of corporate performance when female participation in the boardroom reaches 33%. Thus, the imposition of an ad-hoc 25% female representation in corporate boardrooms, dictated by the new Law 4706/2020 on corporate governance, could most probably be an underproductive policy. Our findings have practical implications for Greek regulators and legislators and contribute to the governance literature for the case of companies that operate in a small open economy.

Keywords: corporate governance; board gender diversity; firm performance; Greece

Citation: Arvanitis, Stavros E., Evangelos G. Varouchas, and George M. Agiomirgianakis. 2022. Does Board Gender Diversity Really Improve Firm Performance? Evidence from Greek Listed Firms. *Journal of Risk and Financial Management* 15: 306. https://doi.org/10.3390/jrfm15070306

Academic Editor: Eleftherios I. Thalassinos

Received: 8 June 2022
Accepted: 9 July 2022
Published: 13 July 2022

1. Introduction

Following recent global corporate governance failures and accounting scandals (e.g., Lehman Brothers, Enron and WorldCom), there is a growing interest in researching the impact of corporate governance factors on firm performance. Women's participation in corporate boards has been emphasized by regulators, policymakers and scholars as one of the most significant attributes of board composition. The European Commission suggested legislative action in 2010 and two years later presented a directive with a goal of having 40% women on boards of directors. Despite the lack of consensus on the directive proposal, numerous EU member states have taken proactive initiatives to increase gender balance in boardrooms. The importance of gender diversity in corporate boards is indicated by the fact that several European countries are encouraging or even requiring public listed firms to increase the proportion of female directors on their boards. For instance, Germany, Italy, France and Belgium have introduced a legislative quota requiring the female representation on corporate boards to be between 30% and 40% of the total board members.

Additionally, the International Labour Organization, the World Bank and the Organization for Economic Co-operation and Development (OECD) support the economic benefits of improved gender balance on corporate boards. In Greece, the new Law 4706/2020 on corporate governance introduced mandatory 25% female representation in boardrooms.

Based on the European Institute for Gender Equality's findings, the average percentage of female directors of the largest publicly listed companies in Europe has significantly increased from 10.6% in 2008 to 29.5% in 2020. In Greece, the average percentage of female directors has doubled in 2020 (13%) compared to 2008 (5.7%). Current empirical findings support the proposition that female board members are monitoring more carefully than male board members (Adams and Ferreira 2009) and offer a variety of viewpoints and experiences to the board, which helps to improve the quality of board decisions and the legitimacy of corporate procedures (Hillman et al. 2007). However, many researchers in recent years have tried to investigate the impact of board gender diversity on firm performance, with inconclusive empirical findings (e.g., Adams and Ferreira 2009; Liu et al. 2014; Terjesen et al. 2016; Bennouri et al. 2018; Fernández-Temprano and Tejerina-Gaite 2020). Furthermore, most of the previous studies limit their research interest on the firms that operate in highly developed economies such as the USA and UK (e.g., Carter et al. 2003; Adams and Ferreira 2009; Brahma et al. 2020). Considering the above studies and their empirical findings, our research aims to investigate the impact of gender diversity on firm performance for firms operating in a small open economy, such as the Greek economy. For this purpose, we employ panel data analysis for a sample of 111 listed firms on the Athens Stock Exchange during the period 2008–2020. Panel data analysis is considered the most efficient method to employ when the sample is a mixture of cross-sectional data and time series. Our study employs the two-step system generalized method of moments approach, which controls for potential sources of endogeneity that plagued many previous studies.

Our study contributes to the existing literature in several ways. First, contrary to previous empirical studies on board gender diversity, our study uses a multi-theoretical approach, highlighting less emphasized theoretical frameworks on governance literature, such as the critical mass theory and social identity theory. Second, our empirical results shed light on the conflicting evidence regarding the relationship between gender diversity and firm value for the case of firms operating within a small open economy, such as the Greek economy. Indeed, we add new empirical evidence to the existing governance literature, showing that greater gender diversity on the board can improve corporate performance. Third, as Greece has experienced a long-term debt crisis (2008–2016), followed by the COVID-19 pandemic crisis, our study sheds light onto female participation in corporate boards and thus enriches the literature of female board participation during these two crises. Moreover, in 2022, Greece is experiencing a strong tourism-led growth and the economy is flourishing again, resulting in job creation, which in turn may lead to increased opportunities for female participation. Therefore, this anticipated increase in female participation will be an important issue for the performance of corporate firms. Fourth, considering the new Greek legal framework 4706/2020 that sets the representation of women on corporate boards to be at least 25% of total board members, our findings show that such an imposition could most probably be underproductive, as the performance maximization point occurs at 33% of female participation in Greek boards. Thus, our results state that policymakers in Greece should rethink the adoption of ad-hoc policies of female participation in corporate boards unsubstantiated by statistical evidence.

The rest of the paper is organized as follows. In Section 2, we briefly present the evolution of corporate governance in Greece. Section 3 provides the theoretical and empirical background and develops the hypotheses. In Section 4, we present our sample, data and econometric methodology. Section 5 contains our empirical results and Section 6 concludes the paper.

2. Corporate Governance in Greece

In Greece, the parameters of corporate governance are more in line with the European model. The majority of Greek corporations were, and a lot of them still remain, family-owned, where the family members participate in the board as executives. Greek family firms did not face agency conflicts between shareholders and managers. Unlike public listed firms worldwide, the conflict of interest in Greek firms was between minority shareholders

and majority shareholders, so this type of structure did not inspire ideas for an effective corporate governance mechanism (Spanos 2005). It is worth noting that Greek firms follow the one-tier board structure. In this type of board structure, both supervisory and managerial functions are carried out by one unified board. The driving forces for the imposition of corporate governance rules, quotas and practices were the following: (1) the use of initial public offerings (IPOs) as means for raising capital that turned Greek firms from family-owned to public listed, (2) Greece's participation in the European Union, (3) the significant growth of the capital market and (4) the participation of institutional investors in the shareholding structure of Greek listed companies. In 2011, the Hellenic Federation of Enterprises (SEV) drafted the corporate governance code SEV for listed companies and had a decisive impact on the consolidation of corporate governance in Greece. Later, the Hellenic Corporate Governance Council (HCGC) amended this code.

Greece's corporate governance framework arose primarily as a result of mandatory legislation, most notably the Greek Law 3016/2002 (Zhou et al. 2018). According to this law, non-executive directors should be at least one-third of the total number of board members, and at least two independent non-executive directors should exist on the board. The recently adopted law 4706/2020 sets stricter criteria regarding the corporate governance of Greek companies. This law mandates the proportion of female directors to be at least 25% of the total number of board members. Apart from the audit committee formation (Law 3693/2008), the new law 4706/2020 mandates the formation of nomination and remuneration committees, which should be composed of non-executive directors.

Greece is an intriguing case because it was involved in the largest haircut in the history of public debt and experienced a severe financial meltdown. As a result of these circumstances, significant changes in the governance framework of publicly traded companies have occurred. A lot of researchers narrow their research interest mainly to listed firms that operate in highly developed economies (e.g., Brahma et al. 2020; Carter et al. 2010). There is a scarcity of studies that examine the relation between board attributes and Greek firms' performance. Using a sample of Greek listed firms during 2008–2012, Zhou et al. (2018) find that firms with large-sized boards and fewer independent board members performed better. On the contrary, Drakos and Bekiris (2010), claim that the board size has a negative impact on the performance of Greek listed firms, while board independence does not affect firm value. Moreover, Georgantopoulos and Filos (2017) find that there is an inverted U-shaped relation between board independence and performance of Greek banks and between board size and bank performance. It is worth mentioning that the governance literature lacks empirical studies that explore the relation between board gender diversity and firm performance for companies that operate in a small open economy such as Greece. In addition, to the best of our knowledge, this is the first empirical research that examines the impact of gender diversity on Greek firms' performance. So, our findings could be beneficial for both Greek regulators and policymakers.

3. Literature Review and Hypotheses Development

The concept of diversity has become a vital element of boards' composition worldwide. The gender of directors is one of the main characteristics of board diversity. Board gender diversity is defined as the percentage of female directors on the company's board. Several theoretical frameworks (agency theory, resource dependence theory, critical mass theory, social psychological theory and social identity theory) provide valuable insights into the link between board gender diversification and financial performance.

3.1. Agency Theory

Berle and Means (1932) established agency theory, which describes the conflict of interests between managers and shareholders. According to the agency theory, board gender diversity mitigates the agency conflicts that arise from the separation of ownership and management. Carter et al. (2003) and Carter et al. (2010) claim that better-diversified boards execute better their monitoring function because diversity increases the independence of

the board. Based on agency theory, Adams and Ferreira (2009) find that gender-diverse boards have superior monitoring skills and also increase manager accountability. Furthermore, board gender diversity, according to Gul et al. (2011), can function as an extra governance mechanism that would help enterprises with weak governance. Moreover, women directors are more sensitive to ethical issues, behave less opportunistically and bring fresh perspectives on complex issues (Cumming et al. 2015; Jensen 1993; Krishnan and Parsons 2008; Francoeur et al. 2008). Due to the fact that board gender diversity positively influences its operation, this will, in turn, enhance the firm value (Nguyen et al. 2015). Overall, the agency theory suggests that gender diversity enhances board effectiveness and improves the financial performance of companies.

3.2. Resource Dependence Theory

According to resource dependence theory, a company's survival is contingent on its ability to get access to vital external resources (Pfeffer and Salancik 1978). Resource dependence theory views the board as a vital resource to the company (Hillman et al. 2000). This theory suggests that well-diversified boards are better than homogeneous groups at providing and securing access to external resources critical for the operation of the firms. Directors with different genders can also bring different information, opinions, knowledge and skills to the board. Hillman et al. (2002) support the theory that more gender-diverse boards boost the level of firm legitimacy since gender equality has become one of the most widely accepted societal standards globally. Female directors may contribute to the board's human capital and communication channels by providing additional insights into the firm's strategic issues, particularly those involving female workers, consumers and business partners (Daily et al. 1999). To sum up, resource dependence theory implies that having female directors on boards is crucial for corporate performance as it can increase enterprises' access to vital external resources (Liu et al. 2014).

3.3. Critical Mass Theory

Based on the critical mass theory (Kanter 1977), once a minority of board members with specific characteristics (age, ethnicity, gender, nationality, tenure, etc.) reaches a certain threshold, it will significantly contribute to the board function. The critical mass theory on board gender diversity states that "one is a token, two is a presence, and three is a voice" (Kristie 2011). In line with this argument, Torchia et al. (2011) and Cheng and Groysberg (2020) state that only a critical mass of women directors (three or more) can really influence board operation and the level of firm innovation. Kramer et al. (2007) conducted interviews with board members in order to investigate the impact women have on corporate boards, and they found that corporations with three or more female directors on the board can benefit the most from women's contribution. Furthermore, Liu et al. (2014) and Brahma et al. (2020) point out that a critical mass of three or more female directors positively influences financial performance.

3.4. Social Psychology Theory

Despite the above, higher gender diversity on the board may not always result in more effective board operation (Carter et al. 2003) since more diversified boards may face more conflicts of interests between their members (Goodstein et al. 1994). Social psychology theory supports that diversity may positively or negatively affect the board operation. Westphal and Milton (2000) give some support to the argument that minorities may reduce groupthink by providing different viewpoints in board discussions, while Campbell and Mínguez-Vera (2008) claim that gender diversity can harm the decision-making process.

3.5. Social Identity Theory

Contrary to resource dependence and agency theories, the social identity theory suggests that board diversity may harm its operation. Based on this theory, people categorize themselves into different social groups according to psychological and demographic at-

tributes (e.g., gender, age, nationality, class and occupation). This self-categorization can cause various problems and conflicts (such as lack of cohesion, miscommunication and less cooperation) between gender-diverse groups (Tajfel 1978). When the board gender diversity is high, miscommunication and lack of cohesion between groups of different gender may harm the board's decision-making process and its ability to find optimal solutions. Therefore, gender diversity on corporate boards leads to lower firm performance. Furthermore, this theoretical framework describes women's exclusion from social networks. For instance, Kanter's (1977) study on homosocial reproduction points out how individuals in powerful positions replicate male-dominated power structures in corporations. Daily and Dalton (1995) highlight how male CEOs are more likely to lead boards composed of members of similar gender, as well as similar age, background and experience. Jehn et al. (1999) state that social category diversity (gender and age) increases the level of relationship conflicts in workgroups. Ali et al. (2014) integrate resource dependence theory and social identity theory and propose an inverted U-shaped relation between board gender diversity and firm performance. However, they fail to confirm the aforementioned non-linear relationship.

3.6. Research Studies on the Relationship between Board Gender Diversity and Firm Performance

The relationship between board gender diversity and performance outcomes, according to Carter et al. (2003), is an empirical issue. Several studies in the corporate governance literature have attempted to empirically investigate the relationship between board gender diversity and financial performance. However, the empirical findings obtained from both emerging and developed economies have remained inconclusive. For instance, Terjesen et al. (2016) find that corporations with more female participation on the board have a higher market value and accounting performance. According to Achkar and Bouri (2020), female participation in the workplace and involvement in a firm's management can increase company performance. Based on two well-known econometric techniques, namely structural equation modelling (SEM) and network analysis through Gaussian graphical models (GGMs), Noja et al. (2021) highlight that upward board gender diversity is essential for higher corporate performance. According to Carter et al. (2003), both female directors and minorities on the board of directors have a beneficial impact on firm value. In support, Liu et al. (2014), Nguyen et al. (2015) and Brahma et al. (2020) document that there is a positive and significant relation between board gender diversity and firm financial performance.

However, Nguyen et al. (2015) state that the positive effect of gender diversity on performance changes to negative after a certain critical point (0.3 for Blau index corresponding to a ratio of nearly 20% female directors on boards), explaining that after this point the costs of diversity outweigh the potential benefits. Mohsni et al. (2021) state that gender diversity is inversely related to both operating and financial risk and positively related to corporate performance in a sample of 232 firms from 27 developing nations. In the French context, Bennouri et al. (2018) find that female directorship increases accounting performance (ROE and ROA), but diminishes market-based performance (Tobin's Q). In the context of the USA, Owen and Temesvary (2018) point out that the inconclusive findings on the relationship between gender diversification and performance are due to the fact that there is a U-shaped relation between women's representation on boards and various performance measures. Contrary to the above, some empirical studies show that there is a negative or no relation between the proportion of female directors and firm performance. For instance, Adams and Ferreira (2009) find that the average effect of board gender diversity on performance is negative. Naghavi et al. (2021) claim that in nations with high power distance, masculine, individualist and low-uncertainty avoidance culture, the high proportion of female board members has a negative impact on firm performance. Fernández-Temprano and Tejerina-Gaite (2020) and Ararat and Yurtoglu (2021) claim that there is no evidence that gender diversity has an impact on the performance of Spanish and Turkish companies, respectively. The latter argument is also supported by the current study of Gruszczyński (2020), who applies binomial models, quantile regression and multiple regression to examine the impact of female directors on performance and concludes that the women presence on corporate

boards did not influence corporate performance. Considering the above, our next two hypotheses are the following.

Hypothesis 1a (H1a). *There is a positive relation between board gender diversity and firm performance.*

Hypothesis 1b (H1b). *The positive relation between gender diversity and firm performance comes with a limit.*

4. Data and Methodology

4.1. Sample and Data

Our initial sample contained all listed firms in the Athens Stock Exchange for the period 2008–2020. Following the convention in the literature, from the 148 listed firms, we excluded 19 financials firms and 18 firms with incomplete data on corporate governance variables. Thus, the final sample consists of 111 firms (1443 firm-year observations). It is important to note that we included only publicly traded companies in our sample for transparency and information availability reasons. We collected corporate governance data from the annual reports of listed firms and from the official website of the Athens Stock Exchange[1], while the financial information was collected from the Refinitiv Eikon database. All firm-level variables are winsorized at the 1% and 99% levels to mitigate outliers' impact. Table 1 provides the sample distribution by sector. As presented in Table 1, our final sample contains firms that operate in nine different sectors, including basic materials, consumer goods, consumer services, health care, industrials, oil and gas, technology, telecommunications and utilities. Based on the third column of cumulative frequencies, the first three sectors (basic materials, consumer goods and consumer services) account for more than 50% of our sample.

Table 1. Sample distribution by sector.

	Frequencies	Percent	Cumulative Frequency
Basic materials	156	10.81	10.81
Consumer goods	429	29.73	40.54
Consumer services	234	16.22	56.76
Health care	39	2.7	59.46
Industrials	325	22.52	81.98
Oil and gas	26	1.8	83.78
Technology	182	12.61	96.4
Telecommunications	13	0.9	97.3
Utilities	39	2.7	100
Total	1443	100	

4.2. Variables

4.2.1. Dependent Variables

Following previous studies (Nguyen et al. 2015; Liu et al. 2014; Carter et al. 2010), we use two well-established performance measures, one accounting-based and another one which is market-based. Return on Assets (ROA) is an accounting measure of performance and gives us an idea of how profitable a company is relative to the value of its total assets. We calculate ROA as the operating income before depreciation divided by fiscal year-end total assets. Tobin's Q is a market-based measure of financial performance, as it measures the market expectations of future earnings. We calculate Tobin's Q as the sum of the market value of a firm's stock and the book value of debt divided by the book value of its total assets. Both indicators (ROA and Tobin's Q) are commonly used in corporate governance literature as measures of financial performance.

4.2.2. Independent and Control Variables

Our main explanatory variable of interest is gender diversity (gender). We use three different proxies to measure board gender diversity. At first, we use the proportion of female board members (female). Moreover, we use two well-known diversity indices to measure the level of gender diversity proposed by Blau (1977) and Shannon (2001). Blau index is defined as $(1 - \sum_{i=1}^{k} P_i^2)$, where $i = (1, 2)$ is the number of board gender categories (two gender categories, female and male) and P_i is the proportion of board members in each category. The minimum value of Blau index is zero (perfectly homogeneous board) while the maximum value is 0.5 (equal number of male and female board members). We calculate the Shannon index as $(-\sum_{i=1}^{k} P_i lnP_i)$, where $i = (1, 2)$ is the number of board gender categories (two gender categories, female and male) and P_i is the proportion of board members in each category. The minimum and maximum values of the Shannon index are zero (male-dominated board or female-dominated board) and 0.693 (both genders are equally presented), respectively. Higher values of Blau and Shannon imply greater board gender diversity. Following the previous literature (Brahma et al. 2020; Nguyen et al. 2015; Liu et al. 2014; Carter et al. 2010), we control for the board and firm characteristics such as board size, the proportion of independent directors, CEO duality, firm size, firm age, leverage and year dummies. Finally, we include in our models the one-year lagged dependent variable to control for the dynamic relationship that exists between governance factors and firm performance. Table 2 contains the acronyms and the definition of each variable.

Table 2. Variables and definitions.

Variables	Acronym	Definition
Dependent variables		
Tobin's Q ratio	*tobinq*	Tobin's Q is the sum of the market value of firm's stock and the book value of debt divided by the book value of its total assets.
Return on assets	*roa*	Return on assets is defined as operating income before depreciation divided by fiscal year-end total assets.
Gender diversity variables		
Percentage of female directors (%)	*female*	The ratio of female directors to total number of directors.
Blau index for gender	*blau*	Blau index for gender: $(1 - \sum_{i=1}^{k} P_i^2)$, where $i = (1, 2)$ is the number of gender categories (two), P_i is the proportion of board members in each category.
Shannon index for gender	*shannon*	Shannon index for gender: $(-\sum_{i=1}^{k} P_i lnP_i)$, where $i = (1, 2)$ is the number of gender categories (two), P_i is the proportion of board members in each category.
Board structure variables		
Board size	*lnboard*	Board size is the total number of directors. The natural logarithm of board size (lnboard) is used in our models.
Percentage of independent directors (%)	*indep*	The ratio of independent directors to total number of directors.
Duality	*duality*	Dummy variable that takes a value of one if the chairperson is also the CEO, and zero otherwise.

Table 2. *Cont.*

Variables	Acronym	Definition
Others control variables		
Firm size	*fsize*	The natural logarithm of the book value of total assets.
Firm age	*lnage*	The natural logarithm of the number of years since the firm was established.
Leverage (%)	*lev*	The ratio of the company's total debt to its total assets.
Year dummy variables	*year dummy*	A dummy variable for each year from 2008 to 2020. One year dummy is treated as the benchmark category to avoid dummy variable trap.

4.3. Descriptive Statistics and Correlations among Variables

Table 3 reports the descriptive statistics for our sample. The mean value of Tobin's Q is 0.74, while the median value is 0.64. Both mean and median values are less than one indicating that the market value of the Greek listed firms during the period 2008–2020 is lower than the book value. This result could be explained by the financial crisis, which negatively affected Greek stock values. The average value of ROA is 0.04, which means that the operating income before depreciation of the Greek firms during the sampling period is lower than their total assets. The standard deviation of ROA (0.07) is higher than its average value (0.04), indicating high volatility. The proportion of female directors ranges from 0% to 57%. The average percentage of female board members is 14%, higher than 10.72% reported by Bennouri et al. (2018) for France and also higher than 6.92% reported by Reguera-Alvarado et al. (2017) for Spain. The Blau value ranges from 0% to 49%. The mean (median) value of Blau is 0.19 (0.20), which indicates low level of gender diversity on Greek corporate boards. This result is very close to Unite et al.'s (2019) findings, which show that the average value of the Blau index is 0.2 using a sample of Philippine firms. Moreover, our obtained average value of Blau index is higher than Reguera-Alvarado et al.'s (2017) findings, who report that the average value of Blau index for Spain is 0.115. The average value of the Shannon index in our sample is 0.3, which is very close to 0.31, obtained by Unite et al. (2019), while its median value is 0.35. This result indicates a low level of gender diversity. The maximum (minimum) value of Shannon is 0.68 (0). Based on the average values of the proportion of female directors, Blau and Shannon, we conclude that gender representation in Greek boards is still low and could be enhanced. The average value of board size is 7.58 members and ranges from a minimum of 5 members to a maximum of 13 members. This average value is smaller than 10.52 reported by Brahma et al. (2020) for the UK context. On an average basis, independent directors account for 32% of total board members. This percent is significantly smaller than 63% reported by Adams and Ferreira (2009) for USA-based firms. Among sampling companies, 62% of the CEOs serve as board chairpersons, which is close to the 75% found by Salloum et al. (2013). It is worth noting that this percentage (62%) is significantly higher than the 32% obtained by Nguyen et al. (2015) for Vietnamese companies, demonstrating that dual roles are very common in Greece. Regarding the rest of the control variables, the average value of firm age is 36.51 years and ranges from 12 to 94 years, while the average value of firm size is 18.39 and ranges from 15.93 to 22.70. Finally, we observe that on an average basis, a firm's debt account for 38% relative to their assets, which indicates that Greek firms have a reasonable level of leverage.

Table 3. Descriptive statistics of the trimmed sample.

Variables	Obs	Mean	Std	p25	Median	p75	Min	Max
Tobin's Q (ratio)	1443	0.74	0.42	0.48	0.64	0.87	0.19	1.91
Return on assets (ratio)	1443	0.04	0.07	0.00	0.04	0.08	−0.19	0.19
Female directors (ratio)	1443	0.14	0.15	0.00	0.11	0.22	0.00	0.57
Blau index	1443	0.19	0.18	0.00	0.20	0.35	0.00	0.49
Shannon index	1443	0.30	0.26	0.00	0.35	0.53	0.00	0.68
Board size (ln)	1443	1.99	0.26	1.79	1.95	2.20	1.61	2.57
Board size (rows)	1443	7.58	2.03	6.00	7.00	9.00	5.00	13.00
Independent directors (ratio)	1443	0.32	0.13	0.25	0.30	0.40	0.00	0.63
Duality	1441	0.62	0.49	0.00	1.00	1.00	0.00	1.00
Firm size (ln)	1443	18.39	1.54	17.28	18.06	19.30	15.93	22.70
Leverage (ratio)	1443	0.38	0.28	0.19	0.34	0.50	0.00	1.40
Firm age (years)	1443	36.51	17.60	24.00	33.00	44.00	12.00	94.00
Firm age (ln)	1443	3.49	0.46	3.18	3.50	3.78	2.49	4.54
Number of firms	111	111	111	111	111	111	111	111

Note: The variables are as defined in Table 2.

According to the data in Table 4, approximately 59% of companies in the sample (equivalent to 856 out of 1443 observations) have at least one female director on their board. This proportion is higher than that reported by Campbell and Mínguez-Vera (2008) for Spain (23.70%) and Nguyen et al. (2015) for Vietnam (51%). This result is a reflection of the high proportion of women in the labor force in Greece, which may contribute to higher gender diversity in the boardroom than would otherwise be the case. Nevertheless, female representation in Greek boardrooms is still low. As reported in Table 4, of 856 cases with at least one female director, only 390 (27%) have two or more women on the board, while the number of cases with at least three female directors is just 10.5%. In terms of frequency of female directors by board size, we observe that cases with one or two female directors on the board tend to be those which have a board membership ranging from six to seven (i.e., relative frequency of female participation on board directors lies in the range of 17% to 32%).

Table 4. The frequency of female directors by board size.

Board Size (Persons)	Number of Female Directors in Boardroom (Persons)						Total
	0	1	2	3	4	5	
5	138	69	21	15	0	0	243
6	72	75	44	9	1	0	201
7	127	143	82	54	22	3	431
8	36	38	24	10	3	0	111
9	105	69	32	18	0	0	224
10	26	19	10	3	1	0	59
11	49	39	20	4	3	2	117
12	12	3	0	0	0	1	16
13	22	11	6	1	0	1	41
Total	587	466	239	114	30	7	1443

Note: Board size is as defined in Table 2.

Table 5 reports the correlations among variables. The proportion of female directors (*female*) is negatively but insignificantly correlated with *tobinq* and significantly and negatively with roa. Both diversity indices (*blau* and *shannon*) are positively but insignificantly correlated with *tobinq* and significantly and negatively with *roa*. As regards other board structure variables, both the natural logarithm of board size (*lnboard*) and the fraction of independent board members (*indep*) are positively and significantly correlated with two performance measures (*tobinq* and *roa*). Contrary, the variable duality is negatively and

significantly correlated with *tobinq* and *roa*. The rest of the control variables (*fsize*, *lnage and lev*) are significantly correlated with *roa*, while only the natural logarithm of firm age (*lnage*) is significantly correlated with *tobinq*. We observe high correlation coefficients among gender diversity variables (*female*, *blau* and *shannon*), but since these three variables are not used simultaneously in the regression model, the high correlation among them is not an issue. We again recheck for multicollinearity using the variance inflation factor (VIF). The results show that the highest VIF is 1.56 and the average of VIFs is 1.23, suggesting that multicollinearity is not a problem in this study.

Table 5. Correlation matrix for variables.

	tobinq	*roa*	*female*	*blau*	*shannon*	*lnboard*	*indep*	*duality*	*fsize*	*lnage*	*lev*
tobinq	1										
roa	0.065 **	1									
female	−0.041	−0.048 *	1								
blau	0.005	−0.047 *	0.954 ***	1							
shannon	0.015	−0.047 *	0.925 ***	0.994 ***	1						
lnboard	0.092 ***	0.233 ***	−0.179 ***	−0.152 ***	−0.128 ***	1					
indep	0.067 **	0.228 ***	−0.159 ***	−0.127 ***	−0.102 ***	0.989 ***	1				
duality	−0.046 *	−0.075 ***	0.072 ***	0.071 ***	0.061 **	−0.212 ***	−0.200 ***	1			
fsize	−0.025	0.081 ***	0.146 ***	0.154 ***	0.148 ***	−0.126 ***	−0.130 ***	−0.024	1		
lnage	0.060 **	0.368 ***	−0.122 ***	−0.110 ***	−0.093 ***	0.593 ***	0.567 ***	−0.170 ***	−0.005	1	
lev	−0.010	−0.153 ***	0.092 ***	0.086 ***	0.086 ***	0.007	0.015	0.014	−0.211 ***	0.138 ***	1
N	1441										

Note: Asterisks indicate significance at 10% (*), 5% (**) and 1% (***). The notation is as defined in Table 2.

4.4. Methodology

4.4.1. Model Specification

According to the theoretical arguments of Harris and Raviv (2008), the relationship between corporate governance and firms' performance is dynamic, meaning that current corporate governance characteristics and performance are affected by firms' past performance. This is supported by Wintoki et al. (2012) and Nguyen et al. (2015), who argue that, rather than the static model used in many previous studies, the appropriate empirical model for the corporate governance and firms' performance association should be a dynamic one, in which lagged performance is used as one of the explanatory variables. This dynamic approach has been recently applied in studies of the board structure–performance nexus (Wintoki et al. 2012; Nguyen et al. 2015). According to the above, the model specification for estimating the relationship between board gender diversity and firm financial performance in a dynamic framework is described as follows:

$$y_{it} = \alpha + \sum_{s=1}^{k} \varphi_s y_{it-s} + \beta \boldsymbol{X}_{it} + \gamma \boldsymbol{Z}_{it} + year\ dummies + \eta_i + \varepsilon_{it} \quad (1)$$

where i and t denote, as usual in the literature, observational firms and time, respectively; φ, β and γ are vectors of coefficients on lagged dependent variables (y_{it-s}), board structure variables ($\boldsymbol{X}_{it}$) and control variables ($\boldsymbol{Z}_{it}$), respectively; η_i represents unobserved time-invariant firm effects; ε_{it} is the disturbance *iid* term; and k is the number of dependent variable lags. Wintoki et al. (2012) suggest that two lags are sufficient to capture all information from the past. After running an OLS regression of current performance on two lags of past performance, controlling for $\boldsymbol{X}_{it}$ and $\boldsymbol{Z}_{it}$, we find that the coefficient on y_{it-2} is not statistically significant at the 5% level, suggesting that one lag is enough to capture the dynamic nature of the board structure–performance relationship. As a result, for the models to be estimated in this study, the 1-year lag of firm's performance (Tobin's Q and ROA) is used. This is consistent with the relevant literature (Adams and Ferreira 2009; Nguyen et al. 2015). Consequently, the Equation (1) may be specifically written in the following way:

$$\begin{aligned} Performance_{it} &= \alpha + \varphi Performance_{it-1} + \beta_1 Gender_{it} + \beta_2 lnboard_{it} \\ &+ \beta_3 indep_{it} + \beta_4 duality_{it} + \gamma_1 fsize_{it} + \gamma_2 lnage_{it} + \gamma_3 lev_{it} \\ &+ year\ dummies + \eta_i + \varepsilon_{it} \end{aligned} \quad (2)$$

where the dependent variable $Performance_{it}$ is the firm's performance, proxied by Tobin's Q (*tobinq*) or return on assets (*roa*). $Performance_{it-1}$, is $tobinq_{it-1}$ or roa_{it-1}. We measure our key explanatory variable $Gender_{it}$ by the proportion of female directors (*female*), the Blau index (*blau*) and the Shannon index (*shannon*) of diversity. To examine the possible nonlinearity in the board gender diversity–performance relationship, we add in our main regression model their quadratic terms, $female^2$, $blau^2$ and $shannon^2$. The other independent variables of board structure are: The board size (*lnboard*) is the natural logarithm of the members of the board. The independence (*indep*) is the ratio of independent directors to total number of directors, while the dummy variable *duality* takes a value of one if the chairperson is also the CEO, and zero otherwise. We control Equation (2) for a set of firm characteristics as follows: the firm size (*fsize*) is the natural logarithm of the book value of total assets. Firm age (*lnage*) is the natural logarithm of the number of years since the firm was established. Leverage (*lev*) is referred to total debt over total assets. Following Wintoki et al. (2012), we assume that firm age (*lnage*) and *year dummies* are exogenous. The rest terms are defined as in Equation (1).

4.4.2. Estimation Method

To address possible endogeneity problems emerging from unobserved time-invariant heterogeneity and/or simultaneity, most earlier investigations on the corporate governance nexus used the fixed-effects methodology and/or the instrumental variable (IV) approach. However, these methodologies are not well suited to address the dynamic endogeneity that often occurs, both in exploring the relationship between board structure and performance and the relationship between gender diversity and performance (Wintoki et al. 2012; Dezsö and Ross 2012). In the present paper, the application of IV methodology is impractical since it is difficult to find a set of external instruments for gender diversity once all explanatory variables are assumed to be endogenously determined. Given the unavailability of appropriate external instruments, the two-step system GMM estimator proposed by Blundell and Bond (1998) constitutes the most appropriate method. Using dynamic estimators has the following advantages over traditional panel estimators: (a) greater control of endogeneity, (b) greater control of possible collinearity of explanatory variables, (c) more effectiveness in identification problems caused by the lack of data for important independent variables and (d) unbiased estimations of the persistence of performance in Hellenic firms.

Estimating Equation (2) using traditional panel methods would give biased estimations, due to the correlation between η_i and $Performance_{i,t-1}$, and between $\varepsilon_{i,t}$ and $Performance_{i,t-1}$. To deal with this case, Arellano and Bond (1991) suggest estimating Equation (2) with the variables in first differences, using the lagged profitability and the determinants in levels. This way, non-observable individual effects (η_i) are eliminated and the same is true for the correlation between η_i and $Performance_{i,t-1}$. In addition, the use of lags either for the profitability or the determinants creates orthogonal conditions between $\varepsilon_{i,t}$ and $Performance_{i,t-1}$.

According to Blundell and Bond (1998) the GMM (1991) estimator leads to biased results because the instruments are weak when there is high correlation among the dependent in the previous and current periods while the number of lags is not particularly high. To solve this problem, Blundell and Bond (1998) propose the use of an alternative estimator, considering a system of variables at levels and in first differences. For the variables at level, the instruments are given in first differences, while for the variables in first differences, the instruments are given in levels.

This GMM system (1998) estimator can only be valid if these conditions are satisfied: (a) the restrictions created (as a consequence of using instruments) are valid, and (b) there

is no second-order autocorrelation. To test the validity of the restrictions created using instruments the Hansen test has been applied. This yields a *J*-statistic which is distributed as χ^2 under the null of the validity of the instruments. We also test for the existence of first and second-order autocorrelation. In the case of not rejecting the null hypothesis (non-existence of first and second-order autocorrelation), we conclude that the results obtained from the GMM system (1998) estimators are robust.

5. Empirical Findings

To investigate the impact of board gender diversity on firm performance, we use three different proxies. The first one is the proportion of female directors (*female*), the second one is the Blau index of diversity (*blau*) and the last one is the Shannon index of diversity (*shannon*). We include in our main regression model their squared values ($female^2$, $blau^2$, $shannon^2$) to test for a possible non-linearities. Moreover, we use one-year lag of the performance variable as an additional explanatory variable. To address the problem of endogeneity that plagued many previous studies, we estimate our regression models by using the two-step system GMM method, which is considered the most effective method for exploring the relation between governance factors and performance. At first, we examine the effect of board gender diversity on firm performance measured by Tobin's Q. Table 6 provides our econometric estimations.

We find that board gender diversity has a positive and significant impact on firm value (*tobinq*) at the 5% level (columns 1, 3 and 5). The positive and statistically significant coefficients of *female*, *blau* and *shannon* confirm this result. This result is consistent with Hypothesis 1a, which claims that gender diversity increases firm performance. This finding is also in line with the findings of many previous studies (e.g., Brahma et al. 2020; Nguyen et al. 2015; Liu et al. 2014; Noja et al. 2021) that confirm the positive relationship between gender diversity and financial performance, while it contrasts with the findings of some other empirical studies (e.g., Adams and Ferreira 2009; Fernández-Temprano and Tejerina-Gaite 2020) that support the negative or no effect of gender diversity on firm performance. Moreover, this empirical finding is in agreement with both agency and resource dependence perspectives. According to these theories, female directors better execute their monitoring responsibilities, increase firm legitimacy and extend the firm's external resources, resulting in better board operation, and this in turn leads to better performance. Overall, this empirical finding highlights the contribution of female directors to corporate success. As previously mentioned, to examine whether there is a non-linear relationship between gender diversity and performance, we include in our models the quadratic terms of female ($female^2$), Blau ($blau^2$) and shannon ($shannon^2$). We find indeed that there is an inverted U-shaped relation between the proportion of female board members and performance. The positive and significant coefficient of *female* and the negative and significant coefficient of $female^2$ (column 2) confirm this result. This empirical finding supports our hypothesis 1b, which states that the positive effect of gender on performance comes with a limit. Although firm performance increases as the proportion of female board members increases, there is a critical point (33% female representation) beyond which a continuous addition of female board members diminishes the firm value, indicating that the costs of gender diversity predicted by social identity theory (e.g., miscommunication, disagreements, conflicts and loss of trust) outweigh the potential benefits of diversity predicted by agency and resource dependence theories (e.g., greater monitoring, improved decision-making, plethora of views, opinions and skills, stronger connections with female clients and workers and better corporate image). In addition, our findings are in contrast to the critical mass theory which claims that only a critical mass of female directors may have a significant influence on a firm's dynamics and its performance (Kanter 1977; Joecks et al. 2013). This result is in line with the findings of Nguyen et al. (2015), who state that after a critical value of about 20%, the proportion of female directors starts to diminish firm performance. In our case, this happens at a much higher percentage of 33% female representation. However, this result

contradicts Owen and Temesvary (2018), who find that there is a U-shaped relationship between board gender diversity and bank performance.

Table 6. The effect of gender diversity on market performance (two-step system GMM).

Independent Variables	Dependent Variable: *tobinq*					
	Female		Blau		Shannon	
	(1)	(2)	(3)	(4)	(5)	(6)
$tobinq_{t-1}$	0.755 ***	0.749 ***	0.751 ***	0.741 ***	0.720 ***	0.707 ***
	(12.757)	(11.013)	(12.625)	(11.696)	(10.407)	(9.786)
$female$	0.325 **	1.023 **				
	(2.040)	(2.617)				
$female^2$		−1.548 **				
		(−2.424)				
$blau$			0.368 **	0.515		
			(2.253)	(1.421)		
$blau^2$				−0.369		
				(−0.504)		
$shannon$					0.262 **	0.188
					(2.300)	(0.727)
$shannon^2$						−0.013
						(−0.033)
$lnboard$	−0.235 **	−0.234 **	−0.234 **	−0.200 **	−0.250 **	−0.242 **
	(−2.226)	(−2.231)	(−2.280)	(−2.248)	(−2.173)	(−2.611)
$indep$	−0.209	−0.256 *	−0.215	−0.195	−0.213	−0.149
	(−1.444)	(−1.721)	(−1.544)	(−1.391)	(−1.453)	(−1.212)
$duality$	0.039	0.025	0.028	0.019	0.023	0.010
	(0.669)	(0.408)	(0.484)	(0.336)	(0.411)	(0.199)
$fsize$	0.058 ***	0.057 **	0.060 **	0.056 **	0.056 **	0.055 **
	(2.716)	(2.385)	(2.459)	(2.341)	(2.538)	(2.562)
$lnage$	−0.048	−0.033	−0.042	−0.048	−0.051	−0.063
	(−0.967)	(−0.610)	(−0.832)	(−0.976)	(−0.916)	(−1.243)
lev	0.250 ***	0.229 ***	0.256 ***	0.267 ***	0.279 ***	0.320 ***
	(2.856)	(2.623)	(2.943)	(3.076)	(2.877)	(3.315)
Constant	−0.334			−0.332	−0.217	−0.222
	(−0.947)			(−0.856)	(−0.632)	(−0.635)
Observations	1330	1330	1330	1330	1330	1330
Number of firms	111	111	111	111	111	111
Number of instruments	53	58	53	58	61	67
AR(1) test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) test (p-value)	0.443	0.494	0.465	0.455	0.438	0.397
Hansen test of over-identification (p-value)	0.634	0.487	0.582	0.583	0.558	0.561
Diff-in-Hansen test of exogeneity (p-value)	0.470	0.460	0.343	0.375	0.237	0.590

Notes: Columns (1)–(6) adopts the two-step Blundell and Bond GMM system (1998) estimation method. The dependent variable is the tobin's q ratio (*tobinq*), which is the sum of the market value of firm's stock and the book value of debt divided by the book value of its total assets. The estimates include time *dummy* variables but not show. All t-statistics are reported in parentheses and are based on robust, firm-clustered standard errors. AR(1) and AR(2) are tests for first-order and second-order serial correlation in the first-differenced residuals and are distributed as $N(0, 1)$, under the null of no serial correlation. The Hansen test of over-identification is distributed as $N(0, 1)$ under the null that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous. Significance levels are indicated by *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$. The notation is as defined in Table 2.

When we use the Blau or the Shannon index as a measure of gender diversity instead of the fraction of female directors and include in the regressions their squared values (columns 4 and 6), we again observe the existence of an inverted U-shaped relation between these two indices and firm performance (*tobinq*), but this time this relation is not significant because both linear and quadratic coefficients of Blau and Shannon indices lack statistical

significance. Similar to Nguyen et al. (2015) and Adams and Ferreira (2009), we show that past performance ($tobinq_{t-1}$) has a significant and positive impact on the current corporate performance, as is shown by the positive and significant coefficient of $tobinq_{t-1}$ in all equations. Regarding other governance variables (columns 1–6), we find that the percentage of independent directors (*indep*) and CEO duality (*duality*) do not have any significant effect on *tobinq* (the fraction of independent directors is significant only in column 2), while the board size (*lnboard*) affects the performance significantly and negatively. The latter finding is in agreement with some prior empirical studies that support the negative relationship between the board size and financial performance (Pathan and Faff 2013; Yermack 1996) but at variance with some others (Brahma et al. 2020; Liu et al. 2014). Furthermore, as shown by the positive and statistically significant coefficient of *fsize* there is a positive relation between the size of the firm and financial performance (*tobinq*), but we do not find any significant relation between firm age (*lnage*) and Greek firm performance measured by Tobin's Q. Finally, we find that there is a positive relationship between the firm leverage ratio (*lev*) and firm value (*tobinq*). González's (2013) study states that the link between leverage and company performance is contingent upon two components. The first one is the cost of financial distress, while the second one is the potential benefit of the disciplinary role of debt financing. Based on the above, the positive relationship between the leverage and firm performance obtained in our study suggests that the benefits of the disciplinary role of debt financing outweigh the costs of the financial meltdown in the context of Greek listed firms.

In Table 6, we also report the results of the specification tests—the AR(2) second-order serial correlation tests and the Hansen *J* test of over-identifying restrictions. Based on the AR(2) test we cannot reject the null of no second-order serial correlation. It is also shown that we cannot reject the null that our instruments are valid based on the *J*-statistic. In addition, we cannot reject the null of the exogeneity of a subset of our instruments in the sys-GMM that we have used for the estimations.

To check the robustness of our empirical findings, we use an alternative accounting-based measure of firm performance. Return on assets (*roa*) is a widely accepted measure of performance in governance literature and gives us an idea of how profitable a firm is relative to its total assets. Table 7 reports the effect of gender diversity on accounting performance (*roa*). The interpretation of the variable coefficients in Table 7 is qualitatively similar to Table 6. We observe that our main empirical finding remains unchanged, indicating that gender diversity (*female*, *blau* or *shannon*) enhances firm performance (*roa*). The positive and significant coefficients of *female*, *blau* and *shannon* (columns 1, 3 and 5) confirm this result. It is important to note that when we use *roa* instead of *tobinq* as a performance measure and include in our models the quadratic term of female ($female^2$), the non-linear inverted U-shaped relation between the proportion of female directors and financial performance disappears (column 2). Further, the coefficients of *blau*, $blau^2$, *shannon* and $shannon^2$ (columns 4 and 6) remain insignificant. The coefficients of past performance (roa_{t-1}), board size (*lnboard*) and firm size (*fsize*) remain unchanged, as a result enhancing the robustness of our findings. The coefficient of *duality* changes from positive to negative but remains statistically insignificant, while the coefficient of *indep* in most equations remains negative and insignificant (except columns (2) and (4)). The coefficient of firm age (*lnage*) remains negative but changes from non-significant to significant, indicating that younger firms perform better. This result is consistent with the findings of Brahma et al.'s (2020) study but at variance with the findings of Unite et al.'s (2019) study. Finally, we find that the coefficient of leverage ratio (*lev*), when we use *roa* as a performance measure, becomes significant and negative. This negative relationship between the leverage ratio and financial performance indicates that the costs of financial meltdown outweigh the benefits of the disciplinary role of debt financing (González 2013). The econometric tests of Table 7 can be interpreted as previously explained.

Table 7. The effect of gender diversity on accounting performance (two-step system GMM).

Independent Variables	Dependent Variable: *roa*					
	Female		Blau		Shannon	
	(1)	(2)	(3)	(4)	(5)	(6)
roa_{t-1}	0.501 ***	0.513 ***	0.501 ***	0.513 ***	0.501 ***	0.499 ***
	(6.987)	(6.839)	(7.016)	(6.757)	(7.050)	(6.836)
$female$	0.106 **	0.275 **				
	(2.188)	(2.055)				
$female^2$		−0.299				
		(−1.380)				
$blau$			0.106 **	0.133		
			(1.997)	(0.939)		
$blau^2$				−0.003		
				(−0.011)		
$shannon$					0.064 *	−0.016
					(1.746)	(−0.248)
$shannon^2$						0.154
						(1.461)
$lnboard$	−0.081 **	−0.094 **	−0.085 **	−0.091 **	−0.088 **	−0.096 ***
	(−2.183)	(−2.299)	(−2.295)	(−2.242)	(−2.387)	(−2.764)
$indep$	−0.058	−0.081 *	−0.062	−0.084 *	−0.064	−0.057
	(−1.116)	(−1.757)	(−1.245)	(−1.704)	(−1.248)	(−1.127)
$duality$	−0.011	−0.020	−0.013	−0.019	−0.013	−0.008
	(−0.793)	(−1.629)	(−0.969)	(−1.562)	(−0.967)	(−0.589)
$fsize$	0.025 ***	0.023 ***	0.025 ***	0.023 ***	0.024 ***	0.028 ***
	(3.136)	(2.690)	(3.264)	(2.665)	(3.257)	(3.250)
$lnage$	−0.022 *	−0.020 *	−0.023 **	−0.020 *	−0.022 **	−0.024 **
	(−1.914)	(−1.948)	(−2.228)	(−1.904)	(−2.245)	(−2.067)
lev	−0.053 **	−0.060 ***	−0.057 ***	−0.060 ***	−0.060 ***	−0.051 **
	(−2.519)	(−3.065)	(−2.822)	(−2.938)	(−3.105)	(−2.384)
Constant	−0.178	−0.133	−0.159	−0.130	−0.137	
	(−1.136)	(−0.948)	(−1.058)	(−0.927)	(−0.926)	
Observations	1330	1330	1330	1330	1330	1330
Number of firms	111	111	111	111	111	111
Number of instruments	53	67	53	67	53	58
AR(1) test (*p*-value)	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) test (*p*-value)	0.270	0.253	0.249	0.258	0.257	0.254
Hansen test of over-identification (*p*-value)	0.311	0.153	0.333	0.133	0.316	0.455
Diff-in-Hansen test of exogeneity (*p*-value)	0.162	0.163	0.214	0.178	0.191	0.499

Notes: Columns (1)–(6) adopts the two-step Blundell and Bond GMM system (1998) estimation method. The dependent variable is return on assets ratio (*roa*), where *roa* is defined as operating income before depreciation divided by fiscal year-end total assets. The estimates include time *dummy* variables but not show. All t-statistics are reported in parentheses and are based on robust, firm-clustered standard errors. AR(1) and AR(2) are tests for first-order and second-order serial correlation in the first-differenced residuals and are distributed as $N(0, 1)$, under the null of no serial correlation. The Hansen test of over-identification is distributed as $N(0, 1)$ under the null that all instruments are valid. The Diff-in-Hansen test of exogeneity is under the null that instruments used for the equations in levels are exogenous. Significance levels are indicated by *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$. The notation is as defined in Table 2.

6. Concluding Remarks

In recent decades, the relationship between gender diversity on corporate boards and financial performance has gotten considerable attention from politicians, regulators and academics worldwide. However, to the best of our knowledge, this topic has not yet been explored in Greece, with the exception of our study. For this purpose, we use the two-step system GMM estimator that deals efficiently with endogeneity problems which are quite

common in governance literature. We adopt three different proxies of gender diversity, i.e., the percentage of female directors, the Blau index and Shannon index, and we estimate their impact on two different firm performance measures, i.e., Tobin's Q and ROA.

Our findings show that board gender diversity, as measured in all three ways, has a positive impact on firm performance. Our empirical findings are in line with agency theory and resource dependence theory perspectives regarding the positive impact of gender diversity on board operation (such as increased legitimacy, effective monitoring, better decision-making and easier access to limited external resources), which in turn can lead to improved financial performance. We also find that there is an inverted U-shaped relationship between the percentage of female directors and firm performance measured by Tobin's Q indicator. Moreover, we show that beyond a certain critical point of 33%, this positive effect of female directors' percentage on firm performance, predicted by agency and resource dependence theories, turns to a negative one, as claimed by social identity theory. In addition, our findings are in contrast to the critical mass theory perspective, according to which female directors may have an impact on corporate outcomes only if they reach a certain threshold and constitute a critical mass.

Our paper contributes to the existing governance literature in several ways. This study sheds light on the conflicting evidence on the relationship between board gender diversity and firm performance for the case of firms that are based in small open economies, such as the Greek economy, by showing that greater gender diversity on the board enhances corporate performance. In addition, to the best of our knowledge, this is the first attempt to investigate empirically the impact of gender diversity on firm value in the Greek context. Thus, our empirical findings have practical implications for Greek regulators and policymakers regarding the implementation of an effective corporate governance system. Moreover, as Greece has experienced a long-term debt crisis (2008–2016) and a COVID-19 pandemic crisis, our study enriches the crisis literature as well. In contrast to prior studies on board gender diversity, this study also uses a multi-theoretical approach, highlighting less emphasized theoretical frameworks on governance literature such as the critical mass theory and social identity theory. Despite the aforementioned contributions of our research, it is worth mentioning that this study has some limitations that can be fruitful avenues for future research. First, as our research uses data from a single country, future studies can expand this research by including more nations that have experienced a financial crisis in the past, such as Portugal and Spain. Second, despite the fact that this research finds a significant relation between board gender diversity and firm performance, the channels through which female board members affect firm value remain unclear. Therefore, future researchers are encouraged to examine both the human and social capital of female directors through which female participation affects financial performance. Furthermore, the interaction between board gender diversity and other diversity attributes (such as nationality, age, expertise, tenure and education) has received less research attention. Thus, future studies should examine whether the interaction between them has an influence on corporate value. Finally, as our sample contains firms that operate in several sectors, future studies can examine how the impact of gender diversity on financial performance differs by sector.

Author Contributions: Conceptualization, S.E.A. and E.G.V.; methodology, S.E.A. and E.G.V.; software, S.E.A.; validation, S.E.A., G.M.A. and E.G.V.; formal analysis, S.E.A., E.G.V. and G.M.A.; investigation, S.E.A., E.G.V. and G.M.A.; resources, S.E.A. and E.G.V.; data curation, S.E.A. and E.G.V.; writing—original draft preparation, S.E.A., G.M.A. and E.G.V.; writing—review and editing, S.E.A., E.G.V. and G.M.A.; visualization, E.G.V.; supervision, S.E.A. and G.M.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: The authors would like to thank the University of West Attica for its overall assistance to this paper including the funding of registration fees to the ICABE-2021 or any other fees concerning the Journal of Risk and Financial Management. We would also like to thank the participants of the ICABE-2021 and especially El. Thalassinos, G. Bitros and M. Cristea for our valuable discussions on the paper. We also gratefully acknowledge two anonymous referees for their valuable suggestions.

Conflicts of Interest: The authors declare no conflict of interest.

Note

[1] https://www.athexgroup.gr. Accessed on 20 September 2021.

References

Achkar, Jessica, and Elie Bouri. 2020. Female empowerment/participation in the workplace and firm performance: A study of privately-owned firms. *International Journal of Productivity and Performance Management* 70: 2149–62. [CrossRef]

Adams, Renée B., and Daniel Ferreira. 2009. Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics* 94: 291–309. [CrossRef]

Ali, Muhammad, Yin Lu Ng, and Carol T. Kulik. 2014. Board age and gender diversity: A test of competing linear and curvilinear predictions. *Journal of Business Ethics* 125: 497–512. [CrossRef]

Ararat, Melsa, and B. Burcin Yurtoglu. 2021. Female directors, board committees, and firm performance: Time-series evidence from Turkey. *Emerging Markets Review* 48: 100768. [CrossRef]

Arellano, Manuel, and Stephen Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies* 58: 277–97. [CrossRef]

Bennouri, Moez, Tawhid Chtioui, Haithem Nagati, and Mehdi Nekhili. 2018. Female board directorship and firm performance: What really matters? *Journal of Banking & Finance* 90: 50–63. [CrossRef]

Berle, Adolf, and Gardiner Means. 1932. *The Modern Corporation and Private Property*. New York: Commerce Clearing House.

Blau, Peter M. 1977. *Inequality and Heterogeneity: A Primitive Theory of Social Structure*. New York: Free Press.

Blundell, Richard, and Stephen Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87: 115–43. [CrossRef]

Brahma, Sanjukta, Chioma Nwafor, and Agyenim Boateng. 2020. Board Gender Diversity and Firm Performance: The UK evidence. *International Journal of Finance & Economics* 26: 5704–19. [CrossRef]

Campbell, Kevin, and Antonio Mínguez-Vera. 2008. Gender diversity in the boardroom and firm financial performance. *Journal of Business Ethics* 83: 435–51. [CrossRef]

Carter, David A., Betty J. Simkins, and W. Gary Simpson. 2003. Corporate governance, board diversity, and firm value. *Financial Review* 38: 33–53. [CrossRef]

Carter, David A., Frank D'Souza, Betty J. Simkins, and W. Gary Simpson. 2010. The gender and ethnic diversity of US boards and board committees and firm financial performance. *Corporate Governance: An International Review* 18: 396–414. [CrossRef]

Cheng, J. Yo-Jud, and Boris Groysberg. 2020. Gender diversity at the board level can mean innovation success. *MIT Sloan Management Review* 61: 1–8.

Cumming, Douglas, Tak Yan Leung, and Oliver Rui. 2015. Gender Diversity and Securities Fraud. *Academy of Management Journal* 58: 1572–93. [CrossRef]

Daily, Catherine M., and Dan R. Dalton. 1995. CEO and director turnover in failing firms: An illusion of change? *Strategic Management Journal* 16: 393–400. [CrossRef]

Daily, Catherine M., Trevis Certo, and Dan R. Dalton. 1999. A decade of corporate women: Some progress in the boardroom, none in the executive suite. *Strategic Management Journal* 20: 93–100. [CrossRef]

Dezsö, Cristian L., and David G. Ross. 2012. Does female representation in top management improve firm performance? A panel data investigation. *Strategic Management Journal* 33: 1072–89. [CrossRef]

Drakos, Anastasios A., and Fivos V. Bekiris. 2010. Endogeneity and the relationship between board structure and firm performance: A simultaneous equation analysis for the Athens Stock Exchange. *Managerial and Decision Economics* 31: 387–401. [CrossRef]

Fernández-Temprano, Miguel A., and Fernando Tejerina-Gaite. 2020. Types of director, board diversity and firm performance. *Corporate Governance: The International Journal of Business in Society* 20: 324–42. [CrossRef]

Francoeur, Claude, Réal Labelle, and Bernard Sinclair-Desgagné. 2008. Gender Diversity in Corporate Governance and Top Management. *Journal of Business Ethics* 81: 83–95. [CrossRef]

Georgantopoulos, Andreas G., and Ioannis Filos. 2017. Board Structure and Bank Performance: Evidence for the Greek Banking Industry during Crisis Period. *International Journal of Economics and Financial Issues* 7: 56–67.

González, Víctor M. 2013. Leverage and corporate performance: International evidence. *International Review of Economics & Finance* 25: 169–84. [CrossRef]

Goodstein, Jerry, Kanak Gautam, and Warren Boeker. 1994. The effects of board size and diversity on strategic change. *Strategic Management Journal* 15: 241–50. [CrossRef]

Gruszczyński, Marek. 2020. Women on Boards and Firm Performance: A Microeconometric Search for a Connection. *Journal of Risk and Financial Management* 13: 218. [CrossRef]
Gul, Ferdinand A., Bin Srinidhi, and Anthony C. Ng. 2011. Board gender diversity and the stock price synchronicity. *Journal of Accounting and Economics* 51: 314–38. [CrossRef]
Harris, Milton, and Artur Raviv. 2008. A theory of board control and size. *Review of Financial Studies* 21: 1797–832. [CrossRef]
Hillman, Amy J., Albert A. Cannella, and Ramona L. Paetzold. 2000. The resource dependence role of corporate directors: Strategic adaption of board composition in response to environmental change. *Journal of Management Studies* 37: 235–55. [CrossRef]
Hillman, Amy J., Albert A. Cannella, and Ira C. Harris. 2002. Women and Racial Minorities in the Boardroom: How Do Directors Differ? *Journal of Management* 28: 747–63. [CrossRef]
Hillman, Amy J., Christine Shropshire, and Albert A. Cannella. 2007. Organizational predictors of women on corporate boards. *Academy of Management Journal* 50: 941–52. [CrossRef]
Jehn, Karen A., Gregory B. Northcraft, and Margaret A. Neale. 1999. Why differences make a difference: A field study of diversity, conflict, and performance in workgroups. *Administrative Science Quarterly* 44: 741–63. [CrossRef]
Jensen, Michael C. 1993. The modern industrial revolution, exit and the failure of internal control systems. *The Journal of Finance* 48: 831–80. [CrossRef]
Joecks, Jasmin, Kerstin Pull, and Karin Vetter. 2013. Gender Diversity in the Boardroom and Firm Performance: What Exactly Constitutes a "Critical Mass"? *Journal of Business Ethics* 118: 61–72. [CrossRef]
Kanter, Rosabeth M. 1977. Some effects of proportions on group life: Skewed sex ratios and response to token women. *American Journal of Sociology* 82: 965–90. [CrossRef]
Kramer, Vicki W., Alison M. Konrad, Sumru Erkut, and Michele J. Hooper. 2007. *Critical Mass on Corporate Boards: Why Three or More Women Enhance Governance*. Wellesley: Wellesley Centers for Women.
Krishnan, Gopal V., and Linda M. Parsons. 2008. Getting to the Bottom Line: An Exploration of Gender and Earnings Quality. *Journal of Business Ethics* 78: 65–76. [CrossRef]
Kristie, James. 2011. The power of three. *Director Boards* 35: 22–32.
Liu, Yu, Zuobao Wei, and Feixue Xie. 2014. Do Women Directors Improve Firm Performance in China? *Journal of Corporate Finance* 28: 169–84. [CrossRef]
Mohsni, Sana, Isaac Otchere, and Saquib Shahriar. 2021. Board gender diversity, firm performance and risk-taking in developing countries: The moderating effect of culture. *Journal of International Financial Markets Institutions and Money* 73: 101360. [CrossRef]
Naghavi, Navaz, Saeed Pahlevan Sharif, and Hafezali Bin Iqbal Hussain. 2021. The role of national culture in the impact of board gender diversity on firm performance: Evidence from a multi-country study. *Equality, Diversity and Inclusion: An International Journal* 40: 631–50. [CrossRef]
Nguyen, Tuan, Stuart Locke, and Krishna Reddy. 2015. Does boardroom gender diversity matter? Evidence from a transitional economy. *International Review of Economics & Finance* 37: 184–202. [CrossRef]
Noja, Gratiela Georgiana, Eleftherios Thalassinos, Mirela Cristea, and Irina M. Grecu. 2021. The Interplay between Board Characteristics, Financial Performance, and Risk Management Disclosure in the Financial Services Sector: New Empirical Evidence from Europe. *Journal of Risk and Financial Management* 14: 79. [CrossRef]
Owen, Ann L., and Judit Temesvary. 2018. The performance effects of gender diversity on bank boards. *Journal of Banking & Finance* 90: 50–63. [CrossRef]
Pathan, Shams, and Robert Faff. 2013. Does board structure in banks really affect their performance? *Journal of Banking & Finance* 37: 1573–89.
Pfeffer, Jeffrey, and Gerald R. Salancik. 1978. *The External Control of Organizations: A Resource Dependence Perspective*. New York: Harper & Row.
Reguera-Alvarado, Nuria, Pilar de Fuentes, and Joaquina Laffarga. 2017. Does Board Gender Diversity Influence Financial Performance? Evidence from Spain. *Journal of Business Ethics* 141: 337–50. [CrossRef]
Salloum, Charbel, Elie Bouri, and Christophe Schmitt. 2013. Board of directors and financial performance in the Middle East. *International Journal of Business Performance Management* 14: 274–92. [CrossRef]
Shannon, Claude E. 2001. A mathematical theory of communication. *ACM SIGMOBILE Mobile Computing and Communications Review* 5: 3–55. [CrossRef]
Spanos, Loukas J. 2005. Corporate governance in Greece: Developments and policy implications. *Corporate Governance: The International Journal of Business in Society* 5: 15–30. [CrossRef]
Tajfel, Henri. 1978. *Differentiation between Social Groups: Studies in the Social Psychology of Intergroup Relations*. New York: Academic Press.
Terjesen, Siri, Eduardo Barbosa Couto, and Paulo Morais Francisco. 2016. Does the presence of independent and female directors impact firm performance? A multi-country study of board diversity. *Journal of Management & Governance* 20: 447–83. [CrossRef]
Torchia, Mariateresa, Andrea Calabrò, and Morten Huse. 2011. Women directors on corporate boards: From tokenism to critical mass. *Journal of Business Ethics* 102: 299–317. [CrossRef]
Unite, Angelo A., Michael J. Sullivan, and Ailyn A. Shi. 2019. Board Diversity and Performance of Philippine Firms: Do Women Matter? *International Advances in Economic Research* 25: 65–78. [CrossRef]

Westphal, James D., and Laurie P. Milton. 2000. How experience and network ties affect the influence of demographic minorities on corporate boards. *Administrative Science Quarterly* 45: 366–98. [CrossRef]

Wintoki, Babajide M., James S. Linck, and Jeffry M. Netter. 2012. Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics* 10: 581–606. [CrossRef]

Yermack, David. 1996. Higher market valuation of companies with a small board of directors. *Journal of Financial Economics* 40: 185–211. [CrossRef]

Zhou, Haiyan, Stephen Owusu-Ansah, and Anastasia Maggina. 2018. Board of directors, audit committee, and firm performance: Evidence from Greece. *Journal of International Accounting, Auditing and Taxation* 31: 20–36. [CrossRef]